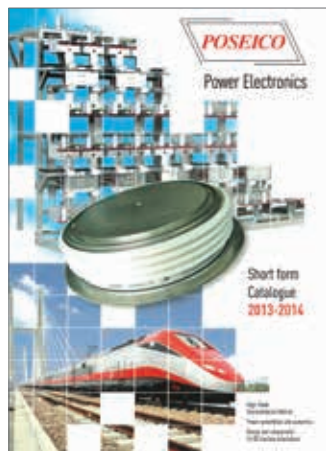
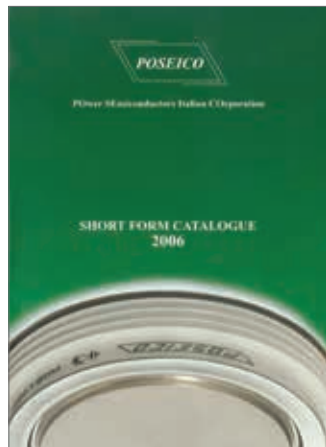
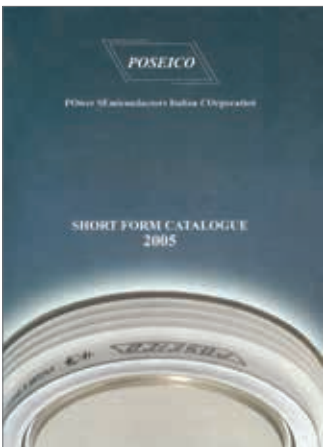
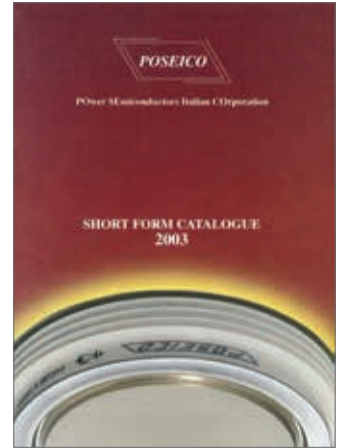
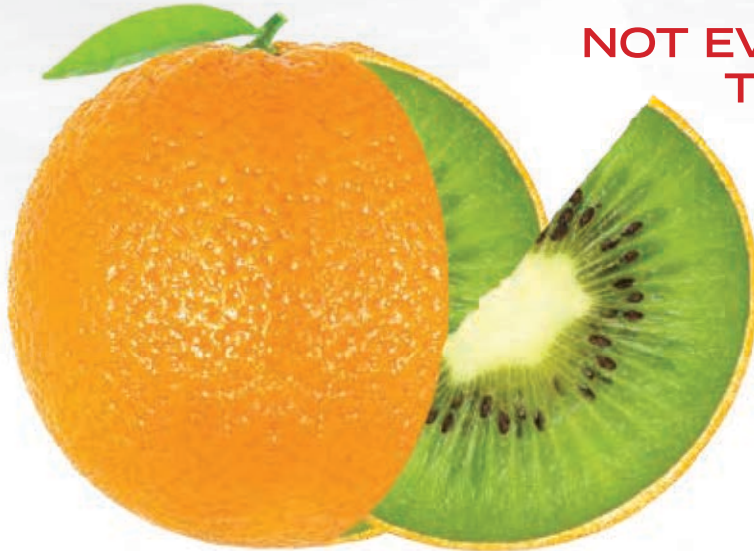




OUR HISTORY, YOUR FUTURE.



OUR HISTORY, YOUR FUTURE.



**NOT EVERYTHING  
THAT LOOKS ORIGINAL,  
IS ORIGINAL.**

## **WHEN YOU BUY FAKES:**

### **YOU ARE DEPRIVING YOURSELF AND OTHERS OF BETTER PUBLIC SERVICES AND MORE JOBS**

Counterfeiting causes substantial losses to legitimate brands and businesses, sometimes even leading to bankruptcy. This can result in job losses as genuine manufactures are forced to reduce costs or close down their businesses. In turn, this can negatively affect governments and economies. Counterfeiters do not pay taxes, which means less money for your city's schools, hospitals, parks and other social programmes.

### **YOU ARE FUNDING ORGANIZED CRIME**

Many criminals use the income from selling counterfeit goods online to fund other types of serious organized crimes such as human trafficking, money laundering or labour exploitation. Counterfeit products are often produced in un-sanitised and un-hygienic factories run by organized crime that violates labour laws, basic human rights, and environmental laws. Many workers, including children, are coerced through a form of modern-day slavery.

### **THE INTELLECTUAL PROPERTY CRIME COORDINATED COALITION (IPC3)**

Fighting the trade of counterfeit products online is a challenging and difficult task. Safeguarding consumers against dangerous and substandard products and tackling the criminal networks involved in these low risk/high revenue illegal activities is a key priority for law enforcement.

To strengthen the fight against counterfeiting and online / offline piracy, Europol and European Union Intellectual Property Office (EUIPO) joined forces to launch in July 2016 the Intellectual Property Crime Coordinated Coalition (IPC3).



**Fake POSEICO devices are disguised to look real.  
ASK FOR THE ORIGINAL.**



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# PRESS-PACK HIGH POWER SEMICONDUCTORS

# PRESS-PACK HIGH POWER SEMICONDUCTORS

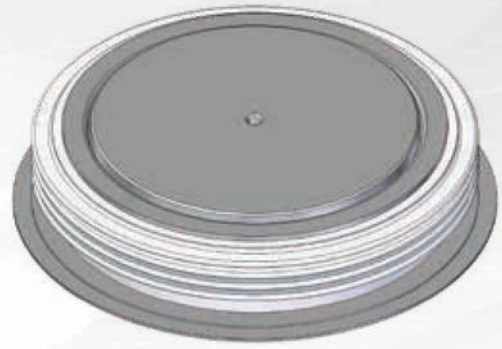
## RECTIFIER DIODES

### MAIN CHARACTERISTICS

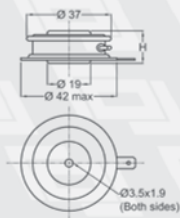
- IEC60747-2 compliant
- Highly reliable device in press-pack case
- Possibility of parallel and series connections
- Low frequency application
- Junction temperature range: 150 - 190 °C

### APPLICATIONS

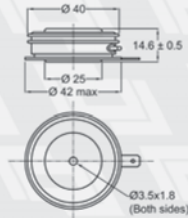
- Rectifier bridge for traction applications
- Input rectifier bridge for industrial applications



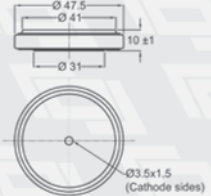
**A2** H = 14.5±0.5 W = 55 gr



**B0** W = 85 gr



**P2** W = 90 gr

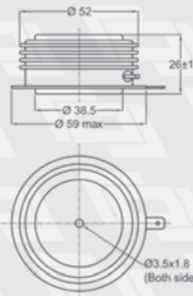


Plastic case

**C0** W = 280 gr



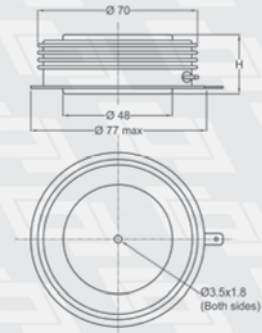
**C1** W = 300 gr



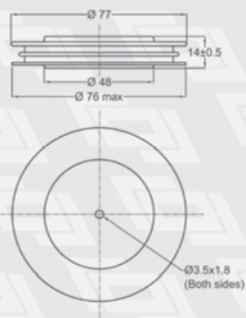
**D1** H = 27±1 W = 500 gr



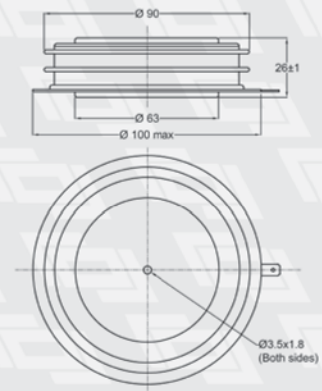
**D2** H = 27±1 W = 520 gr



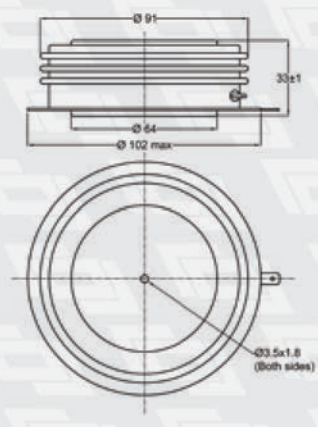
**G0** W = 300 gr



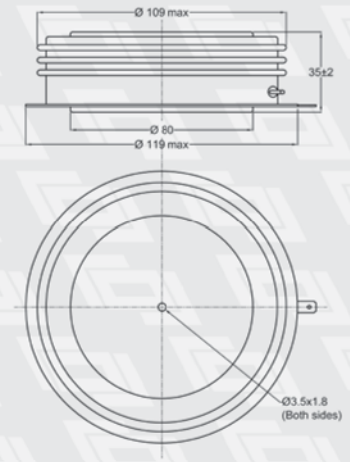
**H0** W = 850 gr



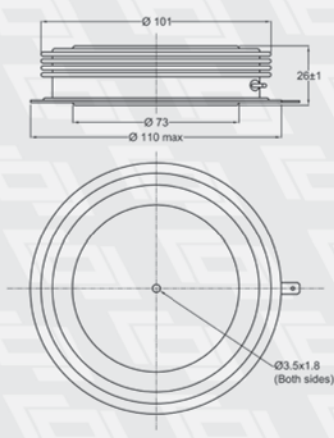
**LO** W = 1000 gr



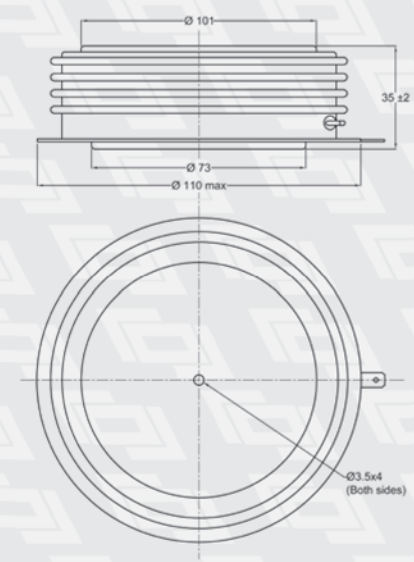
**MO** W = 1700 gr



**NO** W = 1150 gr



**RO** W = 1500 gr



Rectifier Diode	$V_{RRM}$	$I_{F(AV)}$ sine wave 50 Hz $T_h = 55^\circ C$	$I_{FRM}$ sine wave 10 ms $VR < 10 V$ $T_{Jmax}$	$I^2t$	$V_{F(TO)}$ $T_{Jmax}$	$r_f$ $T_{Jmax}$	$T_{Jmax}$	$R_{th(j-c)}$ double side $R_{th DC} = R_{th}$ 180° sin	$R_{th(j-c)}$ double side $R_{th}$ 120° sin	F min / max suggested range	Outline
	[V]	[A]	[kA]	[A <sup>2</sup> ·s·10 <sup>3</sup> ]	[V]	[mΩ]	[°C]	[°C/kW]	[°C/kW]	[kN]	
<b>UP TO 1000 V</b>											
AR302	800	1571	16.0	1280	0.75	0.250	190	50.0	55.7	8.0/9.0	B0
AR1101	1000	2247	28.0	3920	0.75	0.125	175	37.0	41.2	11.8/13.2	C0
AR3001	1000	4653	44.8	10035	0.75	0.055	190	21.0	23.4	22.0/24.5	D2
AR609	600	5381	50.4	12701	0.73	0.035	190	21.0	23.4	22.0/24.5	D2
AR709	1000	8709	85.0	36125	0.70	0.033	190	11.0	12.2	46.0/54.0	M0
AR709LT	1000	9594	85.0	36125	0.70	0.033	190	9.5	10.6	46.0/54.0	N0

1

2

3

4

5

6

7

RECTIFIER DIODES

Rectifier Diode	$V_{RRM}$	$I_{F(AV)}$ sine wave 50 Hz $T_h = 55^\circ\text{C}$	$I_{FSM}$ sine wave 10 ms $V_R < 10\text{ V}$ $T_{jmax}$	$I^2t$	$V_{F(TO)}$ $T_{jmax}$	$r_f$ $T_{jmax}$	$T_{jmax}$	$R_{th(j-h)}$ double side $R_{th DC} = R_{th}$ 180° sin	$R_{th(j-h)}$ double side $R_{th} 120^\circ$ sin	F min / max suggested range	Outline
	[V]	[A]	[kA]	[A <sup>2</sup> ·s·10 <sup>3</sup> ]	[V]	[mΩ]	[°C]	[°C/kW]	[°C/kW]	[kN]	
<b>UP TO 1800 V</b>											
AR320	1800	1315	10.5	551	0.82	0.310	175	50.0	55.7	8.0/9.0	B0
AR420	1800	1754	18.5	1711	0.81	0.240	175	37.0	41.2	11.8/13.2	C1
AR520	1800	2620	31.0	4805	0.79	0.150	175	26.0	28.9	18.0/20.0	D1
<b>UP TO 3000 V</b>											
AR242	2200	831	6.5	211	0.70	0.400	175	95.0	105.9	4.5/5.0	A2
AR904	2900	1232	10.1	510	0.87	0.330	175	52.0	57.9	8.4/9.4	C0
AR340	2900	1264	10.1	510	0.87	0.330	175	50.0	55.7	8.0/9.0	B0
AR1104	2900	1682	17.9	1602	0.85	0.260	175	37.0	41.2	11.8/13.2	C1
AR3007	3000	2298	30.2	4560	0.87	0.127	150	26.0	28.9	18.0/20.0	D1
AR447PC	2400	2395	18.0	1620	0.85	0.260	175	21.0	23.4	11.8/13.2	P2
AR2004	2600	2525	28.0	3920	0.80	0.165	175	26.0	28.9	18.0/20.0	D1
AR3008	3000	2693	30.2	4560	0.87	0.127	175	26.0	28.9	18.0/20.0	D1
AR2004LT	2600	3182	33.6	5645	0.80	0.165	175	18.0	20.1	22.0/24.5	G0
AR3004	2600	3346	35.3	6230	0.80	0.110	175	21.0	23.4	22.0/24.5	D2
AR649	2500	4644	45.0	10125	0.70	0.100	175	14.0	15.6	35.0/40.0	H0
AR749	2500	4757	70.0	24500	0.65	0.140	175	11.0	12.2	46.0/54.0	M0
AR749LT	2500	5179	70.0	24500	0.65	0.140	175	9.5	10.6	46.0/54.0	N0
AR748LT	2600	6544	70.0	24500	0.80	0.070	175	9.5	10.6	46.0/54.0	N0
AR747LT	2600	6909	70.0	24500	0.72	0.065	175	9.5	10.6	46.0/54.0	N0
<b>UP TO 4500 V</b>											
AR372X	4500	586	5.0	125	0.95	1.500	150	52.0	58.0	8.4/9.4	C0
AR372	3200	721	5.6	157	1.00	0.920	150	50.0	55.7	8.0/9.0	B0
AR371X	4500	866	5.6	157	0.70	0.660	150	52.0	58.0	8.4/9.4	C0
AR371	3400	920	5.6	157	0.70	0.660	150	50.0	55.7	8.0/9.0	B0
AR360	3200	1075	10.8	583	0.92	0.390	160	50.0	55.7	8.0/9.0	B0
AR1109	4400	1003	10.3	530	0.89	0.675	150	37.0	41.2	11.8/13.2	C1
AR1107	3600	1213	13.4	898	0.73	0.463	150	37.0	41.2	11.8/13.2	C1
AR2009	4400	1560	18.5	1711	0.83	0.393	150	26.0	28.9	18.0/20.0	D1
AR670	4400	2282	22.0	2420	0.80	0.210	150	21.0	23.4	18.0/20.0	D1
AR3009	3200	2461	30.2	4560	0.87	0.127	160	26.0	28.9	18.0/20.0	D1
AR679HT	4500	2659	30.0	4500	0.79	0.20	150	17.0	18.2	40.0/50.0	L0
AR679	4500	3025	30.0	4500	0.75	0.200	150	14.0	15.6	35.0/40.0	H0
AR770	4500	3869	50.0	12500	0.80	0.150	150	11.0	12.2	46.0/54.0	M0
AR770HT	4500	3869	50.0	12500	0.80	0.150	150	11.0	12.2	46.0/54.0	R0
AR770LT	4500	4228	50.0	12500	0.80	0.150	150	9.5	10.6	46.0/54.0	N0
AR870	4200	4888	60.0	18000	0.90	0.095	160	10.5	11.6	60.0/80.0	M0
<b>UP TO 6000 V</b>											
AR912	5600	645	6.3	198	1.00	1.150	150	52.0	57.9	8.4/9.4	C0
AR480	5000	725	8.0	320	1.00	0.900	125	37.0	41.2	11.8/13.2	C1
AR580	6000	1363	16.0	1280	1.00	0.500	150	26.0	28.9	18.0/20.0	D1
AR680	6000	1483	20.0	2000	1.00	0.400	150	21.0	23.4	22.0/24.5	D2
AR690	6000	2437	18.0	1620	0.98	0.300	150	14.0	15.6	35.0/40.0	H0
AR780	6000	3580	53.0	14045	0.90	0.200	160	11.0	12.2	46.0/54.0	M0
AR771	5000	3683	50.0	12500	0.80	0.170	150	11.0	12.2	46.0/54.0	M0
AR771HT	5000	3683	50.0	12500	0.80	0.170	150	11.0	12.2	46.0/54.0	R0
AR771LT	5000	4020	50.0	12500	0.80	0.170	150	9.5	10.6	46.0/54.0	N0
AR772	5000	4174	45.0	10125	0.76	0.180	175	11.0	12.2	46.0/54.0	M0
AR772HT	5000	4174	45.0	10125	0.76	0.180	175	11.0	12.2	46.0/54.0	R0
AR772LT	5000	4546	45.0	10125	0.76	0.180	175	9.5	10.6	46.0/54.0	N0



# PRESS-PACK HIGH POWER SEMICONDUCTORS

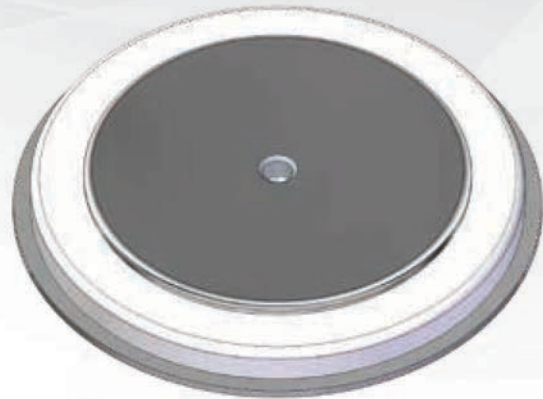
## WELDING DIODES

### MAIN CHARACTERISTICS

- Low on-state voltage
- Low thermal resistance
- Thin hermetic ceramic housing diodes
- Housing-less ultrathin diodes
- Junction temperature range: 175 - 190 °C

### APPLICATIONS

- Medium frequency applications
- Industrial welding systems



**P0** W = 150 gr

**P1** W = 150 gr

**F0** D pole = 48 W = 200 gr  
**F1** D pole = 57 W = 205 gr

**P2** W = 90 gr

Plastic case

**S3** W = 160 gr

Plastic case

**S4** W = 110 gr

WELDING DIODES

Welding Diode	$V_{RRM}$	$I_{F(RM)}$ sine wave 50 Hz $T_c = 85\text{ }^\circ\text{C}$	$I_{FSM}$ sine wave 10 ms $VR < 10\text{ V}$ $T_{Jmax}$	$I^2t$	$V_{F(TO)}$ $T_{Jmax}$	$r_f$ $T_{Jmax}$	$T_{Jmax}$	$R_{th(\theta-c)}$ double side $R_{th,DC} = R_{th,180^\circ \sin}$	F min / max suggested range	Outline
	[V]	[A]	[kA]	[A <sup>2</sup> ·s·10 <sup>3</sup> ]	[V]	[mΩ]	[°C]	[°C/kW]	[kN]	
<b>THIN HERMETIC CERAMIC HOUSING</b>										
AR507LT	600	6798	55.0	15125	0.70	0.035	190	12.0	20.0/22.0	P0
AR509LT	600	5520	50.0	12500	0.70	0.065	190	12.0	20.0/22.0	P0
AR508LT	600	6515	55.0	15125	0.70	0.040	190	12.0	20.0/22.0	P0
AR3001LT	1000	6457	50.4	12701	0.75	0.055	190	10.0	22.0/24.5	F0
AR609LT	600	7582	60.0	18000	0.73	0.035	190	10.0	22.0/24.5	F0
AR608LT	400	14219	80.0	32000	0.74	0.019	175	6.0	25.0/30.0	F1
<b>PLASTIC CASE</b>										
AR409PC	600	3863	30.0	4500	0.75	0.125	190	14.0	11.8/13.2	P2
AR509PC	600	5520	50.0	12500	0.70	0.065	190	12.0	20.0/22.0	P1
AR508PC	600	6515	55.0	15125	0.70	0.040	190	12.0	20.0/22.0	P1
<b>HOUSING-LESS ULTRATHIN DIODES</b>										
AUS602	400	10472	75.0	28125	0.81	0.026	175	5.8	22.0/24.5	S4
AUS603	400	12522	80.0	38720	0.79	0.025	175	4.6	35.0/65.0	S3
AUS605	400	13436	88.0	38720	0.76	0.021	175	4.6	35.0/65.0	S3

# PRESS-PACK HIGH POWER SEMICONDUCTORS

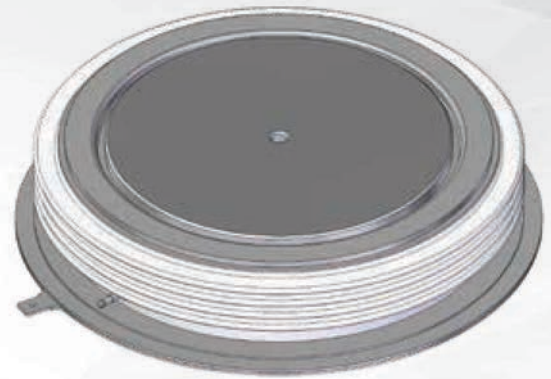
## PHASE CONTROL THYRISTORS

### MAIN CHARACTERISTICS

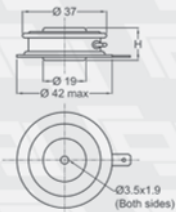
- IEC60747-6 compliant
- Highly reliable device in press-pack case
- Possibility of parallel and series connections
- Line frequency application
- Junction temperature range: 120 - 150 °C

### APPLICATIONS

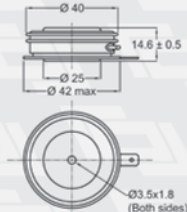
- Industrial controlled rectifiers
- AC switches
- DC motor controls
- UPS systems



**A1** H = 14.3±0.5 W = 55 gr



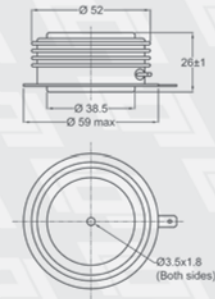
**B0** W = 85 gr



**C0** W = 280 gr



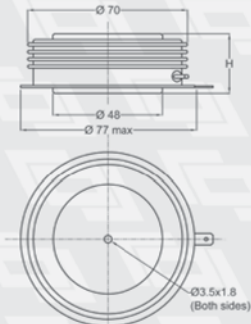
**C1** W = 300 gr



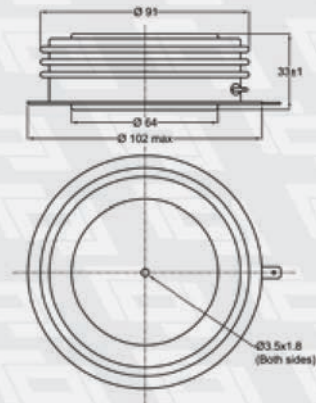
**D1** H = 27±1 W = 500 gr



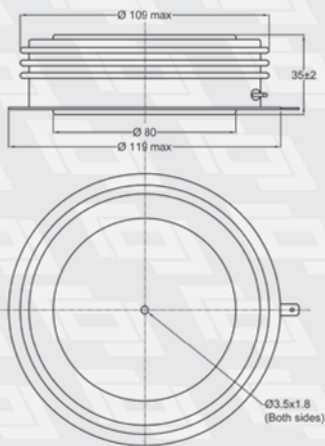
**D2** H = 27±1 W = 520 gr



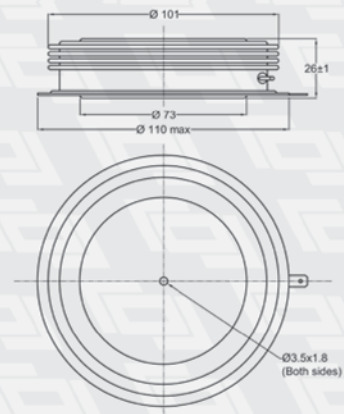
**L0** W = 1000 gr



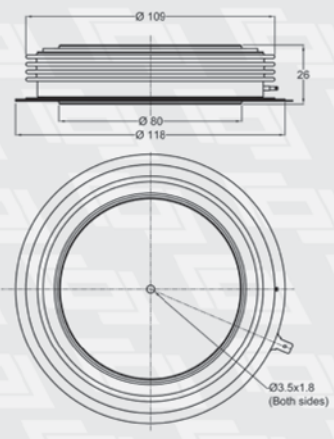
**M0** W = 1700 gr



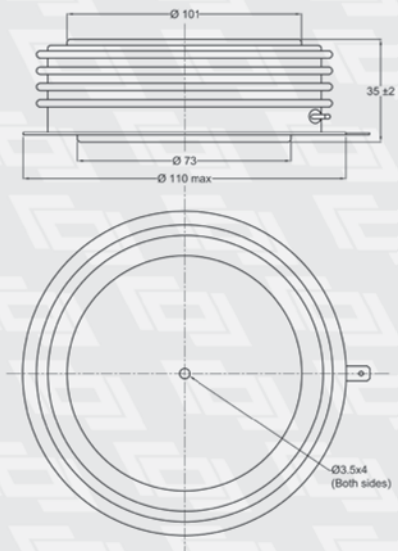
**N0** W = 1150 gr



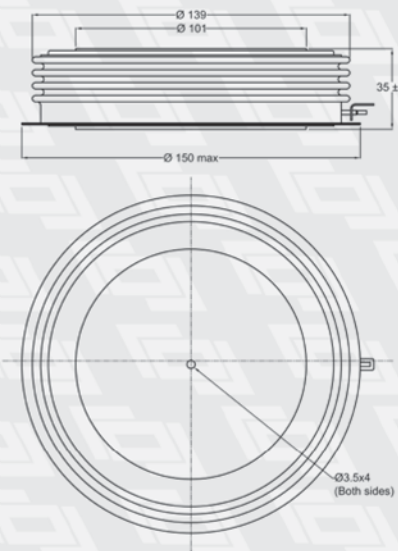
**N1** W = 1700 gr



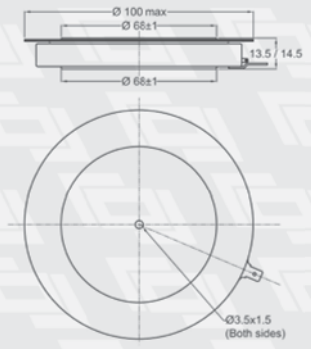
**RO** W = 1500 gr



**ZO** W = 3000 gr



**TO** W = 550 gr



Phase Control Thyristor	$V_{RRM}$ $V_{DRM}$	$I_{T(AV)}$ sine wave 50 Hz $T_v = 55^\circ C$	$I_{T(RMS)}$ sine wave 10 ms $VR < 10V$	$I^2t$ $T_{j,max}$	(di/dt)	(dv/dt)	$V_{GT}$ $T_j = 25^\circ C$	$I_{GT}$ $T_j = 25^\circ C$	$V_{T(RO)}$ $T_{j,max}$	$r_T$ $T_{j,max}$	$T_{j,max}$	$R_{th(j-a)}$ double side 180° sin	$R_{th(j-a)}$ double side 120° sin	F	Outline
	[V]	[A]	[kA]	[A <sup>2</sup> ·s·10 <sup>3</sup> ]	[A/μs]	[V/μs]	[V]	[mA]	[V]	[mΩ]	[°C]	[°C/kW]	[°C/kW]	[kN]	
<b>UP TO 1000 V</b>															
AT202	800	637	6.0	180	320	500	3.5	200	0.80	0.490	150	95.0	105.9	4.9/5.9	A1
AT302	800	997	11.5	661	200	500	3.5	200	0.80	0.450	150	50.0	55.7	8.0/9.0	B0
AT303	800	1102	12.0	720	200	500	3.5	200	0.80	0.340	150	50.0	55.7	8.0/9.0	B0
AT607	800	2585	36.0	6480	200	500	3.5	200	0.80	0.120	140	21.0	23.4	22.0/24.5	D2
AT706	800	4307	70.0	24500	320	500	3.5	250	0.84	0.060	125	11.0	12.2	40.0/50.0	M0
AT706HT	800	4307	70.0	24500	320	500	3.5	250	0.84	0.060	125	11.0	12.2	40.0/50.0	R0
AT706LT	800	4767	70.0	24500	320	500	3.5	250	0.84	0.060	125	9.5	10.6	40.0/50.0	N0
AT708	800	4925	70.0	24500	320	500	3.5	250	0.84	0.060	140	11.0	12.2	40.0/50.0	M0
AT708HT	800	4925	70.0	24500	320	500	3.5	250	0.84	0.060	140	11.0	12.2	40.0/50.0	R0
AT708LT	800	5439	70.0	24500	320	500	3.5	250	0.84	0.060	140	9.5	10.6	40.0/50.0	N0
AT906	800	5597	95.0	45125	200	1000	3.5	400	0.85	0.045	125	8.5	9.5	80.0/100.0	Z0
AT908	800	5823	95.0	45125	200	1000	3.5	400	0.85	0.045	140	7.5	8.5	80.0/100.0	Z0

Phase Control Thyristor	$V_{RRM}$ $V_{DRM}$	$I_{T(RM)}$ sine wave 50 Hz $T_n = 55^\circ C$	$I_{T(SM)}$ sine wave 10 ms VR < 10V	$I^2t$ $T_{Jmax}$	(di/dt)	(dv/dt)	$V_{GT}$ $T_j = 25^\circ C$	$I_{GT}$ $T_j = 25^\circ C$	$V_{T(RO)}$ $T_{Jmax}$	$r_T$ $T_{Jmax}$	$T_{Jmax}$	$R_{th(j-h)}$ double side 180° sin	$R_{th(j-h)}$ double side 120° sin	F	Outline
	[V]	[A]	[kA]	[A <sup>2</sup> ·s·10 <sup>3</sup> ]	[A/μs]	[V/μs]	[V]	[mA]	[V]	[mΩ]	[°C]	[°C/kW]	[°C/kW]	[kN]	
<b>UP TO 1800 V</b>															
AT405	1200	304	2.8	39	200	500	3.5	200	1.00	1.900	125	95.0	105.9	4.9/5.9	A1
AT403	1200	400	5.0	125	200	500	3.5	200	1.00	0.850	125	95.0	105.9	4.9/5.9	A1
AT505	1600	429	5.6	157	200	500	3.5	200	1.00	0.680	125	95.0	105.9	4.9/5.9	A1
AT503	1600	447	6.4	205	200	500	3.5	200	0.90	0.680	125	95.0	105.9	4.9/5.9	A1
AT604	1600	604	8.4	353	200	500	3.5	200	1.05	0.850	125	50.0	55.7	8.0/9.0	B0
AT704	1600	639	8.0	320	200	500	3.5	200	0.86	0.790	125	52.0	57.9	8.0/9.0	C0
AT603	1600	721	8.8	387	200	500	3.5	200	0.91	0.580	125	50.0	55.7	8.0/9.0	B0
AT804	1600	984	12.5	781	200	500	3.5	250	1.00	0.380	125	37.0	41.2	11.8/13.2	C1
AT803	1600	1058	15.0	1125	200	500	3.5	150	0.90	0.340	125	37.0	41.2	11.8/13.2	C1
AT1005	1800	1453	22.4	2509	200	500	3.5	300	0.92	0.260	125	26.0	28.9	18.0/22.0	D1
AT1004	1600	1545	24.6	3026	200	500	3.5	300	0.92	0.216	125	26.0	28.9	18.0/22.0	D1
AT1003	1600	1648	26.9	3618	200	500	3.5	300	0.82	0.200	125	26.0	28.9	18.0/22.0	D1
AT636	1800	1968	36.0	6480	200	500	3.5	300	0.82	0.180	125	21.0	23.4	22.0/24.5	D2
AT620	1400	2100	36.0	6480	200	500	3.5	300	0.81	0.150	125	21.0	23.4	22.0/24.5	D2
AT726	1600	2398	38.0	7220	200	500	3.5	200	0.77	0.160	125	17.0	18.9	40.0/50.0	L0
AT720HT	1400	3950	60.0	18000	200	1000	3.5	350	0.88	0.075	125	11.0	12.2	40.0/50.0	R0
AT720LT	1400	4366	60.0	18000	200	1000	3.5	350	0.88	0.075	125	9.5	10.6	40.0/50.0	N0
AT631LT	1800	4477	65.0	21125	400	1000	3.0	300	0.99	0.068	125	9.0	10.0	40.0/50.0	T0
<b>UP TO 2800 V</b>															
AT333	2400	660	7.5	281	200	500	3.5	300	0.95	0.720	125	50.0	55.7	8.0/9.0	B0
AT807	2400	837	10.0	500	200	500	3.5	250	1.12	0.552	125	37.0	41.2	11.8/13.2	C1
AT1007	2600	1272	19.0	1805	200	500	3.5	300	1.15	0.308	125	26.0	28.9	18.0/22.0	D1
AT655	2800	1546	30.0	4500	200	500	3.5	300	1.05	0.290	125	21.0	23.4	22.0/24.5	D2
AT646	2200	1731	36.0	6480	200	500	3.5	300	0.90	0.240	125	21.0	23.4	22.0/24.5	D2
AT746	2600	1794	25.0	3125	200	500	3.5	300	1.10	0.270	125	17.0	18.9	40.0/50.0	L0
AT846LT	2800	2862	39.2	7683	200	1000	3.5	400	0.95	0.230	125	9.5	10.6	40.0/50.0	N0
AT847	2800	2979	39.2	7683	800	1000	3.5	400	0.85	0.175	125	11.0	12.2	40.0/50.0	M0
AT847HT	2800	2979	39.2	7683	800	1000	3.5	400	0.85	0.175	125	11.0	12.2	40.0/50.0	R0
AT737	2000	3239	50.4	12701	200	500	3.5	350	0.95	0.127	125	11.0	12.2	40.0/50.0	M0
AT737HT	2000	3239	50.4	12701	200	500	3.5	350	0.95	0.127	125	11.0	12.2	40.0/50.0	R0
AT847LT	2800	3262	39.2	7683	800	1000	3.5	400	0.85	0.175	125	9.5	10.6	40.0/50.0	N0
AT737LT	2000	3565	50.4	12701	200	500	3.5	350	0.95	0.127	125	9.5	10.6	40.0/50.0	N0
AT738	2200	3669	60.0	18000	200	500	3.5	350	0.92	0.090	125	11.0	12.2	40.0/50.0	M0
AT738HT	2200	3669	60.0	18000	200	500	3.5	350	0.92	0.090	125	11.0	12.2	40.0/50.0	R0
AT738LT	2200	4050	60.0	18000	200	500	3.5	350	0.92	0.090	125	9.5	10.6	40.0/50.0	N0
AT940	2900	4687	75.0	28125	200	1000	3.5	400	1.00	0.070	125	7.5	8.5	80.0/100.0	Z0
<b>UP TO 4500 V</b>															
AT818	4000	580	5.9	174	200	500	3.5	200	1.35	1.335	125	37.0	41.2	11.8/13.2	C1
AT671	4500	1085	13.0	845	400	1000	3.5	400	1.20	0.700	125	21.0	23.4	22.0/24.5	D2
AT1228	3600	1275	20.0	2000	200	1000	3.5	300	1.20	0.450	125	21.0	23.4	22.0/24.5	D2
AT875	4400	2003	25.2	3175	200	1000	3.5	400	1.30	0.334	120	11.0	12.2	40.0/50.0	M0
AT875HT	4400	2003	25.2	3175	200	1000	3.5	400	1.30	0.334	120	11.0	12.2	40.0/50.0	R0
AT866	3600	2166	29.1	4234	200	1000	3.5	400	1.20	0.325	125	11.0	12.2	40.0/50.0	M0
AT866HT	3600	2166	29.1	4234	200	1000	3.5	400	1.20	0.325	125	11.0	12.2	40.0/50.0	R0
AT875LT	4400	2199	25.2	3175	200	1000	3.5	400	1.30	0.334	120	9.5	10.6	40.0/50.0	N0
AT876LT	4400	2800	25.2	3175	200	1000	3.5	400	1.25	0.200	120	9.5	10.6	40.0/50.0	N0
AT866LT	3600	2374	32.0	5120	200	1000	3.5	400	1.20	0.325	125	9.5	10.6	40.0/50.0	N0
AT870	4200	2969	50.0	12500	200	1000	3.5	400	1.00	0.170	125	10.5	11.7	60.0/80.0	M0
AT870LT	4200	3276	50.0	12500	200	1000	3.5	400	1.00	0.170	125	9.0	10.0	60.0/80.0	N1
AT970	3400	3872	68.0	23120	200	1000	3.5	250	1.12	0.112	125	7.5	8.5	80.0/100.0	Z0
AT971	4200	3977	68.0	23120	200	1000	3.5	250	1.12	0.125	125	7.5	8.5	80.0/100.0	Z0
<b>UP TO 6000 V</b>															
AT480	5800	527	4.5	101	200	500	3.5	250	1.30	1.760	125	37.0	41.2	11.8/13.2	C1
AT681	6000	840	10.0	500	100	500	3.5	400	1.30	1.150	120	21.0	23.4	22.0/24.0	D2
AT880	5200	2571	40.0	8000	200	1000	3.5	400	1.07	0.240	125	10.5	11.7	60.0/80.0	M0
AT980	6000	2680	50.0	12500	200	1000	3.5	400	1.30	0.235	120	8.5	9.5	80.0/100.0	Z0
AT975	5200	3263	60.0	18000	200	1000	3.5	250	1.07	0.190	125	7.5	8.5	80.0/100.0	Z0

# PRESS-PACK HIGH POWER SEMICONDUCTORS

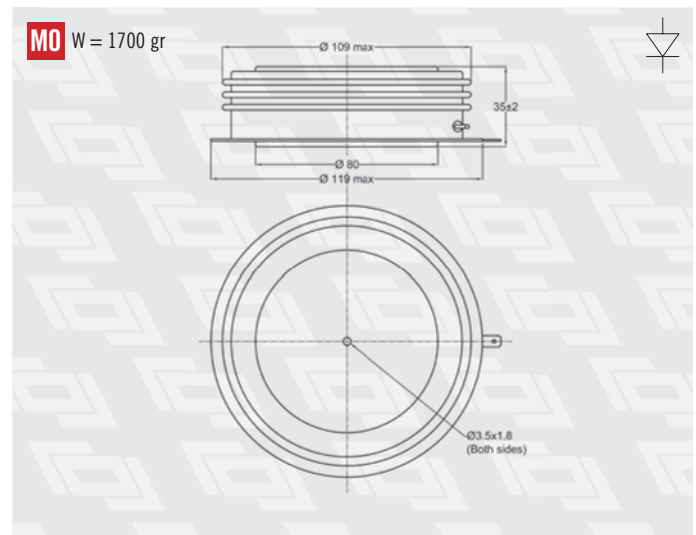
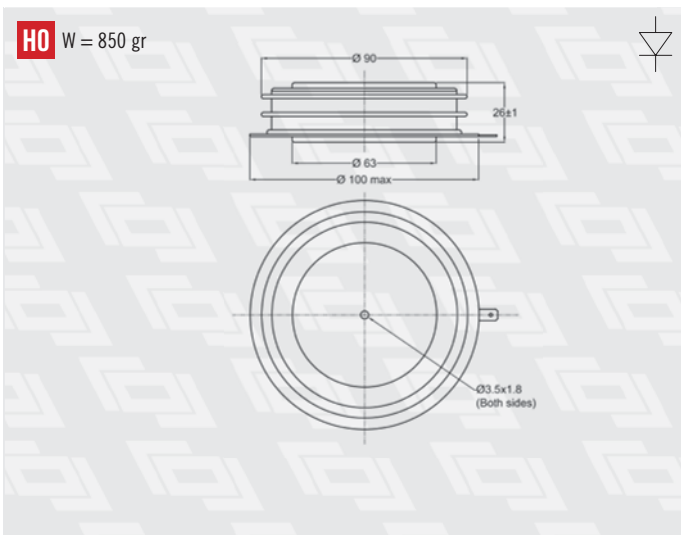
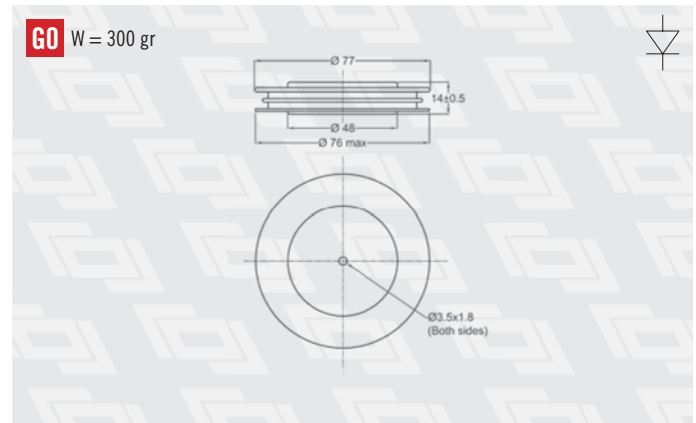
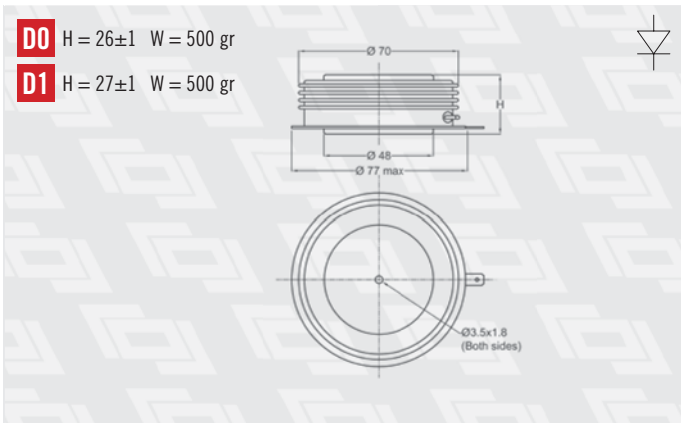
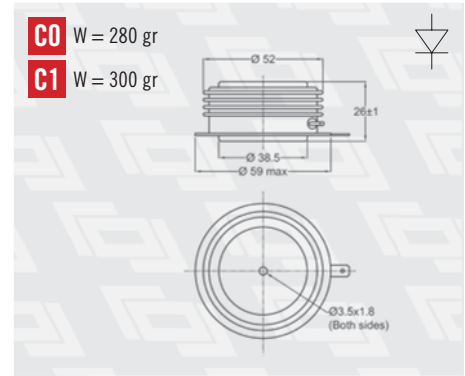
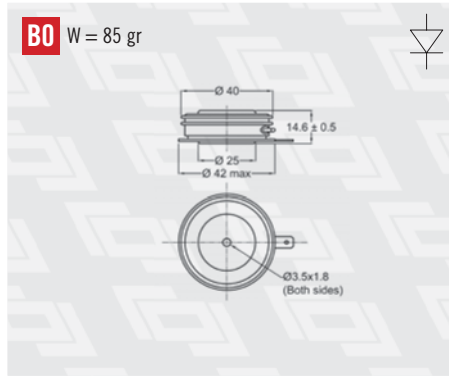
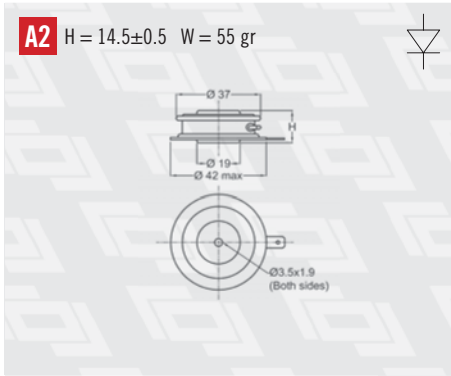
## FAST RECOVERY DIODES

### MAIN CHARACTERISTICS

- IEC60747-2 compliant
- Highly reliable device in press-pack case
- Possibility of parallel and series connections
- High frequency application
- Junction temperature range: 125 - 150 °C

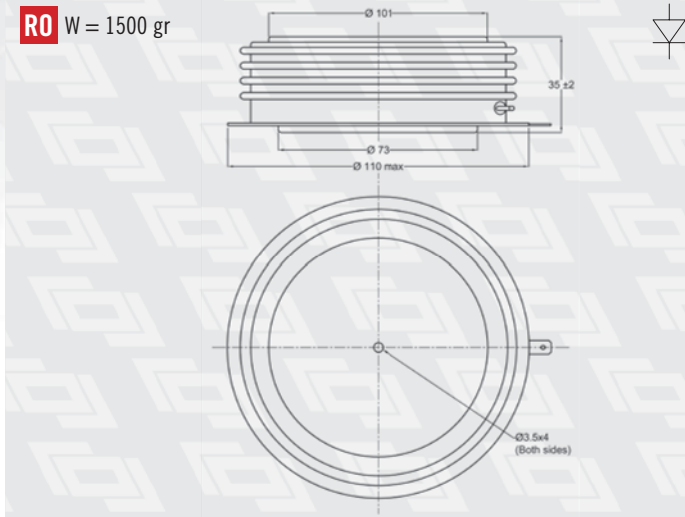
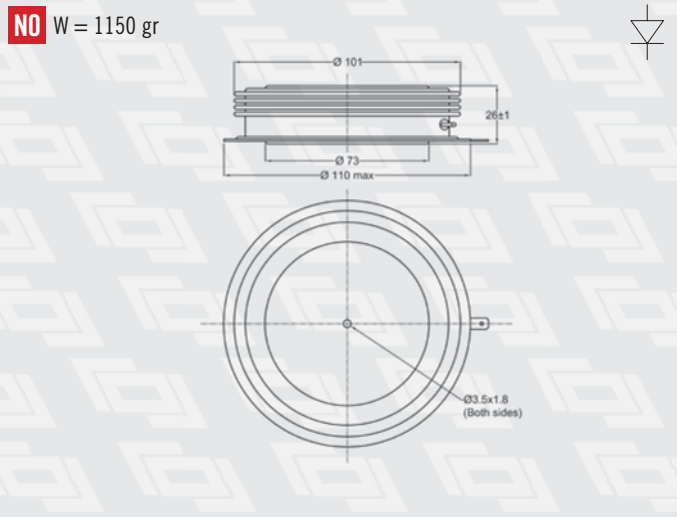
### APPLICATIONS

- Chopper and inverter circuits
- Power converter for traction applications

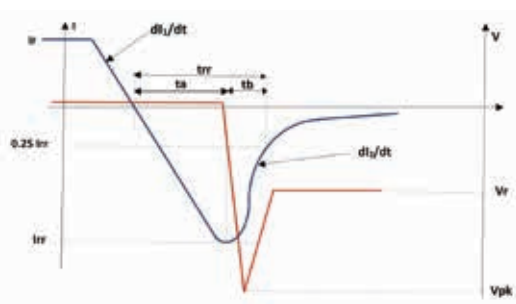


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FAST RECOVERY DIODES



Fast Recovery Diode	$V_{RRM}$	$I_{F(V)}$ sine wave 50 Hz $T_b = 55^\circ\text{C}$	$I_{FSM}$ sine wave 10 ms $VR < 10\text{ V}$	$ I^2t _{T_j \text{ max}}$	$V_{F(TO)}$	$r_F$	$Q_{rr}$	Recovery Parameters			$T_{j \text{ max}}$	$R_{th(j-h)}$ double side 180° sin	$R_{th(j-h)}$ double side 120° sin	F min/max suggested range	Outline
								$t_{rr}$	$I_r$	$(di_r/dt)$					
	[V]	[A]	[kA]	[A <sup>2</sup> ·s·10 <sup>3</sup> ]	[V]	[mΩ]	[μC]	[μs]	[A]	[A/μs]	[°C]	[°C/kW]	[°C/kW]	[kN]	
<b>UP TO 1800 V</b>															
ARF221	1400	416	4.5	101	1.05	0.700	50	2.0	200	40	125	95.0	105.9	4.5/5.0	A2
ARF612	1500	426	3.8	72	1.15	1.141	210	4.0	200	50	150	95.0	105.9	4.5/5.0	A2
ARF220	1400	444	4.5	101	1.00	0.600	80	2.5	200	40	125	95.0	105.9	4.5/5.0	A2
ARF322	1600	742	11.0	605	0.90	0.500	60	2.0	1000	60	125	52.0	57.9	8.4/9.4	C0
ARF422	1600	940	14.0	980	1.20	0.350	200	3.5	1000	60	125	37.0	41.2	11.8/13.2	C1
ARF526	1600	1348	20.0	2000	1.00	0.300	250	3.5	1000	100	125	26.0	28.9	18.0/20.0	D1
<b>UP TO 3300 V</b>															
ARF261	3300	124	3.0	45	2.30	12.000	45	1.0	200	100	125	95.0	105.9	4.5/5.0	A2
ARF260	3300	189	3.0	45	1.95	4.200	79	1.6	500	100	125	95.0	105.9	4.5/5.0	A2
ARF241	2500	255	3.0	45	1.75	3.200	50	1.4	200	80	150	95.0	105.9	4.5/5.0	A2
ARF240	2500	280	3.0	45	1.50	3.000	90	2.0	200	80	150	95.0	105.9	4.5/5.0	A2
ARF912	2600	754	6.4	205	1.15	0.685	260	4.0	350	80	150	52.0	57.9	8.4/9.4	C0
ARF340	2600	773	6.4	205	1.15	0.685	260	4.0	350	80	150	50.0	55.7	8.0/9.0	B0
ARF435	2600	955	12.0	720	1.10	0.675	360	4.0	500	80	150	37.0	41.2	11.8/13.2	C1
ARF565	3200	1217	14.0	980	1.50	0.500	1000	5.0	1000	100	150	26.0	28.9	18.0/20.0	D1
ARF2012	2600	1527	16.0	1280	1.03	0.362	800	4.6	1000	100	150	26.0	28.9	18.0/20.0	D1
ARF648	2500	2508	30.0	4500	0.85	0.300	1000	5.0	1000	250	150	14.0	15.6	35.0/40.0	H0
ARF744	2500	3723	48.0	11520	0.85	0.160	500	5.0	1000	60	150	11.0	12.2	46.0/54.0	M0
<b>UP TO 4500 V</b>															
ARF370	4500	484	4.0	80	1.74	1.700	700	5.0	1000	100	150	52.0	57.9	8.4/9.4	C0
ARF463	4500	732	10.0	500	1.70	1.000	650	5.2	600	80	150	37.0	41.2	11.8/13.2	C1
ARF674	4500	944	15.0	1125	1.90	0.700	600	8.0	500	30	125	21.0	23.4	22.0/24.5	D0
ARF675	4500	1087	15.0	1125	1.70	0.700	1700	5.6	1000	250	125	18.0	20.0	22.0/24.5	G0
ARF677	4500	1374	18.0	1620	1.25	0.500	1150	7.0	500	80	140	21.0	23.4	22.0/24.5	D0
ARF676	4800	1514	18.0	1620	1.25	0.500	2000	6.0	1000	250	140	18.0	20.0	22.0/24.5	G0
ARF678	4500	1691	27.0	2880	1.30	0.650	1350	4.2	1000	250	150	14.0	15.6	35.0/40.0	H0
ARF774	4500	2327	26.0	3380	1.30	0.250	1500	8.6	1000	60	125	11.0	12.2	46.0/54.0	M0
<b>UP TO 5600 V</b>															
ARF490	5600	652	9.5	451	1.50	0.870	1400	4.8	1000	200	125	37.0	41.2	11.8/13.2	C1



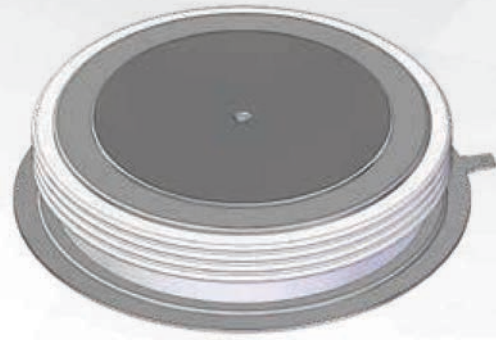
Fast Recovery Diodes dynamic characteristics definition

# PRESS-PACK HIGH POWER SEMICONDUCTORS

## FAST RECOVERY DIODES FOR IGBT, IEGT AND IGCT APPLICATIONS

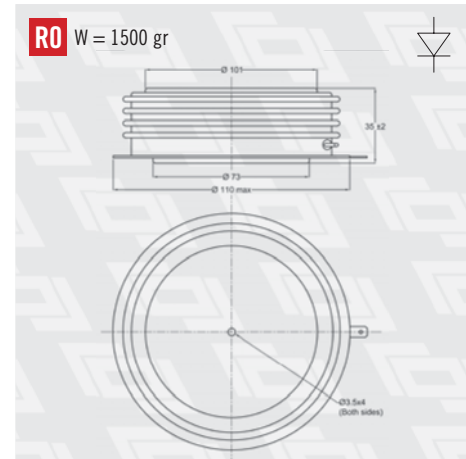
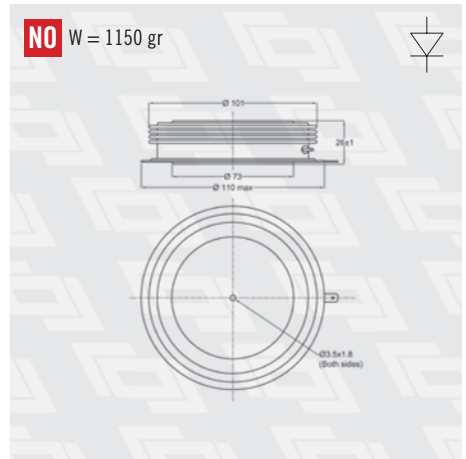
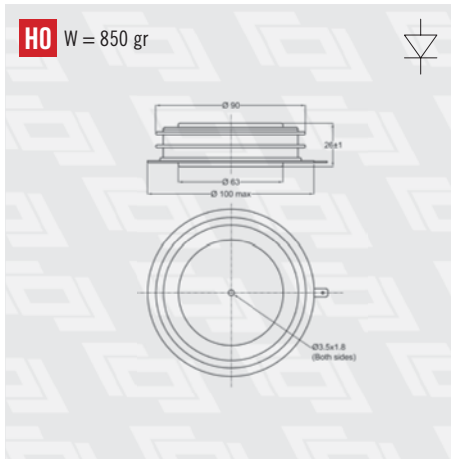
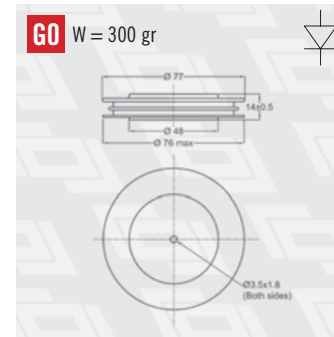
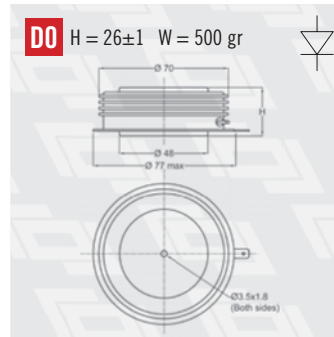
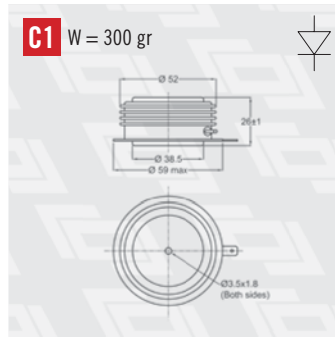
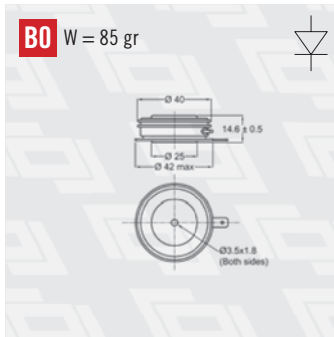
### MAIN CHARACTERISTICS

- IEC60747-2 compliant
- Highly reliable device in press-pack case
- Possibility of parallel and series connections
- Low losses
- High di/dt capability
- High frequency application
- Snubberless operation
- Junction temperature range: 125 - 150 °C
- Improved recovery softness



### APPLICATIONS

- Suitable as freewheeling, snubber and clamp diode in IGCT and IGBT circuits



Fast Recovery Diode	V <sub>RRM</sub> [V]	I <sub>F(AV)</sub> sine wave 50 Hz T <sub>j</sub> = 55 °C [A]	I <sub>FSM</sub> sine wave 10 ms VR < 10 V [kA]	P <sub>t</sub>   T <sub>j</sub> max [A <sup>2</sup> ·s·10 <sup>3</sup> ]	V <sub>F(10)</sub> T <sub>j</sub> max [V]	r <sub>F</sub> T <sub>j</sub> max [mΩ]	Recovery Parameters					T <sub>j</sub> max [°C]	R <sub>th(j-h)</sub> double side 180° sin [°C/kW]	R <sub>th(j-b)</sub> double side 120° sin [°C/kW]	F min/max suggested range [kN]	Outline
							Q <sub>rr</sub> T <sub>j</sub> max [μC]	t <sub>rr</sub> T <sub>j</sub> max [μs]	I <sub>F</sub> [A]	(di/dt) [A/μs]						
<b>UP TO 3300 V</b>																
ARF360	3300	290	4.5	101	1.86	4.100	55	1.3	500	100	125	50.0	55.7	8.0/9.0	B0	
ARF664	3300	935	18.0	1620	1.80	0.700	2000	3.6	2100	1100	125	21.0	23.4	22.0/24.5	D0	
<b>UP TO 4500 V</b>																
ARF462	4500	435	10.0	500	2.70	1.400	1150	2.6	1000	1000	125	37.0	41.2	11.8/13.2	C1	
ARF671	4500	790	15.0	1125	1.90	1.100	2500	3.6	2100	1000	125	21.0	23.4	22.0/24.5	D0	
ARF672	4500	935	15.0	1125	1.80	0.950	1600	2.9	2100	1100	125	18.0	20.0	22.0/24.5	G0	
ARF673	4500	990	15.0	1125	1.70	0.850	2300	3.5	2100	1100	125	18.0	20.0	22.0/24.5	G0	
ARF681	4500	1140	25.0	3125	1.95	0.800	2200	3.8	2100	1000	125	14.0	15.6	35.0/40.0	H0	
ARF670	4500	1315	15.0	1125	1.50	0.600	2050	3.9	1000	500	140	18.0	20.0	22.0/24.5	G0	
ARF771LT	4500	1730	28.0	3920	1.95	0.800	3500	4.7	2500	1000	140	9.5	10.6	46.0/54.0	NO	
<b>UP TO 6000 V</b>																
ARF694	6000	645	10.0	500	2.10	1.800	2000	3.5	2100	1000	125	21.0	23.4	22.0/24.5	D0	
ARF695	6000	880	18.0	1620	2.10	1.550	3000	5.0	2100	1000	125	14.0	15.6	35.0/40.0	H0	
ARF794HT	6000	1060	20.0	2000	2.10	1.400	4000	5.0	2500	1000	125	11.0	12.2	46.0/54.0	RO	
ARF794LT	6000	1190	20.0	2000	2.10	1.400	4000	5.0	2500	1000	125	9.5	10.6	46.0/54.0	NO	

# PRESS-PACK HIGH POWER SEMICONDUCTORS

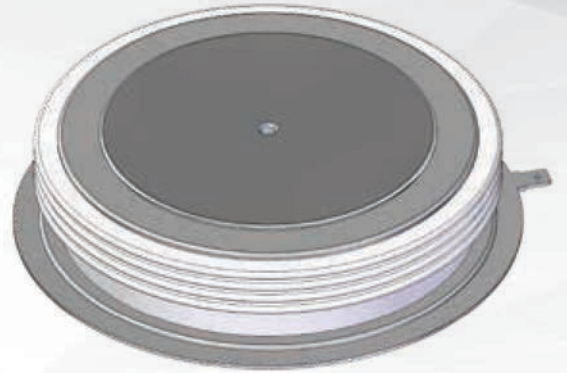
## FAST SWITCHING THYRISTORS

### MAIN CHARACTERISTICS

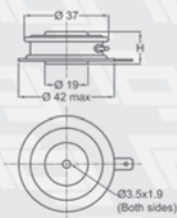
- IEC60747-6 compliant
- Highly reliable device in press-pack case
- Low switching losses
- High frequency application
- Precise control of  $V_{Tj}$ ,  $t_q$  and  $Q_{Tj}$  by electron irradiation
- Junction temperature range: 120 - 125 °C

### APPLICATIONS

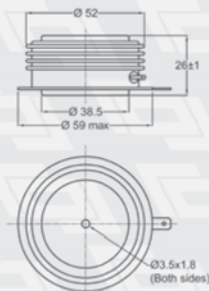
- Induction melting
- Induction heating
- Medium frequency industrial drivers
- Resonant power supplies
- UPS and pulse power systems
- Choppers, inverters and auxiliary system for traction applications



**A0** H = 14.5±0.5 W = 55 gr



**C0** W = 85 gr

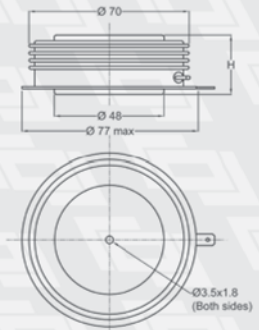


**D0** H = 26±1 W = 500 gr

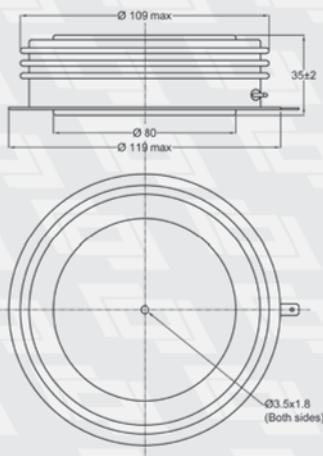


**D1** H = 27±1 W = 500 gr

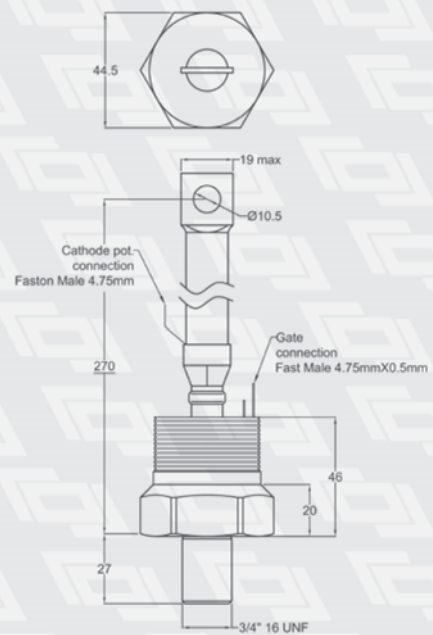
**D2** H = 27±1 W = 520 gr



**M0** W = 280 gr



**VT1**





**SYMMETRICAL FAST SWITCHING THYRISTORS**

Fast Switching Thyristor	$V_{RRM}$ $V_{DRM}$	$I_{T(AV)}$ sine wave 50 Hz $T_c = 55^\circ\text{C}$	$I_{TSM}$ sine wave 10 ms $VR < 10V$	$(di/dt)_{crit}$ $T_{jmax}$	$(dv/dt)_{crit}$ $T_{jmax}$	$V_{GT}$ $T_j = 25^\circ\text{C}$	$I_{GT}$ $T_j = 25^\circ\text{C}$	$V_{T(RO)}$ $T_{jmax}$	$r_T$ $T_{jmax}$	$t_d$	$t_q$	$I_r$ $di_r/dt = 60 \text{ [A/}\mu\text{s]}$ IF 1000[A]	$Q_{rr,max}$ $di_r/dt = 60 \text{ [A/}\mu\text{s]}$ IF 1000[A]	$T_{jmax}$	$R_{th(j-c)}$ double side 180°/120° sin	F	Outline
	[V]	[A]	[kA]	[A/μs]	[V/μs]	[V]	[mA]	[V]	[mΩ]	[μs]	[μs]	[A]	[μC]	[°C]	[°C/kW]	[kN]	
<b>STUD TYPE</b>																	
ATF310VT	1400	225 <sup>(1)</sup>	6.1	200	500	3	200	1.14	0.700	5	60	-	-	125	100 <sup>(2)</sup>	38/41 <sup>(3)</sup>	VT1
<b>PRESS-PACK UP TO 1200 V</b>																	
ATF587	1200	350	4.5	200	500	3.5	350	1.38	0.830	0.40	25	139	190	125	95.0/105.9	4.5/5.0	A0
ATF585	800	445	6.0	200	500	3.5	350	1.30	0.325	0.60	15	104	140	125	95.0/105.9	4.5/5.0	A0
ATF413	1200	705	9.0	500	600	3.5	350	1.55	0.650	0.85	12	75	80	125	37.0/41.2	11.0/13.0	C1
ATF860	1200	730	7.5	400	500	3.5	350	1.64	0.520	0.60	15	140	250	125	37.0/41.2	11.0/13.0	C1
ATF414	1200	805	10.0	500	600	3.5	350	1.50	0.430	0.85	15	100	120	125	37.0/41.2	11.0/13.0	C1
ATF857	1200	830	8.5	400	500	3.5	350	1.38	0.435	0.40	25	150	300	125	37.0/41.2	11.0/13.0	C1
ATF415	1200	920	10.0	500	600	3.5	350	1.38	0.300	0.85	20	150	200	125	37.0/41.2	11.0/13.0	C1
ATF514	1200	1219	16.0	500	600	3.5	350	1.30	0.199	0.85	15	85	100	125	26.0/28.9	14.0/17.0	D1
ATF515	1200	1330	16.0	500	600	3.5	350	1.20	0.250	0.85	25	110	160	125	24.0/26.6	14.0/17.0	D1
ATF614	1200	1355	20.0	800	600	3.5	350	1.36	0.328	0.85	20	100	120	125	21.0/23.4	17.0/21.0	D2
ATF615	1200	1625	20.0	800	600	3.5	350	1.25	0.200	0.85	25	140	230	125	21.0/23.4	17.0/21.0	D2
<b>PRESS-PACK UP TO 1600 V</b>																	
ATF427	1400	846	10.0	400	500	3.5	350	1.40	0.400	0.60	30	168	330	125	37.0/41.2	11.0/13.0	C1
ATF828	1600	845	10.0	400	600	3.5	350	1.30	0.450	0.60	35	180	360	125	37.0/41.2	11.0/13.0	C1
ATF827	1400	900	10.0	400	600	3.5	350	1.32	0.350	0.60	25	168	330	125	37.0/41.2	11.0/13.0	C1
ATF524	1600	1055	15.0	500	600	3.5	350	1.45	0.425	0.85	35	160	320	125	26.0/28.9	14.0/17.0	D1
ATF527	1400	1230	14.6	800	500	3.5	350	1.40	0.260	1.50	25	230	650	125	26.0/28.9	14.0/17.0	D1
ATF1047	1400	1305	16.0	500	600	3.5	350	1.32	0.230	0.60	30	230	650	125	26.0/28.9	14.0/17.0	D1
ATF624	1400	1526	15.0	800	600	3.0	300	1.42	0.145	1.50	25.0	200	650	125	26.0/28.9	17.0/21.0	D2
<b>PRESS-PACK UP TO 2000 V</b>																	
ATF820	2000	725	9.0	400	600	3.5	350	1.53	0.600	0.60	50	205	550	125	37.0/41.2	11.0/13.0	C1
ATF420	2000	800	8.2	800	500	3.5	350	1.20	0.590	1.50	55	205	550	125	37.0/41.2	11.0/13.0	C1
ATF1040	2000	1075	14.0	500	500	3.5	350	1.40	0.414	0.60	50	227	620	125	26.0/28.9	14.0/17.0	D1
ATF530	2000	1100	15.0	800	500	3.0	150	1.30	0.410	1.50	50	300	620	125	26.0/28.9	14.0/17.0	D1
ATF744	2000	2248	43.0	1500	1000	3.5	350	1.42	0.145	1.50	50	112	600	125	11.0/12.2	40.0/50.0	M0
ATF743	2000	2595	36.0	500	600	3.5	350	1.30	0.180	0.80	70	350	800	125	11.0/12.2	40.0/50.0	M0
<b>PRESS-PACK UP TO 2500 V</b>																	
ATF633	2100	1390	17.0	400	600	3.5	350	1.30	0.320	0.80	60	195	450	125	21.0/23.4	17.0/21.0	D2
ATF545	2500	1070	10.0	500	500	3.5	350	1.50	0.611	1.70	70	268	770	125	21.0/23.4	17.0/21.0	D2

(1)  $T_c = 80^\circ\text{C}$   
 (2) Single side  $R_{th(j-c)}$   
 (3) Mounting torque in Nm

**ASYMMETRICAL FAST SWITCHING THYRISTORS**

Fast Switching Thyristor	$V_{DRM}$ $I_{DRM}$	$V_{RRM}$ $I_{RRM}$	$I_{T(AV)}$ sine wave 50 Hz $T_c = 55^\circ\text{C}$	$I_{TSM}$ sine wave 10 ms $VR < 10V$	$(di/dt)_{crit}$ $T_{jmax}$	$(dv/dt)_{crit}$ $T_{jmax}$	$V_{GT}$ $T_j = 25^\circ\text{C}$	$I_{GT}$ $T_j = 25^\circ\text{C}$	$V_{T(RO)}$ $T_{jmax}$	$r_T$ $T_{jmax}$	$t_d$	$t_q$	$V_T$ $T_j = 80^\circ\text{C}$ $I_T = 2000 \text{ A}$	$T_{jmax}$	$R_{th(j-c)}$ double side 180°	F	Outline
	[V/mA]	[V/mA]	[A]	[kA]	[A/μs]	[V/μs]	[V]	[mA]	[V]	[mΩ]	[μs]	[μs]	[V]	[°C]	[°C/kW]	[kN]	
ATA646	2100 / 200	1000 / 30	1100	14.0	300	500	2.5	500	1.40	0.400	2.20	55	2.35	125	26.0	14.0/17.0	D0
ATA644	2800 / 200	20 / 1000	1355	16.0	300	500	2.5	500	1.45	0.300	2.20	55	3.35	125	21.0	14.0/17.0	D0

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# PRESS-PACK HIGH POWER SEMICONDUCTORS

## GTO (GATE TURN OFF THYRISTORS)

### MAIN CHARACTERISTICS

- High reliable device in press-pack case
- Very good trade off between conduction and switching losses
- Possibility of series connection
- Medium frequency applications
- Junction temperature range:  $-30 \div 125 \text{ }^\circ\text{C}$

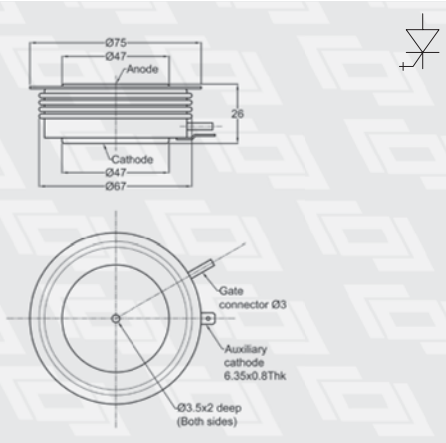
### APPLICATIONS

- Inverter for traction converters
- Converter for auxiliary systems
- Spare parts

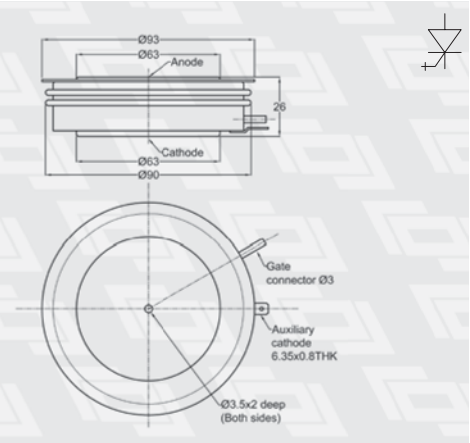


GTO (GATE TURN OFF THYRISTORS)

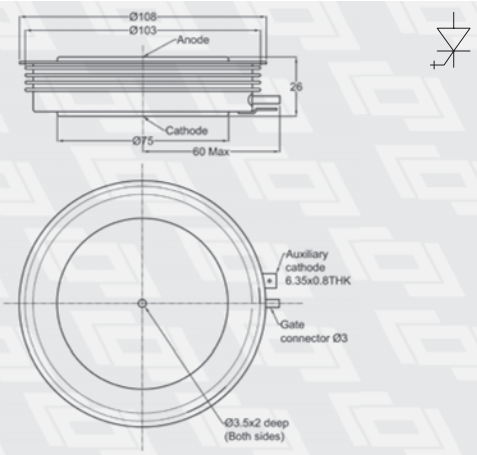
**E0** W = 530 gr



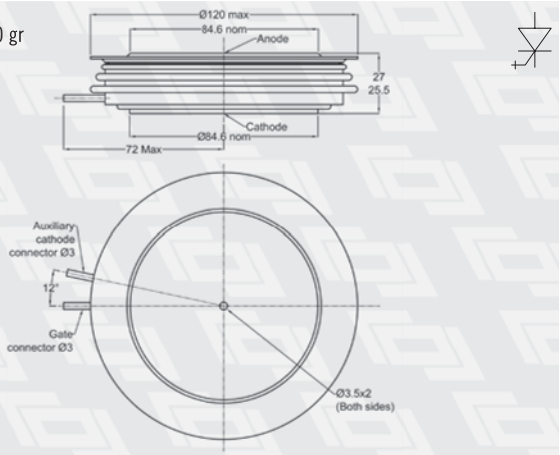
**I0** W = 800 gr



**Q1** W = 1300 gr



**Z2** W = 1600 gr



### GTOS (GATE TURN OFF THYRISTORS) CHARACTERISTICS

Gate Turn Off Thyristor	$V_{DRM}$ [V]	$V_{RRM}$ [V]	$I_{DRM}$ [mA]	$I_{RRM}$ [mA]	$I_{TCM}$ @ $C_s$ [A]	$I_{TAV}/T_h$ 50 Hz [A/°C]	$I_{TSM}$ [kA]	$dV/dt_{crit}$ [V/μs]	$V_{GT}$ $T_J = 25 \text{ }^\circ\text{C}$ [V]	$I_{GT}$ $T_J = 25 \text{ }^\circ\text{C}$ [A]	$V_T/I_T$ $T_J = 25 \text{ }^\circ\text{C}$ [V/A]	$V_T/I_T$ $T_J = 125 \text{ }^\circ\text{C}$ [V/A]	$t_{gt}$ [μs]	$t_{gv}$ [μs]	$T_{Jmax}$ [°C]	$R_{th(j-c)}$ double side [°C/kW]	Contact Diameter [mm]	Weight [g]	F [kN]	Outline	
<b>UP TO 2500 V</b>																					
ATG635	2500	15	100	50	1500	3.0	550/75	10.0	1000	1.5	2.0	3.5/1400	3.2/1400	10	22	125	30	48	530	14.0/17.0	E0
ATG646	2500	17	50	50	2000	4.0	800/75	16.0	1000	1.0	3.0	2.7/2000	2.8/2000	5	24	125	22	63	800	17.0/24.0	I0
<b>UP TO 4500V</b>																					
ATG675	4500	17	100	10	1000	0.7	413/75	7.0	1000	1.5	2.5	2.3/250	4.0/1000	10	19	125	30	48	530	14.0/17.0	E0
ATG677	4500	17	150	10	2000	4.0	685/70	13.0	1000	1.5	2.5	3.0/2000	3.6/2000	10	25	125	22	63	800	17.0/24.0	I0
ATG777	4500	16	100	10	2400	4.0	890/75	17.0	1000	1.5	3.0	3.0/3000	3.1/3000	10	30	125	16	75	1300	31.0/35.0	Q0
ATG778	4500	16	100	10	3000	4.0	760/75	17.0	1000	1.5	3.0	3.4/3000	3.8/2500	10	30	125	16	75	1300	31.0/35.0	Q0
ATG875	4500	17	150	10	4000	6.0	1100/75	25.0	1000	1.5	3.0	3.6/2500	3.5/2500	7	34	125	11	85	1600	32.0/44.0	Z2

# PRESS-PACK HIGH POWER SEMICONDUCTORS

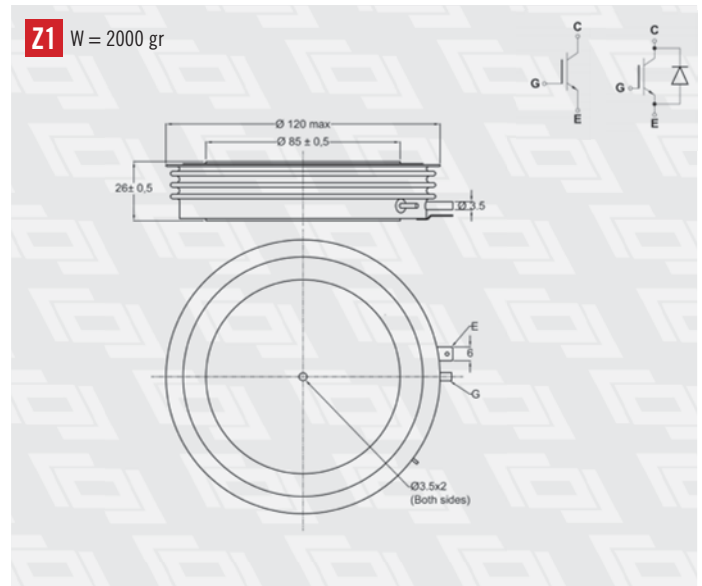
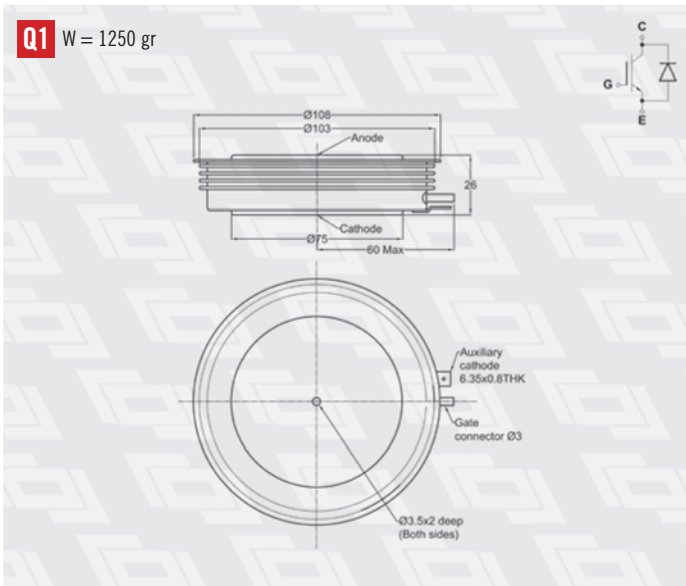
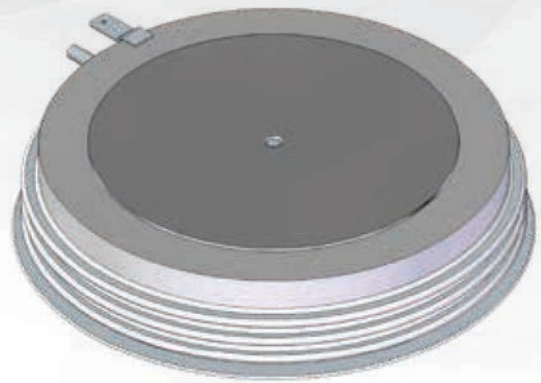
## IGBT PRESS-PACK

### MAIN CHARACTERISTICS

- Very high reliable device in press-pack case
- Very good trade off between conduction and switching losses
- Welding and soldering free
- High frequency applications
- Junction temperature range:  $-30 \div 125 \text{ }^\circ\text{C}$

### APPLICATIONS

- Industrial applications
- Traction applications



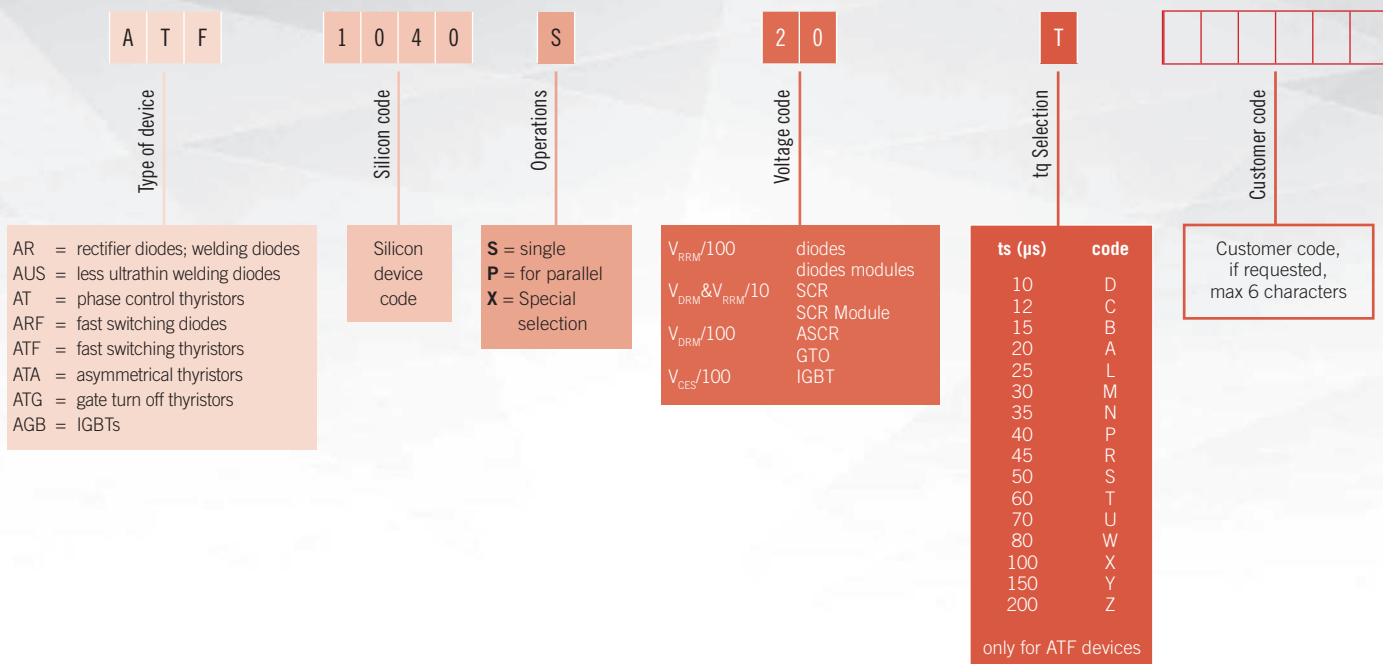
### IGBT PRESS-PACK CHARACTERISTICS

IGBT Press-Pack	$V_{CES}$	$I_{CES}$	$I_C$	$I_{CM}$	$V_{CE(sat)}$ @ $I_C$ , $T_j = 125 \text{ }^\circ\text{C}$ ; max	$V_F$ @ $I_F$ diode; max	$t_{on}$ $T_j = 125 \text{ }^\circ\text{C}$ ; typ	$t_{r(on)}$ $T_j = 125 \text{ }^\circ\text{C}$ ; typ	$t_{off}$ $T_j = 125 \text{ }^\circ\text{C}$ ; typ	$t_{f(off)}$ $T_j = 125 \text{ }^\circ\text{C}$ ; typ	$t_{rr}$ $T_j = 125 \text{ }^\circ\text{C}$	$V_{GEth}$ $T_j = 25 \text{ }^\circ\text{C}$ ; typ	$T_{j(max)}$	$R_{th(j-b)}$ IGBT	$R_{th(j-b)}$ Diode	Contact Diameter	Weight	F	Outline		
	[V]	[mA]	[A]	[A]	[V]	[A]	[μs]	[μs]	[μs]	[μs]	[μs]	[V]	[°C]	[V/A]	[μs]	[mm]	[g]	[kN]			
<b>UP TO 2500 V</b>																					
AGB1000S25	2500	200	1000	2000	6.0	1000	3.2	1000	2.2	0.3	1.7	0.5	0.6	4.5	125	18	45	75	1250	28.3/34.4	Q1
<b>UP TO 4500V</b>																					
AGB1500FIS45	4500	50	1500	3000	4.3	1500	no diode	3.8	0.4	11.8	1.8	no diode	7.5	125	10 <sup>(1)</sup>	no diode	85	2000	28.0/35.0	Z1	

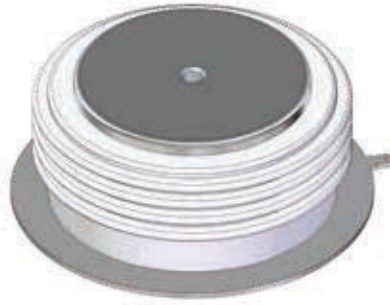
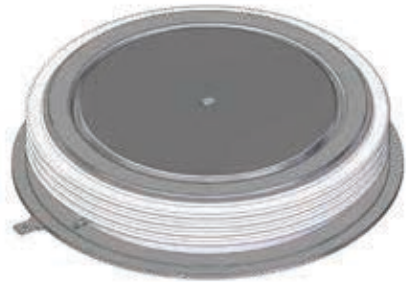
(1)  $R_{th(j-c)}$

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# PRESS-PACK HIGH POWER SEMICONDUCTORS IDENTIFICATION SYSTEM



PRESS-PACK HIGH POWER SEMICONDUCTORS



FOR SPECIAL SELECTIONS PLEASE CONTACT OUR SALES DEPARTMENT

# HIGH POWER INSULATED MODULES

# HIGH POWER INSULATED MODULES

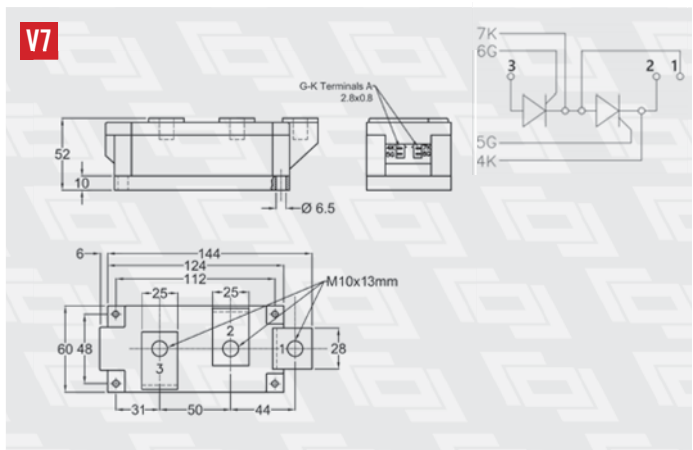
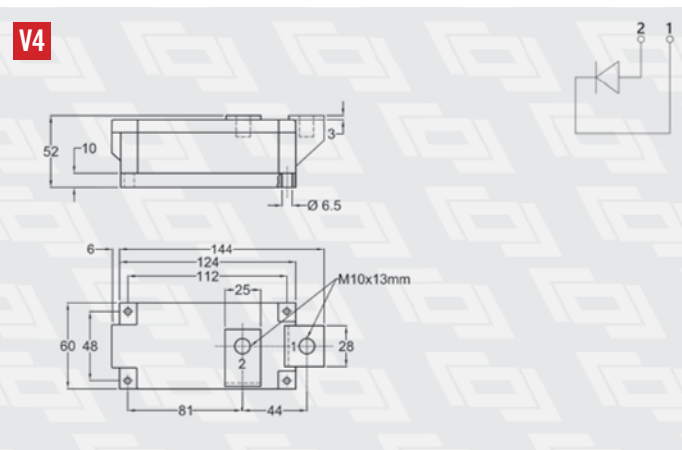
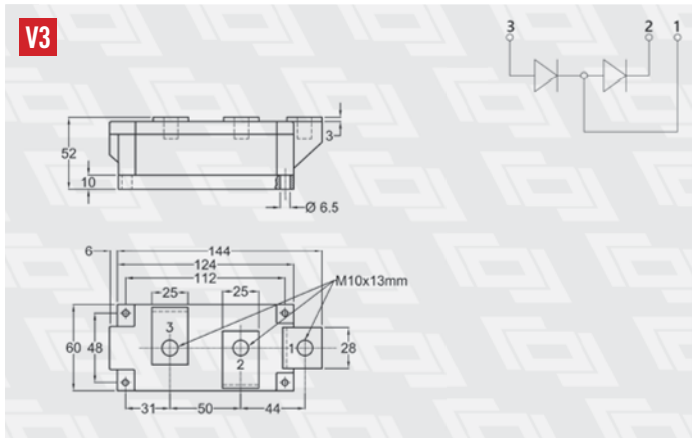
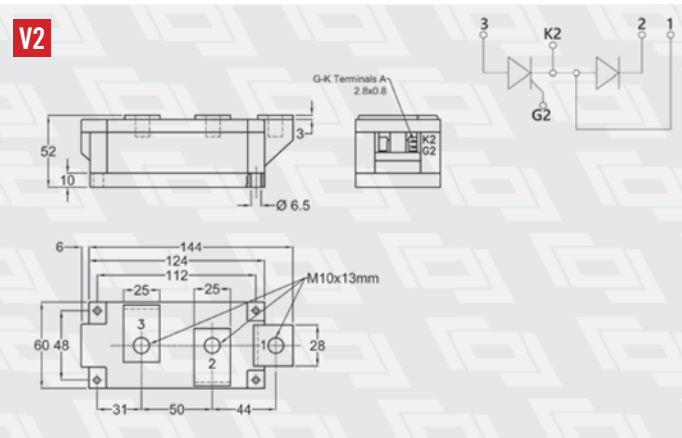
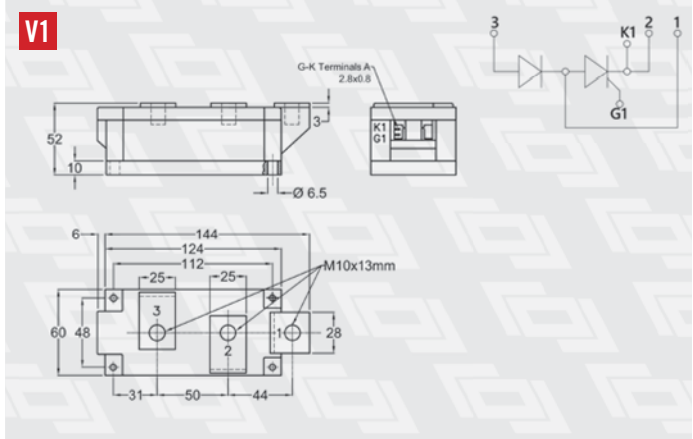
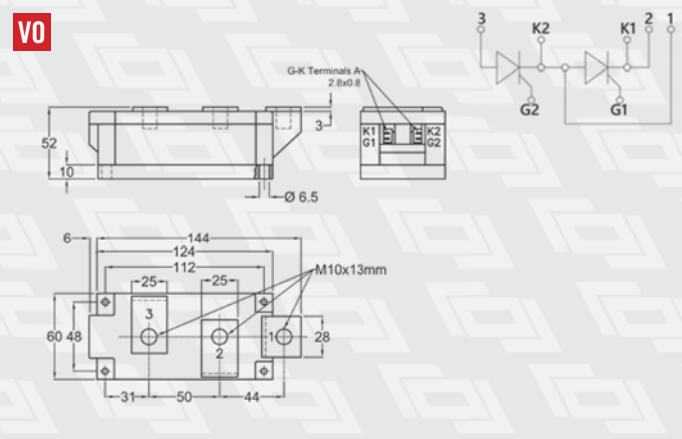
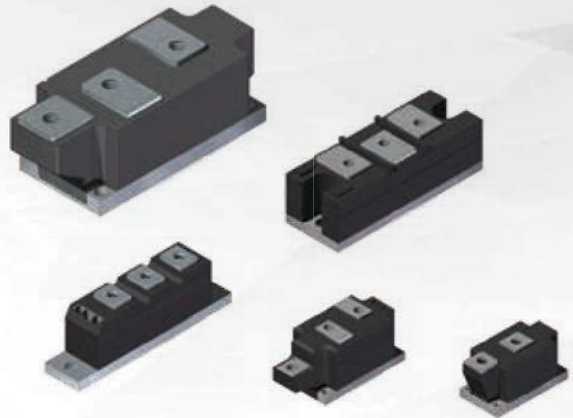
## RECTIFIER DIODE AND PHASE CONTROL THYRISTOR INSULATED MODULES

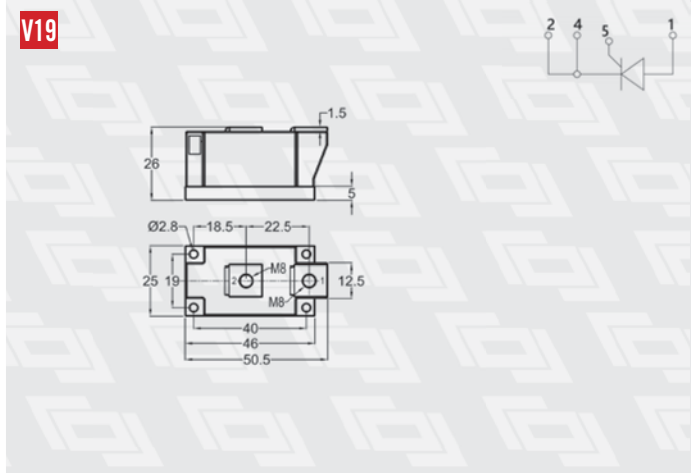
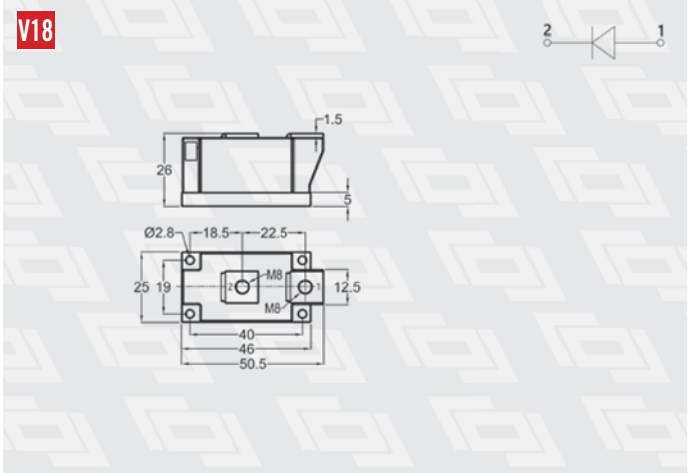
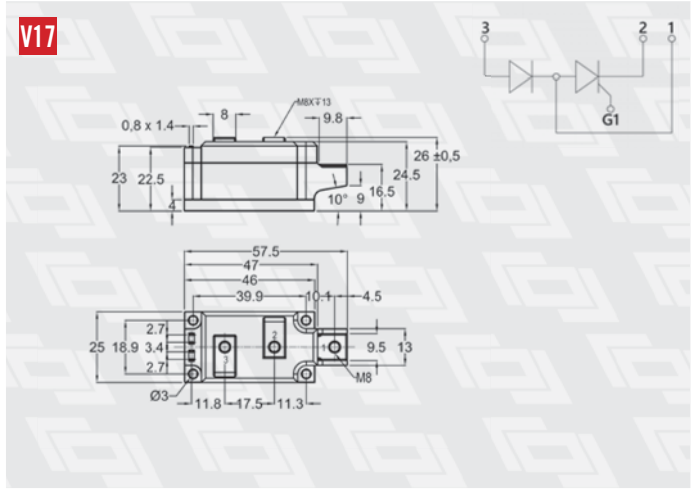
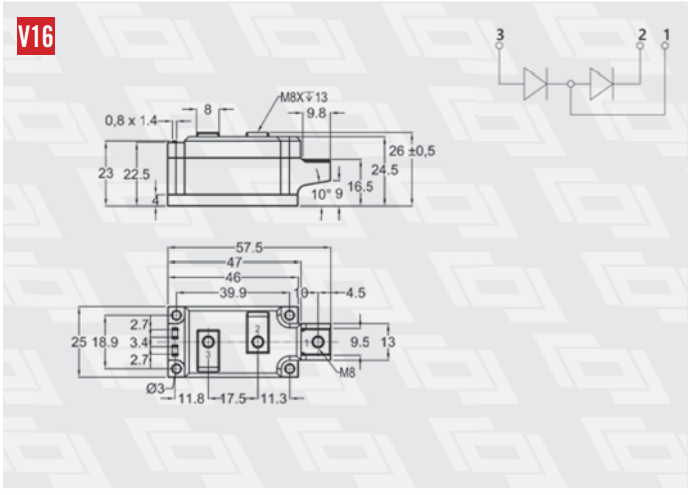
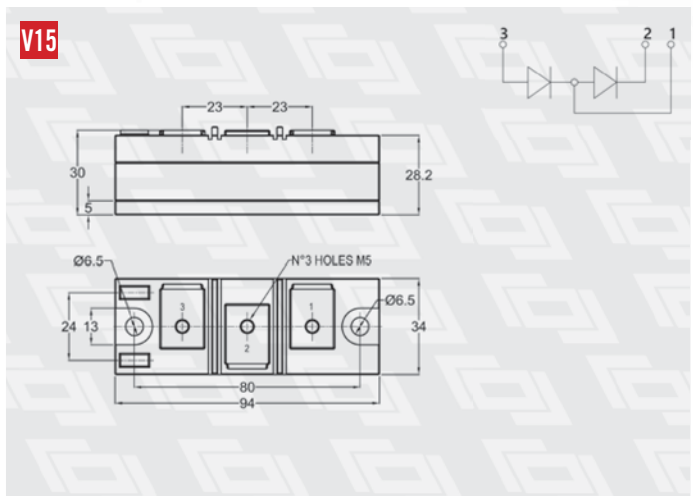
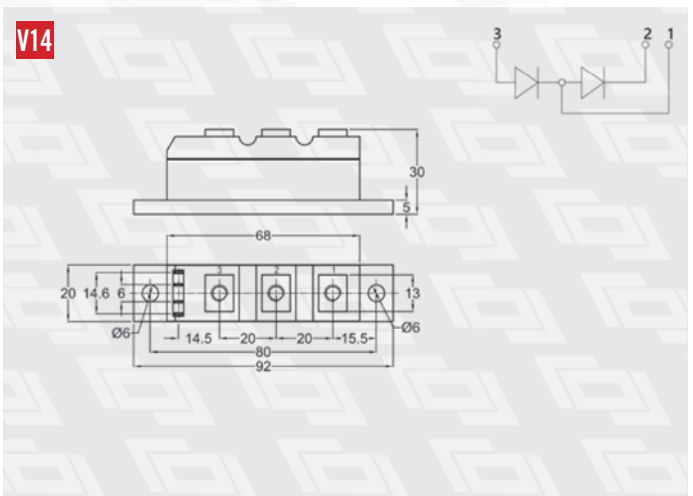
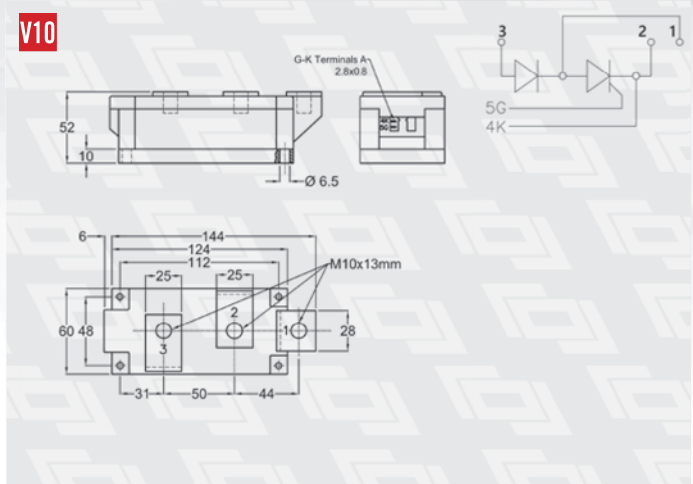
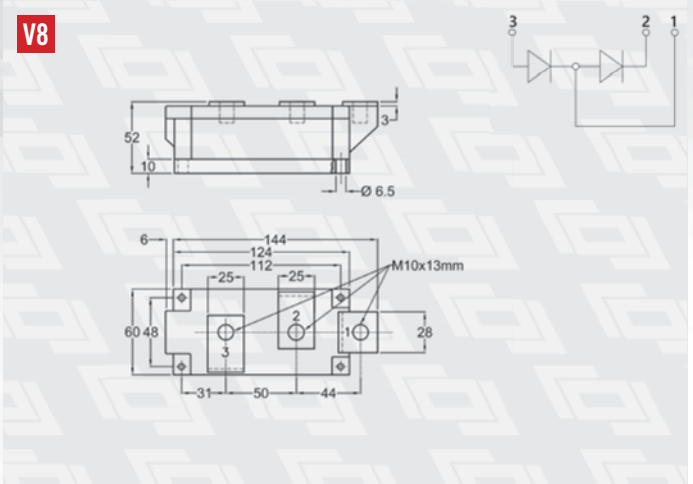
### MAIN CHARACTERISTICS

- Different class of insulation voltage (RMS) from 2.5 kV to 6.0 kV
- Full hermetic packaging for 4.5 kV and 6.0 kV insulated modules
- Base plate insulation using  $Al_2O_3$  or AlN substrate for thermal management optimization
- Industrial compatible packaging

### APPLICATIONS

- Controlled and not controlled rectifier bridges for industrial applications
- UPS systems
- Battery chargers





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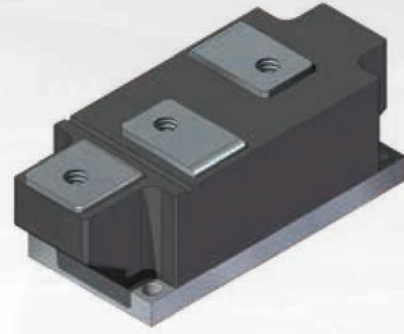
RECTIFIER DIODE AND PHASE CONTROL THYRISTOR INSULATED MODULES

Rectifier Diode and Phase Control Thyristor Insulated Module	$V_{DRM}$ $V_{RRM}$	$I_{T(AV)}/T_c$ $I_{F(AV)}/T_c$	$I_{FSM}$ $I_{FSM}$ 10 ms, $T_{jmax}$	$V_{T(TO)}$ $V_{F(TO)}$ $T_{jmax}$	$r_F$	$R_{th(j-c)}$ for element	$T_{jmax}$	$V_{ms(RMS)}$ 1 min; $T_j = 25^\circ C$	Weight	Outline
	[V]	[A / °C]	[A]	[V]	[mΩ]	[°C/kW]	[°C]	[V]	[g]	
<b>INSULATION VOLTAGE VINS = 2500 - 3000 V</b>										
ADD105	2200	102 / 100	2400	0.82	0.200	370	150	2500	160	V14
ADD165	2200	165 / 100	4600	0.80	1.000	252	150	2500	310	V15
ADD265	2200	266 / 100	8300	0.70	0.680	164	150	3000	800	V16
ADD465	4000	471 / 100	12000	0.82	0.600	70	150	3000	1500	V8
ADD605	3200	691 / 85	15000	0.85	0.290	70	150	3000	1500	V8
ADD705	2600	718 / 85	20000	0.85	0.250	70	150	3000	1500	V8
ADD805	2200	819 / 85	19000	0.77	0.180	70	150	2500	1500	V8
ADD905	1200	837 / 85	24000	0.80	0.150	70	150	2500	1500	V8
ADS1005	1000	957 / 100	23000	0.75	0.125	50	150	2500	1500	V4
ATD155	1600	155 / 85	4800	0.85	1.500	180	125	2500	300	V15
ATD185	1600	176 / 85	5200	0.95	1.000	164	125	3000	800	V17
ATD215	1600	221 / 85	6600	1.00	0.850	124	125	3000	800	V17
ATD255	1600	259 / 85	8000	0.80	0.700	124	125	3000	800	V17
ATD425	1800	464 / 85	13000	1.00	0.380	60	125	3000	1500	V10
ATD505	1800	519 / 85	13000	0.90	0.300	60	125	3000	1500	V10
ATD575	1800	596 / 85	14500	0.90	0.300	50	125	3000	1500	V10
ATT405	2400	399 / 85	9000	1.02	0.420	70	125	3000	1500	V7
ATT505	1800	490 / 85	13000	0.95	0.300	70	130	3000	1500	V7
ATT575	1800	573 / 85	14500	1.00	0.380	50	135	3000	1500	V7
ATT605	1200	649 / 85	17000	0.81	0.250	70	140	3000	1500	V7
AZD615	1800	622 / 85	22000	0.75	0.215	74.5	150	3000	1500	V18
AZT155	2600	155 / 85	5000	1.20	2.300	124	125	3000	900	V19
AZT315	2200	320 / 85	9000	1.00	0.860	74	125	3000	900	V19
AZT435	2200	446 / 85	14000	0.95	0.450	62	125	3000	900	V19
AZT505	1600	518 / 85	17000	0.90	0.270	62	125	3000	900	V19
<b>INSULATION VOLTAGE VINS = 4500 V</b>										
ADD480	4500	572 / 85	4500	1.00	0.920	50	150	4500	1500	V3
ADD500	3300	552 / 100	10300	0.89	0.675	50	150	4500	1500	V3
ADD700	2800	751 / 100	17900	0.85	0.260	50	150	4500	1500	V3
ADD1000	1000	957 / 100	23000	0.75	0.125	50	150	4500	1500	V3
ADS1000	1000	957 / 100	23000	0.75	0.125	50	150	4500	1500	V4
ADT461	2400	462 / 85	12000	1.10	0.552	50	125	4500	1500	V2
ADT501	1600	533 / 85	14500	1.00	0.380	50	125	4500	1500	V2
ADT571	1600	573 / 91	14500	1.00	0.380	50	135	4500	1500	V2
ATD461	2400	462 / 85	12000	1.10	0.552	50	125	4500	1500	V1
ATD501	1600	533 / 85	14500	1.00	0.380	50	125	4500	1500	V1
ATD571	1600	573 / 91	14500	1.00	0.380	50	135	4500	1500	V1
ATT250	4000	256 / 85	5900	1.35	1.400	70	125	4500	1500	V0
ATT461	2400	462 / 85	12000	1.10	0.552	50	125	4500	1500	V0
ATT501	1600	533 / 85	14500	1.00	0.380	50	125	4500	1500	V0
ATT571	1600	573 / 91	14500	1.00	0.380	50	135	4500	1500	V0
ATT621	1600	620 / 91	15000	0.90	0.340	50	135	4500	1500	V0
<b>HIGH INSULATION VOLTAGE VINS = 6000 V</b>										
ADD360HVI	4500	385 / 85	5600	1.00	0.920	90	150	6000	1500	V3
ADD460HVI	5600	460 / 85	8000	1.00	0.920	70	150	6000	1500	V3
ADD480HVI	4500	493 / 85	9000	0.89	0.815	70	150	6000	1500	V3
ADD500HVI	3300	526 / 85	10300	0.89	0.675	70	150	6000	1500	V3
ADD700HVI	2800	711 / 85	17900	0.85	0.260	70	150	6000	1500	V3
ADT200HVI	5800	200 / 85	5900	1.45	2.850	70	125	6000	1500	V2
ADT250HVI	4500	259 / 85	5900	1.35	1.335	70	125	6000	1500	V2
ATD200HVI	5800	200 / 85	5900	1.45	2.850	70	125	6000	1500	V1
ATD250HVI	4500	259 / 85	5900	1.35	1.335	90	125	6000	1500	V1



# HIGH POWER INSULATED MODULES

## FAST RECOVERY DIODES INSULATED MODULES

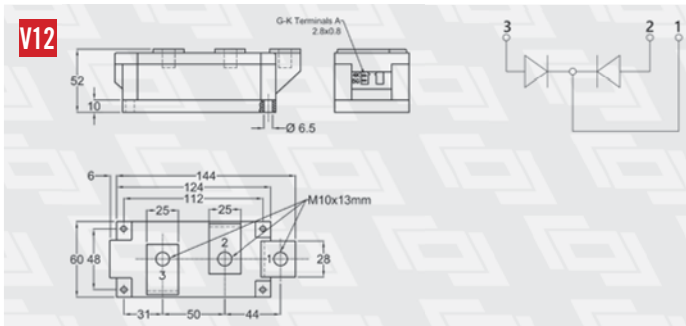
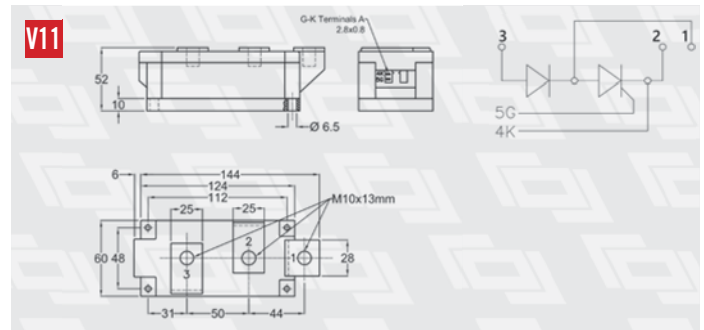
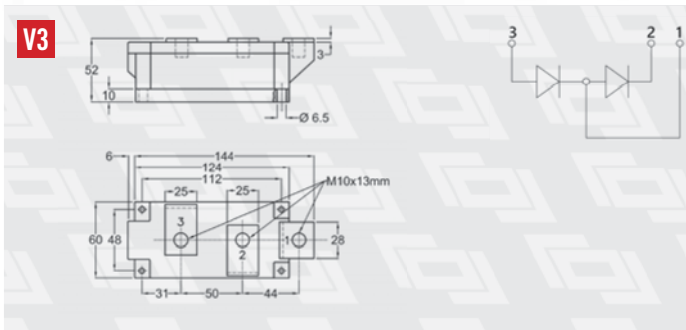


### MAIN CHARACTERISTICS

- Insulation voltage (RMS) from 4.5 kV to 6 kV
- Full hermetic package
- Base plate insulation using AlN substrate
- Industrial compatible package
- Improved recovery softness

### APPLICATIONS

- Auxiliary system for traction applications

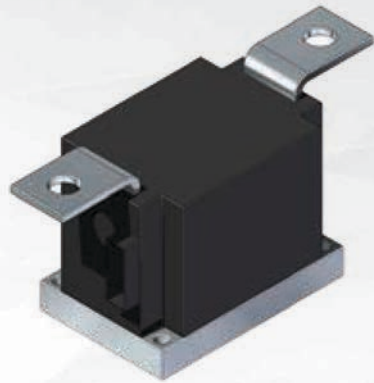


Fast Recovery Diode Insulated Module	$V_{RRM}$	$I_{F(AV)} / T_c$	$I_{FSM} / 10\text{ ms}, T_{j\text{max}}$	$V_{FT(D)} / T_{j\text{max}}$	$r_F$	$Q_{rr}^{(1)}$	$R_{th(j-c)}$ for element	$T_{j\text{max}}$	$V_{ins(RMS)} / 1\text{ min}; T_j = 25\text{ °C}$	Weight	Outline
	[V]	[A / °C]	[A]	[V]	[mΩ]	[μC]	[°C/kW]	[°C]	[V]	[g]	
AFF150	3300	150 / 55	2500	1.70	7.400	175	105	125	4500	1500	V3
AFF150A	3300	150 / 55	2500	1.70	7.400	175	105	125	4500	1500	V11
AFF150K	3300	150 / 55	2500	1.70	7.400	175	105	125	4500	1500	V12
AFF230	2600	208 / 100	5000	1.15	1.500	185	125	150	4500	1500	V3
AFF230A	2600	208 / 100	5000	1.15	1.500	185	125	150	4500	1500	V11
AFF230K	2600	208 / 100	5000	1.15	1.500	185	125	150	4500	1500	V12
AFF300	2600	252 / 70	5000	1.15	0.685	120	105	125	4500	1500	V3
AFF300A	2600	252 / 70	5000	1.15	0.685	120	105	125	4500	1500	V11
AFF300K	2600	252 / 70	5000	1.15	0.685	120	105	125	4500	1500	V12
AFF350	4500	356 / 55	9000	2.70	1.400	900	50	125	4500	1500	V3
AFF350A	4500	356 / 55	9000	2.70	1.400	900	50	125	4500	1500	V11
AFF350K	4500	356 / 55	9000	2.70	1.400	900	50	125	4500	1500	V12
AFF450	4500	448 / 100	10000	1.40	0.750	1600	50	150	4500	1500	V3
AFF450A	4500	448 / 100	10000	1.40	0.750	1600	50	150	4500	1500	V11
AFF450K	4500	448 / 100	10000	1.40	0.750	1600	50	150	4500	1500	V12
AFF450HVI	4500	450 / 80	10000	1.40	0.750	1600	50	150	6000	1500	V3
AFF450AHVI	4500	450 / 80	10000	1.40	0.750	1600	50	150	6000	1500	V11
AFF450KHVI	4500	450 / 80	10000	1.40	0.750	1600	50	150	6000	1500	V12

(1) Recovery condition  $I_r = 200\text{ A}$ ;  $di/dt = 1000\text{ A}/\mu\text{s}$ ;  $VR = 50\text{ V}$

# HIGH POWER INSULATED MODULES

## HIGH CURRENT RECTIFIER DIODE AND PHASE CONTROL THYRISTOR INSULATED MODULES

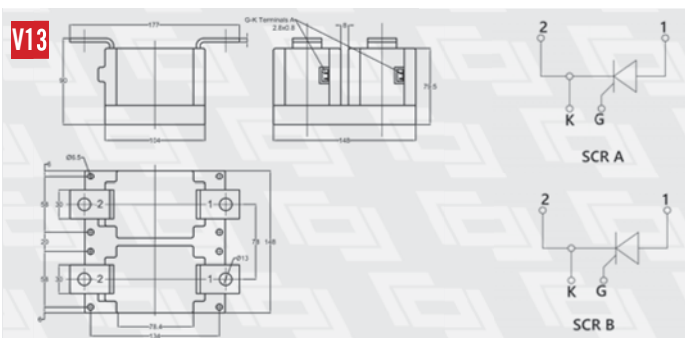
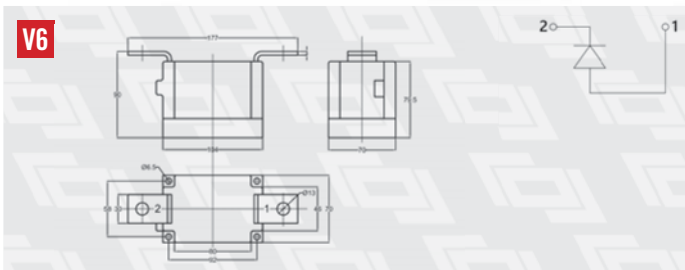
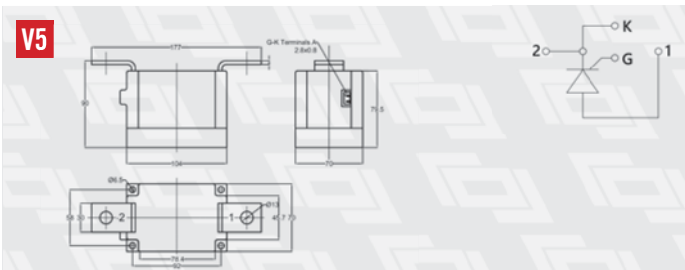


### MAIN CHARACTERISTICS

- Insulation voltage (RMS) from 3.0 kV to 6.0 kV
- Full hermetic packaging
- Base plate insulation using AlN substrate
- Industrial compatible packaging

### APPLICATIONS

- Controlled and not controlled rectifier bridges for industrial applications
- UPS systems
- Battery chargers



High Current Rectifier Diode and Phase Control Thyristor	$V_{RRM}$ $V_{RRM}$	$I_{T(AV)}/T_c$ $I_{T(AV)}/T_c$	$I_{FSM}$ $I_{FSM}, T_{Jmax}$ 10 ms, $T_{Jmax}$	$V_{FTO}$ $V_{FTO}$ $T_{Jmax}$	$r_F$ $T_{Jmax}$	$R_{th(j-c)}$ for element	$T_{Jmax}$	$V_{MS (RMS)}$ 1 min, $T_J = 25^\circ C$	Weight	Outline
	[V]	[A / °C]	[kA]	[V]	[mΩ]	[°C/kW]	[°C]	[V]	[g]	
<b>INSULATION VOLTAGE VINS = 3000 V</b>										
AZT805	1800	819 / 85	30	0.83	0.190	42	125	3000	2500	V5
AZT745	2200	783 / 85	30	0.85	0.190	42	125	3000	2500	V5
<b>INSULATION VOLTAGE VINS = 4500 V</b>										
AZD1280	1000	1287 / 100	38.0	0.75	0.055	42	150	4500	2800	V6
AZD1600	1000	1600 / 95	44.8	0.75	0.055	42	150	4500	2800	V6
AZD1080	2800	1087 / 100	30.0	0.80	0.110	42	150	4500	2800	V6
AZD930	4500	929 / 100	19.0	0.80	0.210	42	150	4500	2800	V6
AZT1150	800	1149 / 85	30.0	0.80	0.120	42	140	4500	2800	V5
AZT800	1800	808 / 85	30.0	0.82	0.180	42	125	4500	2800	V5
AZT740	2200	719 / 85	30.0	0.90	0.240	42	125	4500	2800	V5
AZT630	2800	634 / 85	26.0	1.05	0.290	42	125	4500	2800	V5
AZT530	3600	532 / 85	17.0	1.22	0.450	42	125	4500	2800	V5
AZT460	4500	452 / 85	11.0	1.20	0.700	42	125	4500	2800	V5
<b>HIGH INSULATION VOLTAGE VINS = 6000 V</b>										
AZD780HVI	4500	805 / 100	19.0	0.80	0.210	51	150	6000	2800	V6
AZD610HVI	5800	611 / 100	20.0	1.00	0.400	51	150	6000	2800	V6
AZT400HVI	4500	411 / 85	11.0	1.20	0.700	51	125	6000	2800	V5
AZT310HVI	5800	313 / 85	10.0	1.30	1.150	51	120	6000	2800	V5
AZTT400HVI	4500	411 / 85	11.0	1.20	0.700	51	125	6000	5800	V13
AZTT310HVI	5800	313 / 85	10.0	1.30	1.150	51	120	6000	5800	V13

# HIGH POWER INSULATED MODULES

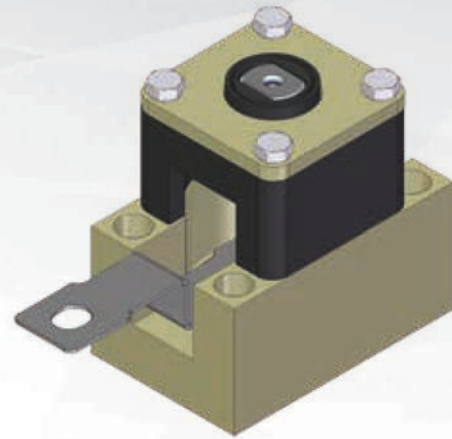
## INSULATED POWER MODULE - ABI SERIES

### MAIN CHARACTERISTICS

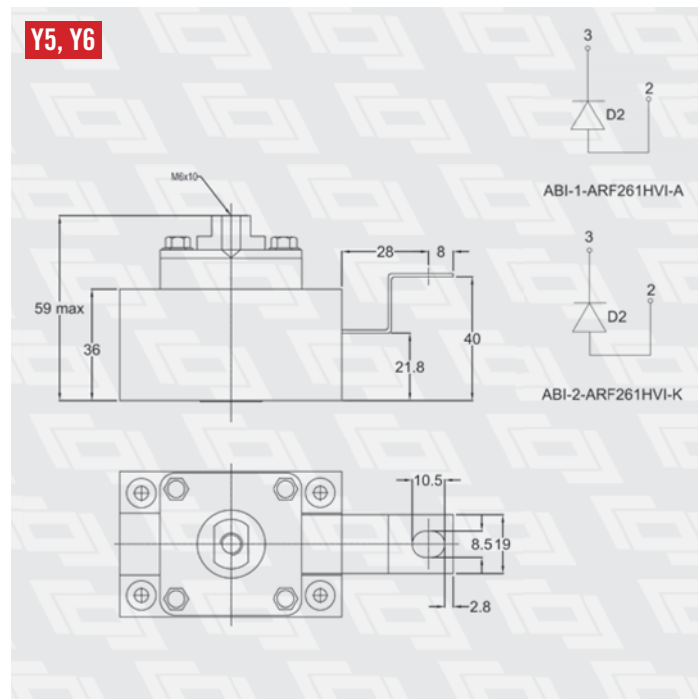
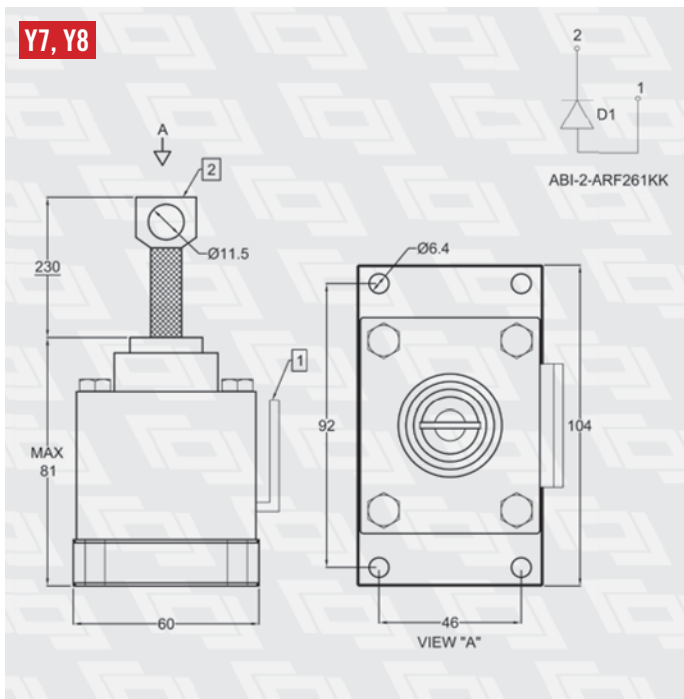
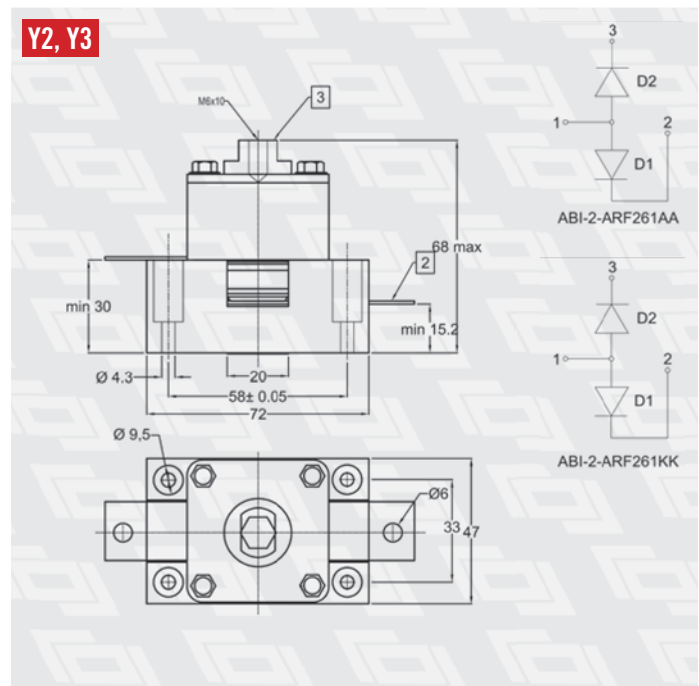
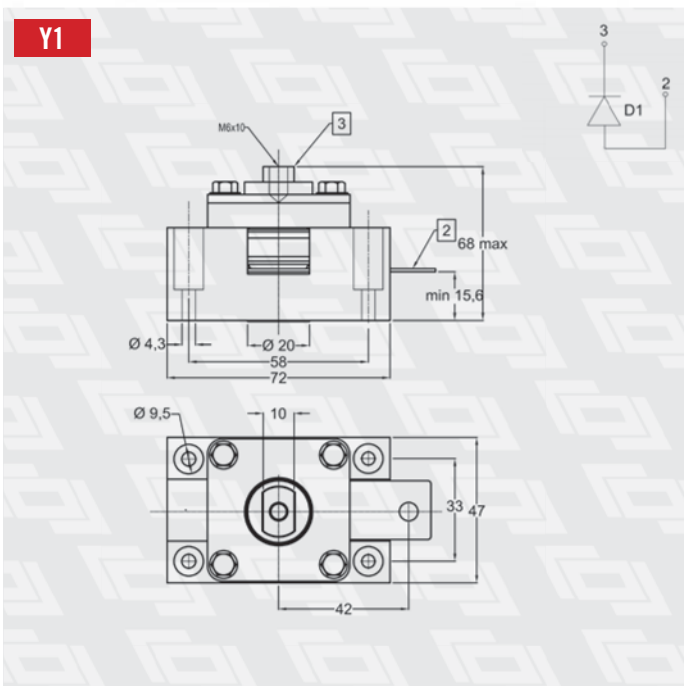
- Insulation voltage (RMS) up to 9.5 kV
- Custom design to optimize circuit layout
- The materials used are compliant with UL94-V0 standard and ROHS requirements
- Base plate insulation using AlN substrates

### APPLICATIONS

- Auxiliary circuits for traction
- Medium voltage industrial inverters



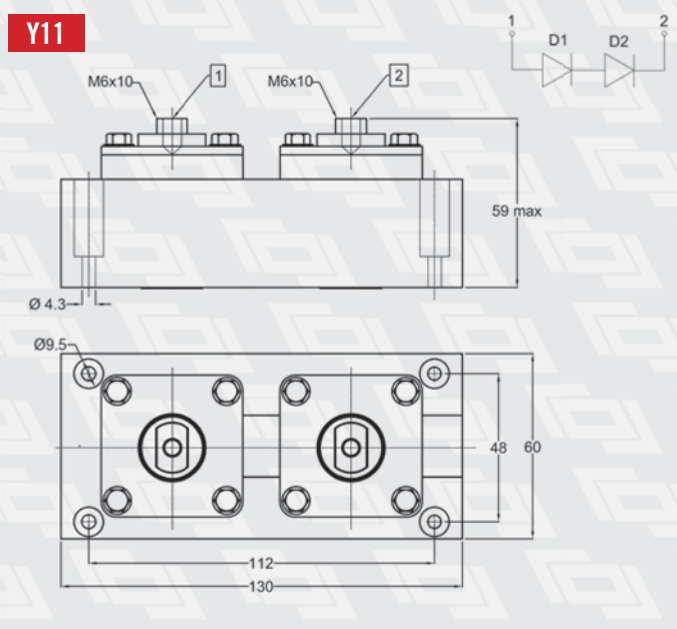
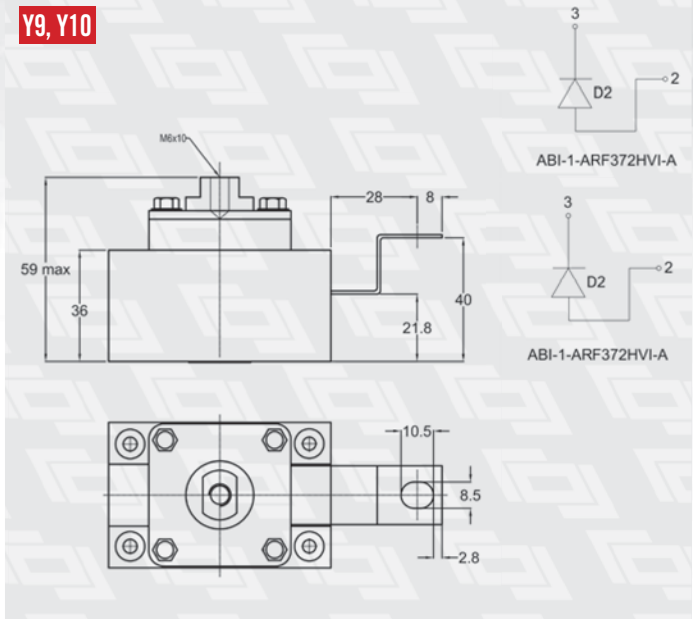
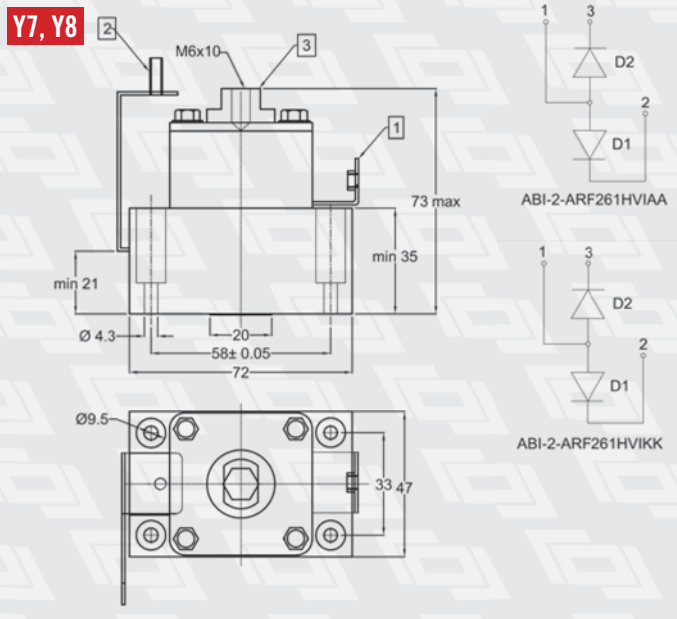
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INSULATED POWER MODULE - ABI SERIES

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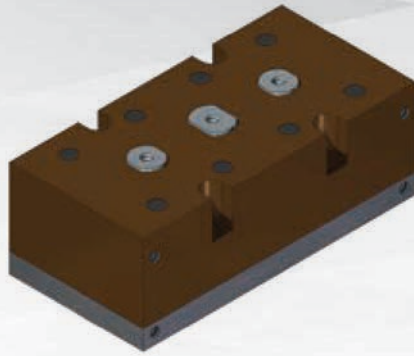
INSULATED POWER MODULE - ABI SERIES



Insulated Power Module type ABI	Voltage class	Devices number	$V_{RRM}$	$I_{FM}$ $T_v = 55^\circ\text{C}$	Recovery parameters			$V_{ins}$ rms, 1 min	$T_{Jmax}$	Outline
					$Q_{rr}$ $T_{Jmax}$	$t_{rr}$ $T_{Jmax}$	Test condition $dI_r/dt$			
STANDARD INSULATION VOLTAGE $V_{INS} = 6000\text{ V}$										
ABI-1-ARF261	S33	1	3300	67	45	1.0	100	6000	125	Y1
ABI-2-ARF261AA	S33	2	3300	D1 = 43 D2 = 24	45	1.0	100	6000	125	Y2
ABI-2-ARF261KK	S33	2	3300	D1 = 43 D2 = 24	45	1.0	100	6000	125	Y3
ABI-1-AR409PC	S02	1	200	825	-	-	-	6000	125	Y4
HIGH INSULATION VOLTAGE $V_{INS} = 9500\text{ V}$										
ABI-1-ARF261HVI-A	S33	1	3300	59	45	1.0	100	9500	125	Y5
ABI-1-ARF261HVI-K	S33	1	3300	59	45	1.0	100	9500	125	Y6
ABI-2-ARF261HVIAA	S33	2	3300	D1 = 40.5 D2 = 20.0	45	1.0	100	9500	125	Y7
ABI-2-ARF261HVIKK	S33	2	3300	D1 = 40.5 D2 = 20.0	45	1.0	100	9500	125	Y8
ABI-1-ARF372HVI-A	S45	1	4500	64	100	1.7	100	9500	125	Y9
ABI-1-ARF372HVI-K	S45	1	4500	64	100	1.7	100	9500	125	Y10
ABI-2-AR372X2HVI	S45	2	4500	191	450 (typ)	-	-	9500	150	Y11

# HIGH POWER INSULATED MODULES

## ADVANCED POWER MODULE - APM SERIES



### MAIN CHARACTERISTICS

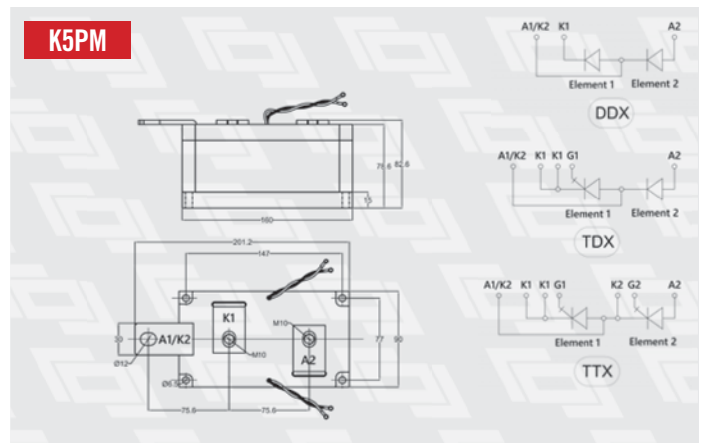
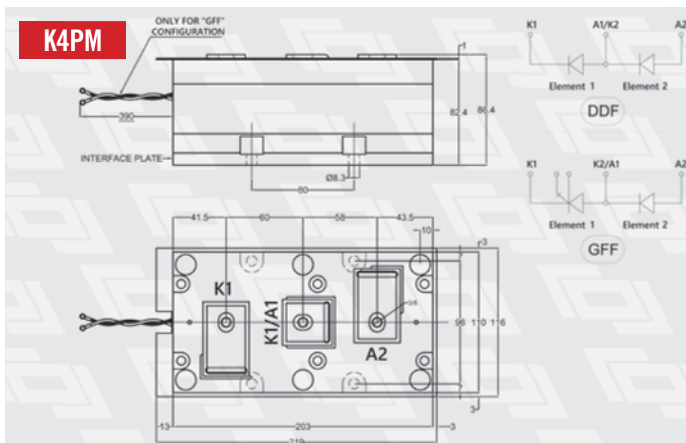
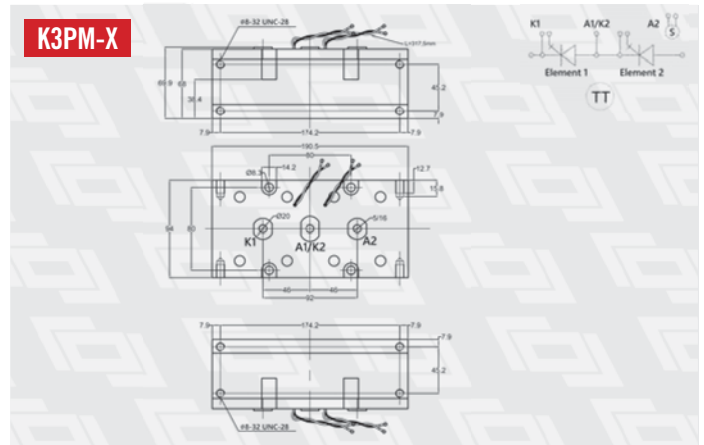
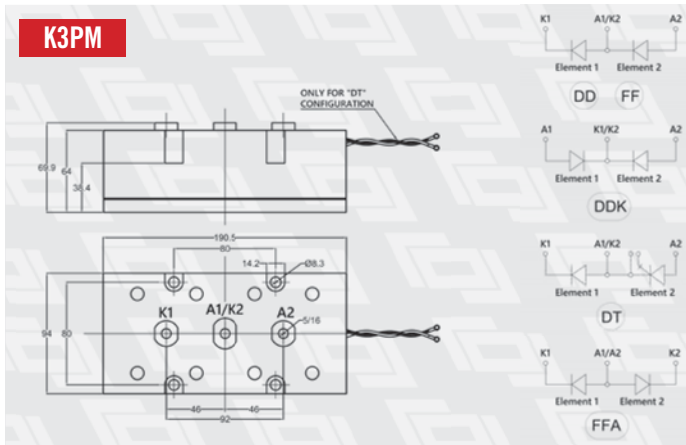
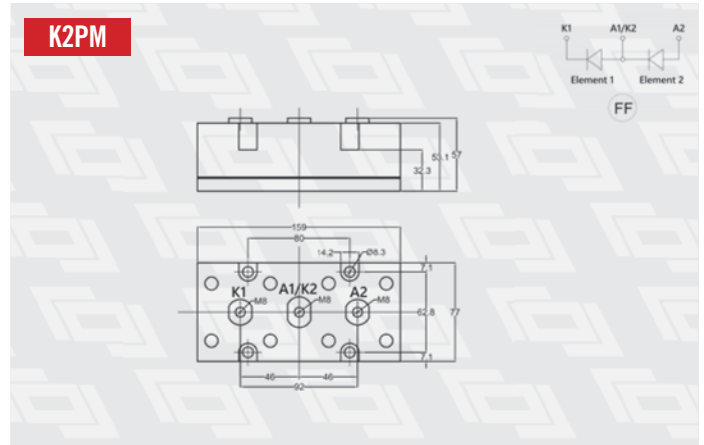
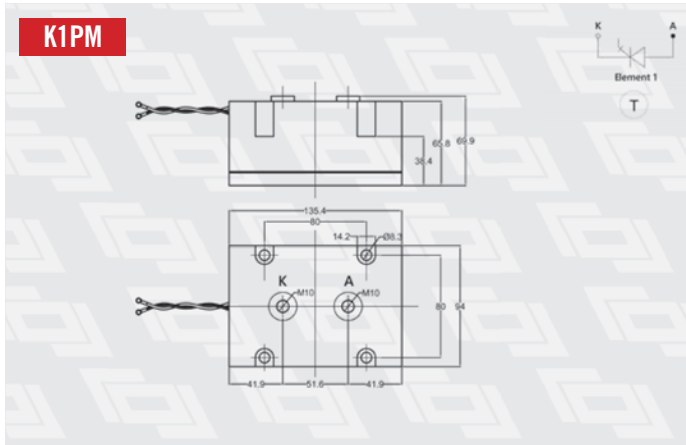
- Insulated module with press-pack device inside
- Different configurations:
  - GTO - Fast Recovery Diode / Dual Fast Recovery Diode / Dual Thyristor / Dual Rectifier Diode / Thyristor - Rectifier Diode
- Insulation system with high efficiency thermoconductive material
- Devices electrically and mechanically compatible with POW-R-BRIK module
- High durability and reliability
- Precise control of  $V_{tr}$ ,  $t_q$  and  $Q_{rr}$  by electronic irradiation

### A POWERFUL INSULATED MODULE TECHNOLOGY

- High insulation and high thermal conductivity is obtained by using AlN disc or thermoconductive elastomer
- High reliability based on press-pack hermetic technology
- Customized control plan with 100% test of request characteristics
- Test report

### APPLICATIONS

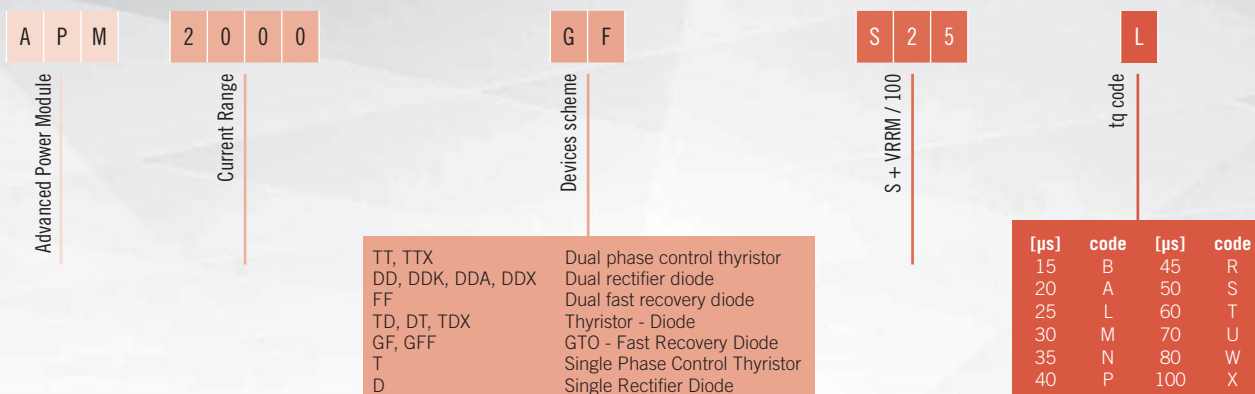
- For industrial medium frequency applications
- Inverters for traction (Tramway, Metro)
- Input rectifier bridge for industrial applications



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ADVANCED POWER MODULE - APM SERIES

## ADVANCED POWER MODULES IDENTIFICATION SYSTEM



## MAXIMUM RATING AND ELECTRICAL CHARACTERISTICS

### THYRISTOR AND DIODES ADVANCED POWER MODULES

Advanced Power Module	ELEMENT 1		ELEMENT 2		ELEMENT 1		ELEMENT 2		ELEMENT 1		ELEMENT 2		(dV <sub>g</sub> /dt)	t <sub>q</sub> [μs]
	V <sub>DRM</sub>	V <sub>VRRM</sub>	V <sub>DRM</sub>	V <sub>VRRM</sub>	I <sub>FAV</sub>	@T <sub>c</sub>	I <sub>FAV</sub>	@T <sub>c</sub>	I <sub>TSM</sub>	I <sub>FSM</sub>	V <sub>FT(D)</sub>	r <sub>f</sub>		
	[V]	[V]	[V]	[V]	[A]	[°C]	[A]	[°C]	[KA]	[KA]	[V]	[mΩ]	[V]	[mΩ]
APM530T	3000	-	459	85	-	-	13.0	-	1.20	0.450	-	-	500	400.0
APM240FF	2200	2200	239	85	239	85	6.5	6.5	1.20	0.800	1.20	0.800	-	4.0
APM230FF	2500	2500	224	100	224	100	5.0	5.0	1.40	1.500	1.40	1.500	-	1.5
APM530DD	3000	3000	839	100	839	100	14.0	14.0	0.90	0.130	0.90	0.130	-	25.0
APM800DDK	2500	2500	882	100	882	100	16.0	16.0	0.85	0.120	0.85	0.120	-	25.0
APM800FFA	2500	2500	801	80	801	80	16.0	16.0	1.10	0.310	1.10	0.310	-	2.3
APM800FF	2500	2500	801	80	801	80	16.0	16.0	1.10	0.310	1.10	0.310	-	2.3
APM540DT	2400	2400	780	85	780	85	16.0	16.0	0.90	0.120	0.90	0.120	300	-
APM590TT	1400	1400	593	85	593	85	27.0	27.0	0.82	0.180	0.82	0.180	1000	-
APM1200DD	2500	2500	1192	85	1192	85	33.0	33.0	0.76	0.105	0.76	0.105	-	-
APM310TTHVI	5600	5600	313	85	313	85	10.0	10.0	1.30	1.150	1.30	1.150	500	-
APM310TDHVI	5600	5600	313	85	469	85	10.0	10.0	1.30	1.150	1.30	1.150	500	-
APM800TT	1800	1800	808	85	808	85	25.0	25.0	0.82	0.820	0.82	0.820	500	250.0
APM740DDHVI	5600	5600	738	85	738	85	20.0	20.0	1.00	0.400	1.00	0.400	-	-
APM1100DDHVI	2800	2800	1085	85	1085	85	28.0	28.0	0.80	0.140	0.80	0.140	-	-

### GTO AND FAST RECOVERY DIODES ADVANCED POWER MODULES

Advanced Power Module	GTO		DIODE		GTO		DIODE		GTO		DIODE		GTO (dV <sub>g</sub> /dt)				
	V <sub>DRM</sub>	V <sub>VRRM</sub>	V <sub>DRM</sub>	V <sub>VRRM</sub>	I <sub>TCM</sub>	T <sub>c</sub> = 55 °C	I <sub>TCM</sub>	T <sub>c</sub> = 55 °C	I <sub>TSM</sub>	T <sub>c</sub> = 125 °C	I <sub>TSM</sub>	T <sub>c</sub> = 140 °C		V <sub>FT(D)</sub>	r <sub>f</sub>	V <sub>FT(D)</sub>	r <sub>f</sub>
	[V]	[V]	[V]	[V]	[A]	[A]	[A]	[A]	[KA]	[KA]	[KA]	[KA]	[V]	[mΩ]	[V]	[mΩ]	[V/μs]
APM1800GFF	2500 / 16	2500	1800	435	421	11	11	1.30	0.650	1.25	0.500	1000					
APM2000GFF	2500 / 16	2500	2000	435	400	11	11	1.30	0.650	1.15	0.730	1000					

## GATE, THERMAL AND MECHANICAL CHARACTERISTICS

### THYRISTOR AND DIODES ADVANCED POWER MODULES

Advanced Power Module	ELEMENT 1		ELEMENT 2		R <sub>th(j-c)</sub> for element	T <sub>jmax</sub>	V <sub>ins(RMS)</sub> 1 min	Mounting torque		Base plate dimension		Outline		
	V <sub>GT</sub>	I <sub>GT</sub>	V <sub>GT</sub>	I <sub>GT</sub>				Case to heatsink	Busbar to terminal	A	B	Case	Scheme	Ref (*)
	[V]	[mA]	[V]	[mA]	[°C/kW]	[°C]	[V]	[Nm]	[Nm]	[mm]	[mm]			
APM530T	3	200	-	-	51	125	4500	27	14	135.0	94	K1PM	T	Yes
APM240FF	-	-	-	-	100	125	4500	14	14	159.0	77	K2PN	FF	Z7A
APM230FF	-	-	-	-	100	150	4500	14	14	159.0	77	K2PN	FF	Z7A
APM530DD	-	-	-	-	51	150	4500	27	14	190.5	94	K3PM	DD	Z9A
APM800DDK	-	-	-	-	51	150	4500	27	14	190.5	94	K3PM	DDK	Z9A
APM800FFA	-	-	-	-	51	150	4500	27	14	190.5	94	K3PM	FFA	Z9A
APM800FF	-	-	-	-	51	150	4500	27	14	190.5	94	K3PM	FF	Z9A
APM540DT	-	-	3.0	200	51	130	4500	27	14	190.5	94	K3PM	DT	Z9A
APM590TT	3.5	350	3.5	350	70	130	4500	5	14	190.5	94	K3PM-X	TT	Z9A
APM1200DD	-	-	-	-	51	150	4500	5	15	203.0	110	K4PM	DDF	Z5AA
APM310TTHVI	3.5	400	3.5	400	51	120	6000	4	14	160.0	90	K5PM	TTX	-
APM310TDHVI	3.5	400	-	-	51	120	6000	4	14	160.0	90	K5PM	TDX	-
APM800TT	3.5	300	3.5	300	42	125	4500	4	14	160.0	90	K5PM	TTX	-
APM740DDHVI	-	-	-	-	51	150	6000	4	14	160.0	90	K5PM	DDX	-
APM1100DDHVI	-	-	-	-	51	150	6000	4	14	160.0	90	K5PM	DDX	-

### GTO AND FAST RECOVERY DIODES ADVANCED POWER MODULES

APM1800GFF	1.0	3000	-	-	80	125	3500	5	15	203.0	110	K4PM	GFF	Z5AA
APM2000GFF	1.0	3000	-	-	80	125	3500	5	15	203.0	110	K4PM	GFF	Z5AA

(\*) Case compatible with POW-R\_BRICK outline

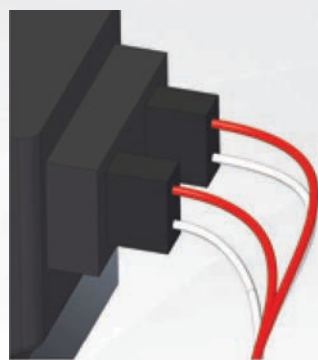
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# ACCESSORIES

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# ACCESSORIES

## GATE LEAD FOR PRESS-PACK DEVICES AND INSULATED MODULES



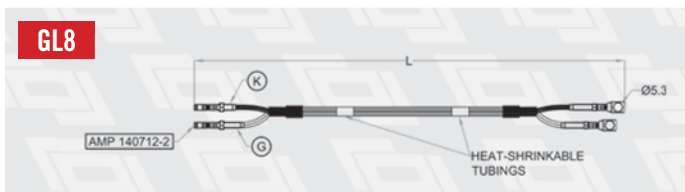
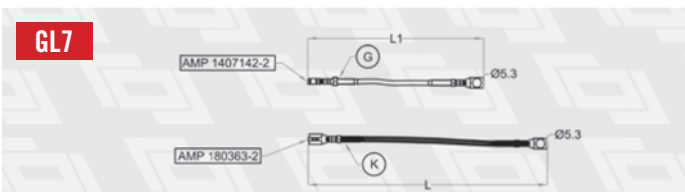
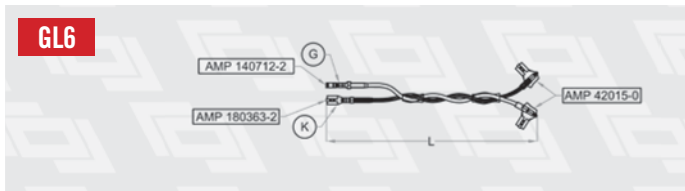
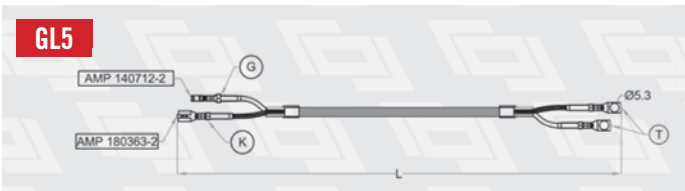
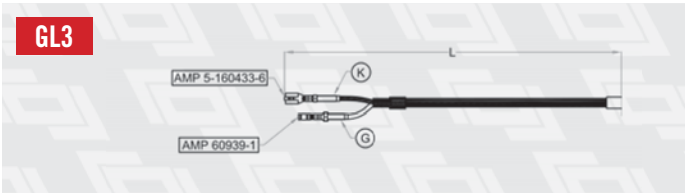
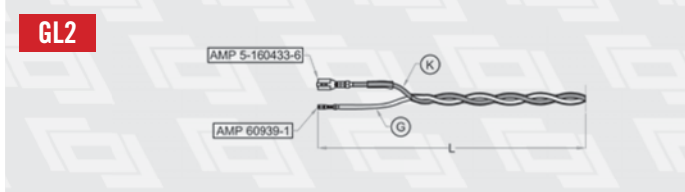
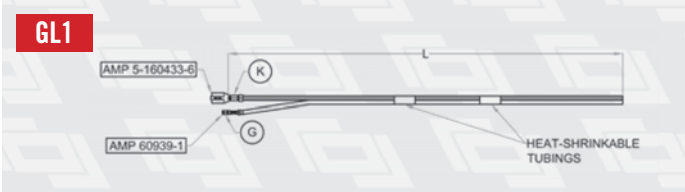
### MAIN CHARACTERISTICS

- Custom special gates are available on request
- All products are manufactured using material compliant with UL94-V0

### APPLICATIONS

- Connection of press-pack Thyristors to gate board
- Connection of press-pack GTO to gate board
- Connection of insulated modules to gate board

GATE LEAD FOR PRESS-PACK DEVICES AND INSULATED MODULES



Gate Lead	Application	Lead type	Color		Length L / L1	Conductor construction	Insulating material	Operating temperature	Outline
			K	G					
AGL250	Thyristors	bipolar	red	white	305	19 / 0.160 mm	FEP	-55 / +135	GL1
AGL255	Thyristors	twisted bipolar	red	white	305	19 / 0.203 mm	FEP	-55 / +125	GL2
AGL260	Thyristors	bipolar	red	white	500	19 / 0.160 mm	FEP	-55 / +135	GL1
AGL270	Thyristors	bipolar	red	white	1000	19 / 0.203 mm	FEP	-55 / +135	GL1
AGL275	Thyristors	twisted bipolar	red	white	620	19 / 0.160 mm	FEP	-55 / +125	GL2
AGL276	Thyristors	twisted bipolar	red	white	1020	19 / 0.160 mm	FEP	-55 / +125	GL2
AGL277	Thyristors	twisted bipolar	red	white	1520	19 / 0.160 mm	FEP	-55 / +125	GL2
AGL251	Modules	bipolar	red	white	305	19 / 0.203 mm	FEP	-55 / +125	GL4
AGL300	Asymm. thyristor	coaxial	black	white	1000	19 / 0.203 mm	FEP	-55 / +105	GL3
AGL791	GTO	coaxial	black	white	400	3.5 mmq	ETFE	-55 / +105	GL5
AGL795	GTO	bipolar	black	white	103 / 86	42 mmq	FEP	-55 / +125	GL7
AGL796	GTO	twisted bipolar	black	white	150	42 mmq	FEP	-55 / +105	GL6
AGL793	GTO	double coaxial	black	white	670	2 x 3.5 mmq	ETFE	-55 / +105	GL8



# ACCESSORIES

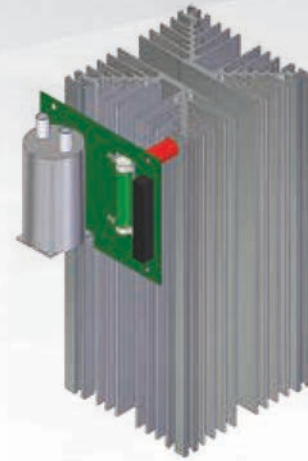
## CUSTOM GATE DRIVERS AND SNUBBER CIRCUITS

### MAIN CHARACTERISTICS

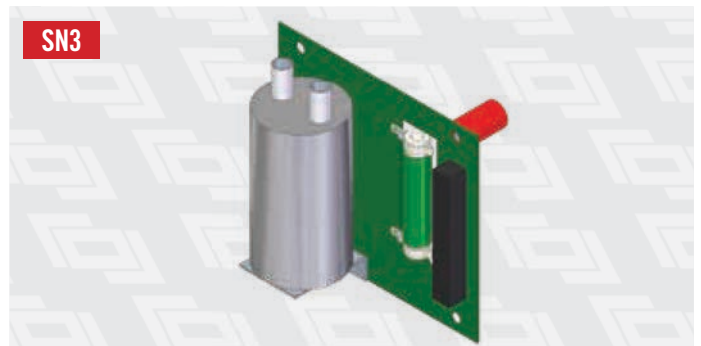
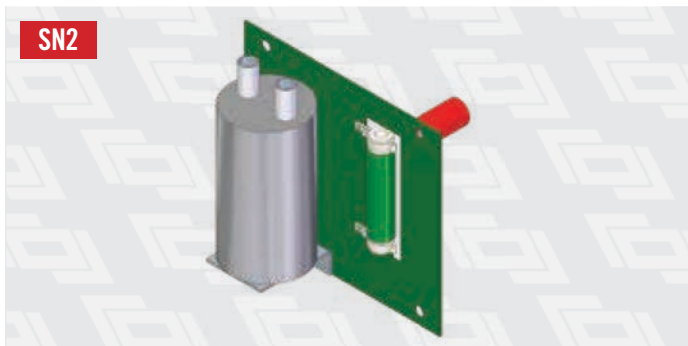
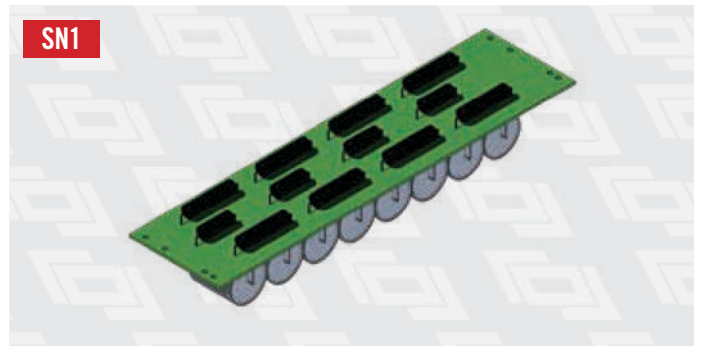
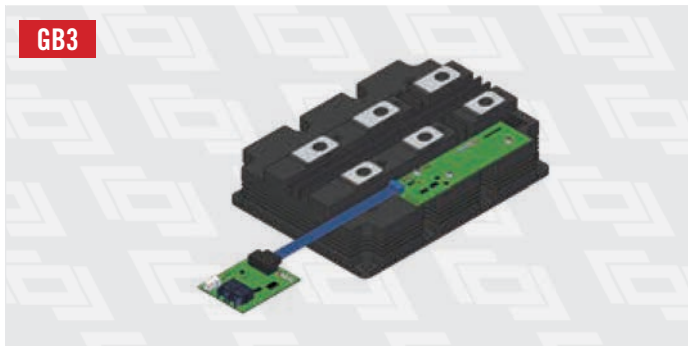
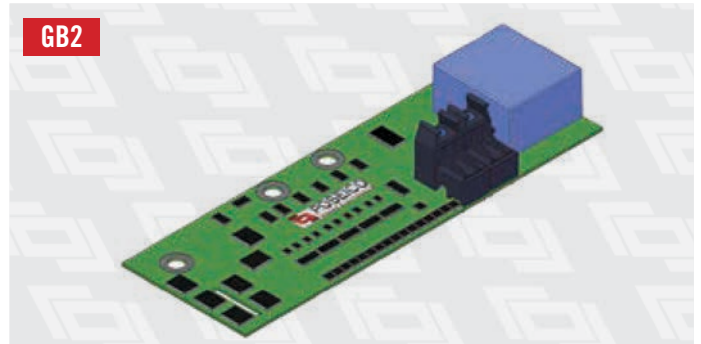
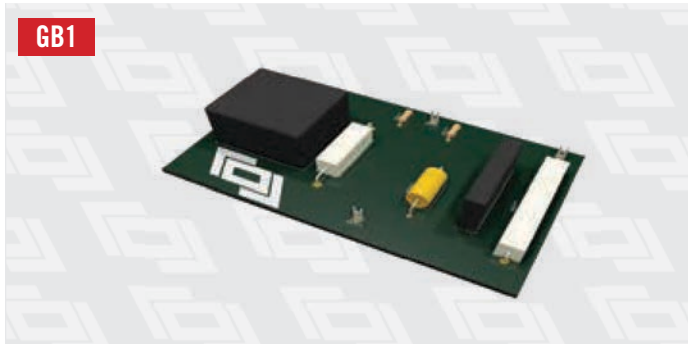
- Custom design gate boards optimized for specific application
- Snubber circuit optimized for devices performance

### APPLICATIONS

- Turn on and turn off of Thyristors, GTO, IGBT
- Protection circuit for power semiconductors
- Failures detection



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## CUSTOM GATE DRIVERS AND SNUBBER CIRCUITS

Gate Driver and Snubber Circuit	Description	Outline
ASE010	Thyristor gate driver board	GB1
ASE030	IGBT gate driver board (single board) IGBT gate driver board (double board)	GB2 GB3
ASE005	Snubber circuit for rectifier diode bridge arms Single Diode RC snubber circuit for traction bridge	SN1 SN2
ASE002	Single Diode RC snubber circuit for traction bridge with detection of diode failure. High voltage signal insulated by optocoupler. Also available with fiber optic	SN3

# ACCESSORIES

## THERMOCONDUCTIVE INSULATOR DISCS

### MAIN CHARACTERISTICS

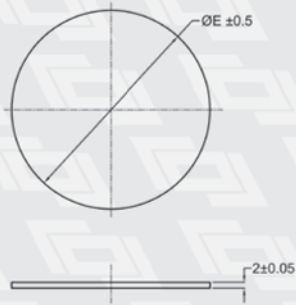
- Thermoconductive insulator discs based on aluminum nitride materials
- Suitable for power assemblies used inside press-pack power stacks

### APPLICATIONS

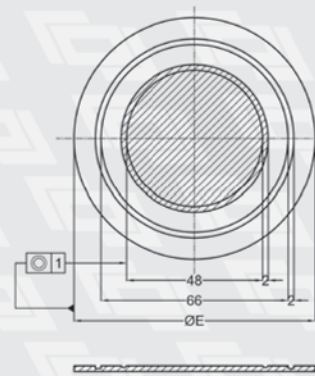
- Insulation system for press-pack device circuits



ID1

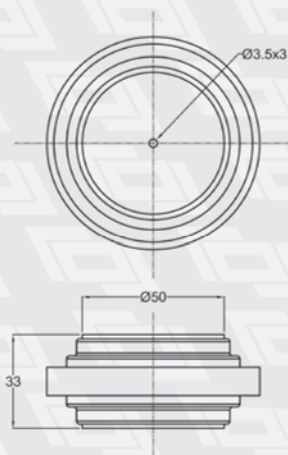


ID2

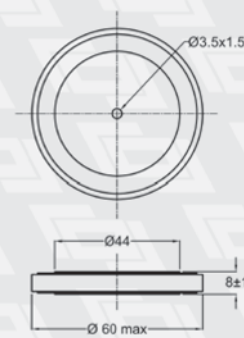


	ALN085W03M	ALN115W03M
φE	85.0	118.0
φ1	48.0	78.0
φ2	66.0	96.0

ID3



ID4



Thermoconductive Insulator Disc	Description	Insulator thermoconductive material	Insulator disc thickness	Insulating Disc External Diameter φE	Material of external housing	Outline
			[mm]	[mm]		
ALN039W02	Aluminum nitride disc	AlN	2.00	39.0	-	ID1
ALN056W02	Aluminum nitride disc	AlN	2.00	56.0	-	ID1
ALN070W02	Aluminum nitride disc	AlN	2.00	70.0	-	ID1
ALN085W03M	Metalized Aluminum nitride disc	AlN	3.00	85.0	-	ID2
ALN115W03M	Metalized Aluminum nitride disc	AlN	3.00	118.0	-	ID2
ALN070W02PC	Aluminum nitride disc in plastic case housing	AlN	2.00	70.0	Epoxy resin	ID3
ALN0039W02PC	Aluminum nitride disc in plastic case housing	AlN	2.00	39.0	LCP	ID4

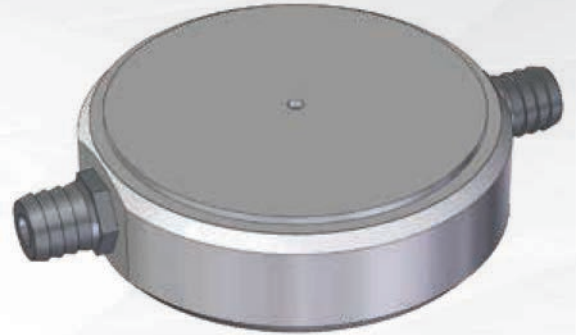
# HEATSINKS AND COOLING SYSTEMS

# HEATSINKS AND COOLING SYSTEMS

## WATER COOLING HEATSINKS

### MAIN CHARACTERISTICS

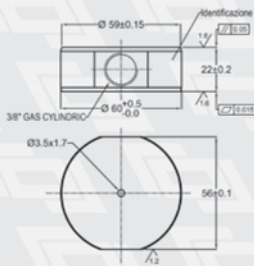
- High temperature brazed aluminum
- Internal surfaces are maintained clean and suitable for deionized water cooling
- Design assisted by FEM simulation to optimize thermal efficiency and uniformity
- Fully tested by Poseico using special dedicated equipments
- Custom connections available on request



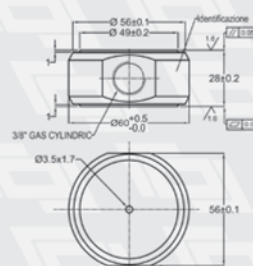
### APPLICATIONS

- Bilateral cooling of press-pack devices
- Single side cooling of insulated modules

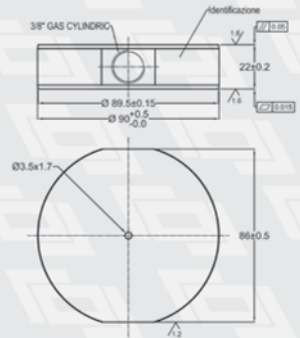
WH1



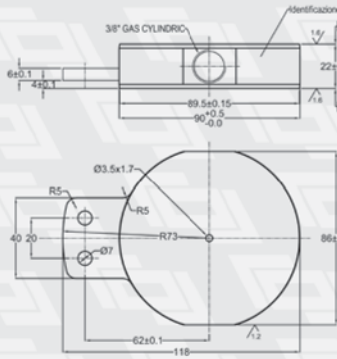
WH2



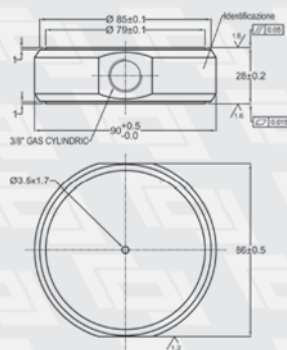
WH3



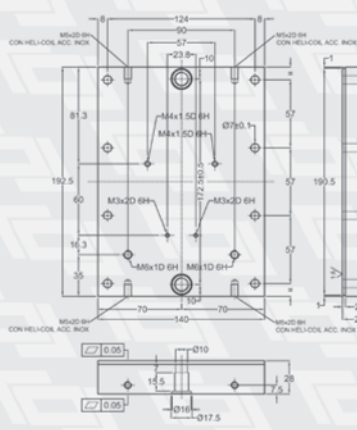
WH4



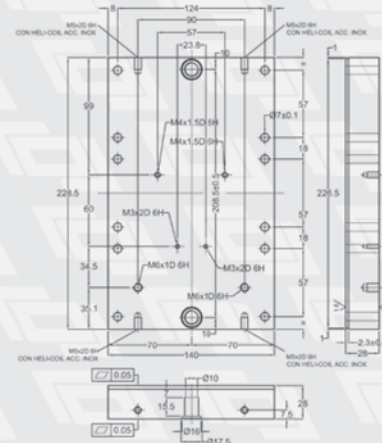
WH5

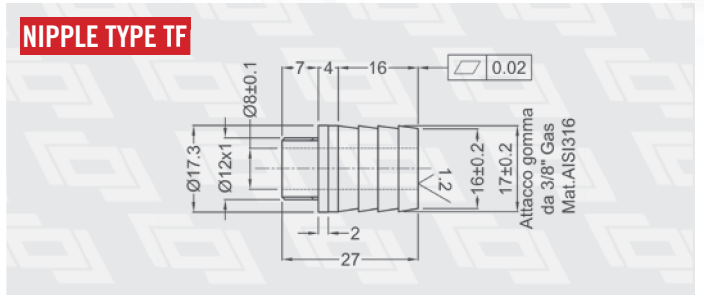
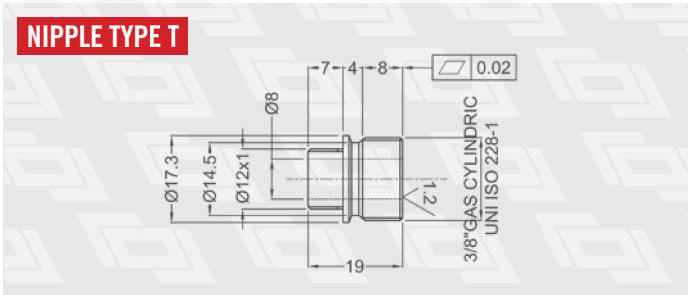
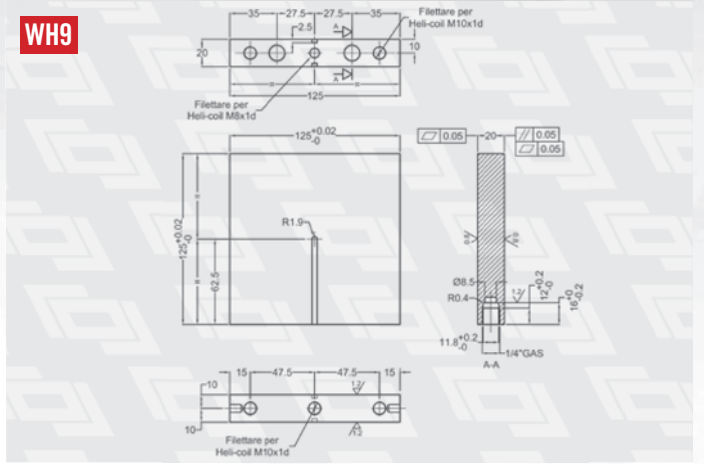
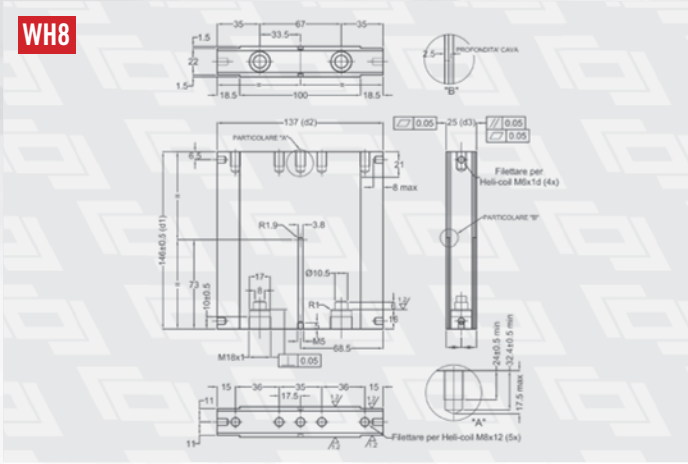


WH6

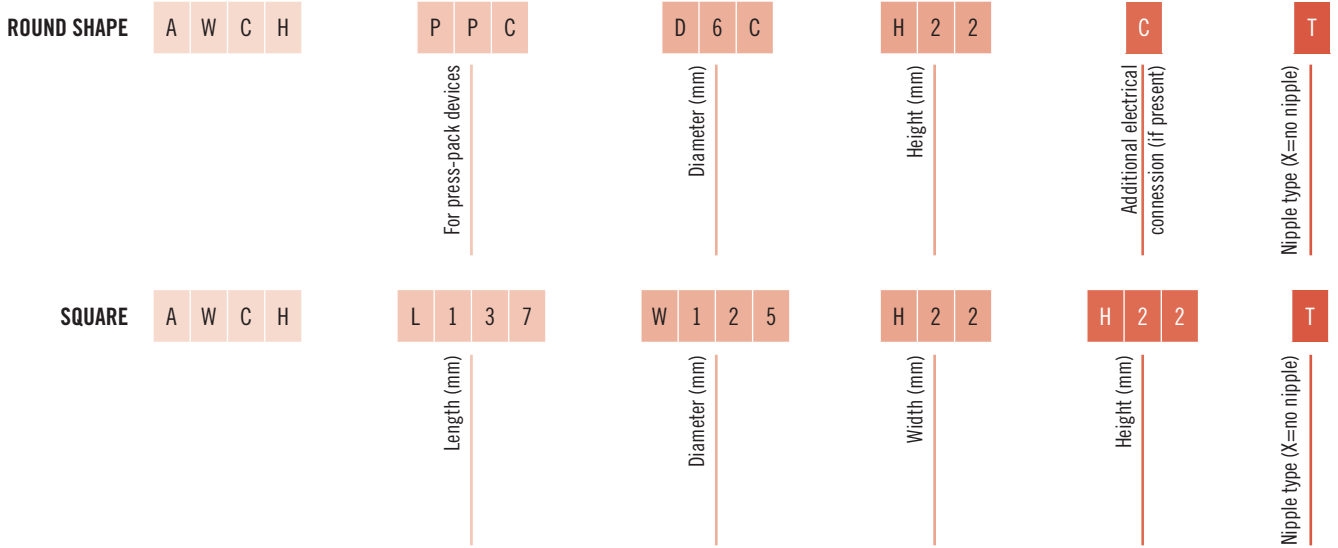


WH7





### WATER COOLED HEATSINK IDENTIFICATION SYSTEM



Type Water Cooling Heatsink	Q range minimum / maximum	R <sub>th</sub> at Q	ΔP max at Q		Weight	Nipple Type	Outline
	[l/m]	[°C/kW]	[l/m]	[mbar]	[l/m]	[g]	
AWCH-PPC-D60H22T	3/9	10.5*	6.0	200	6.0	160	T WH1
AWCH-PPC-D60H22TF	3/9	10.5*	6.0	200	6.0	160	TF WH1
AWCH-PPC-D60H28T	3/9	10.5*	6.0	500	6.0	160	T WH2
AWCH-PPC-D60H28TF	3/9	10.5*	6.0	500	6.0	160	TF WH2
AWCH-PPC-D90H22T	3/9	5.5*	6.0	300	6.0	330	T WH3
AWCH-PPC-D90H22TF	3/9	5.5*	6.0	300	6.0	330	TF WH3
AWCH-PPC-D90H22CT	3/9	6.0*	6.0	300	6.0	330	T WH4
AWCH-PPC-D90H28T	3/9	7.0*	6.0	500	6.0	330	T WH5
AWCH-PPC-D90H28TF	3/9	7.0*	6.0	500	6.0	330	TF WH5
AWCH-L125W125T20X	2/8	5.6*	5.0	500	5.0	850	- WH9
AWCH-L137W146T25X	2/10	5.0*	5.0	250	5.0	1800	- WH8
AWCH-L192W140T28T	3/9	5.5	6.0	300	6.0	2100	T WH6
AWCH-L228W140T28T	3/9	5.0	6.0	200	6.0	1800	T WH7

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# HEATSINKS AND COOLING SYSTEMS

## ICP - INTEGRATED COLD PLATE

### MAIN CHARACTERISTICS

- Up to 30 kW of power dissipation capability
- Very uniform temperature at cold plate surface level
- All IGBT and diode chips have uniform temperature distribution
- Each device has an individual cooling optimization
- Basic material: aluminum
- Suitable for deionized water use
- Possibility of mounting the devices on both sides
- The power, the gate drives, the busbar connection and cooling system can be integrated in a single compact assembly
- Each device has its optimized cooling performance
- Strong reduction of connections in the cooling circuit

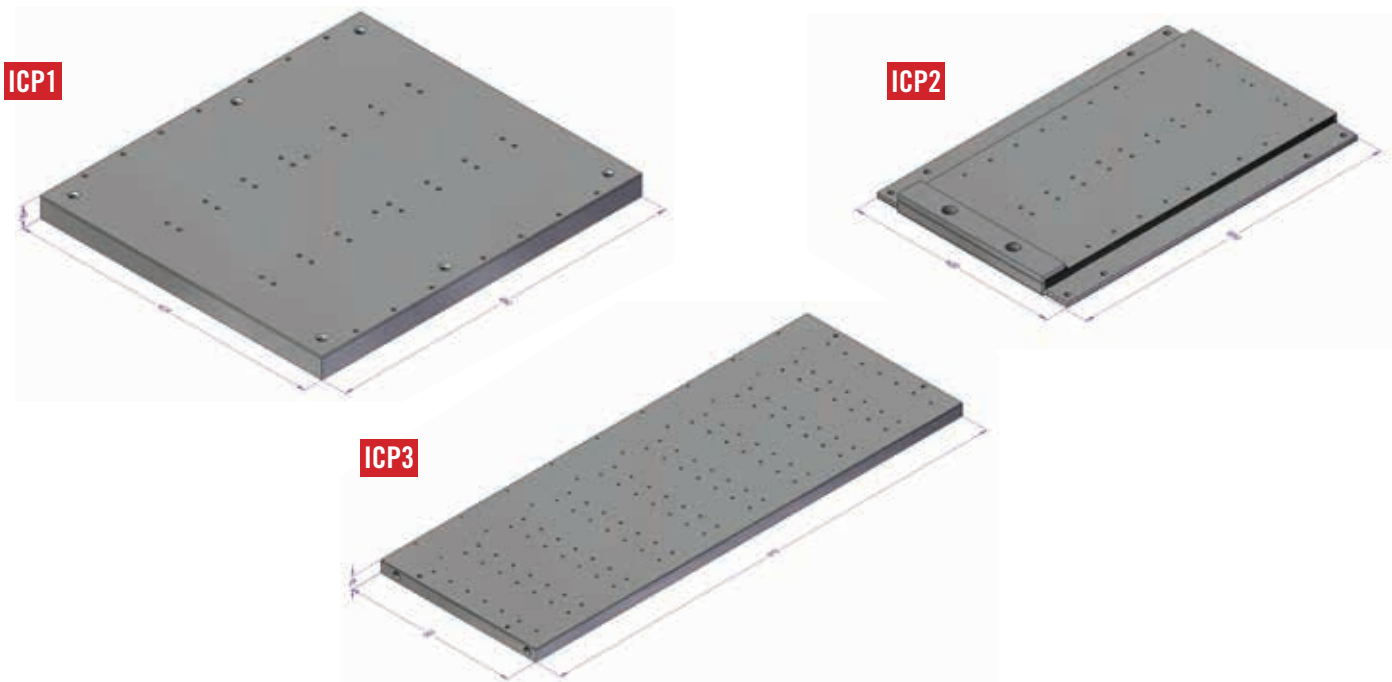


### APPLICATIONS

- Liquid cooling of power device circuits

## EXAMPLE OF COLD PLATE REALIZED

ICP - INTEGRATED COLD PLATE



Integrated Cold Plate	Dimension [mm]	Number of active side	Number and dimension of power insulated modules N° - dimension in mm	Total power losses [KW]	Outline
AWCH-L424W482T30	424x482x30	1	4 - IGBT 190x140 / 2 - Diode 130x140	8.8	ICP1
AWCH-L640W420T24	640x420x24	2	8 - IGBT 140x190 / 4 - resistor 60x60	16.2	ICP2
AWCH-L505W355T15-35	505x355x15	2	13 - IGBT 122x62 / 4 - resistor	7.7	-
AWCH-L780W290T23-L2	780x290x23	1	6 - IGBT 140x190	15.0	-
AWCH-L780W290T23-L3	780x290x23	1	4 - IGBT 140x190 / 2 - IGBT 140x130	15.0	-
AWCH-L750W144T16	750x144x16	2	4 - IGBT 140x190	10.0	-
AWCH-L970W352T26	970x352x26	1	9 - IGBT 89x250	13.5	ICP3

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# HEATSINKS AND COOLING SYSTEMS

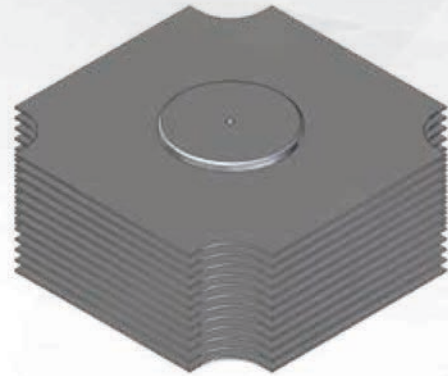
## FORCED AIR COPPER HEATSINKS

### MAIN CHARACTERISTICS

- High performance heatsinks for air forced cooling
- 1 mm Copper fins soft soldered to Copper pole
- Customized design on request
- Nichel plated surface treatment

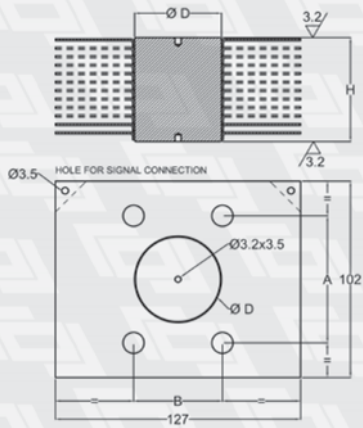
### APPLICATIONS

- Air forced cooling of press-pack devices

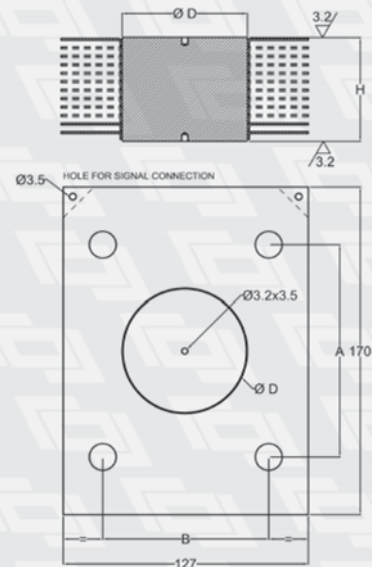


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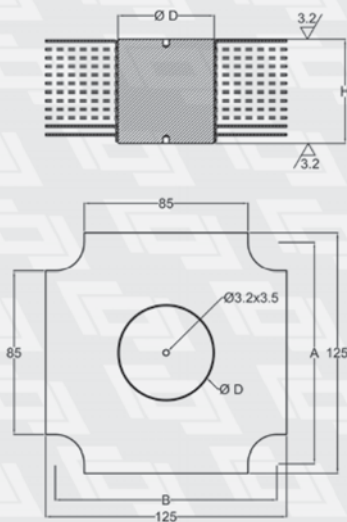
CH1



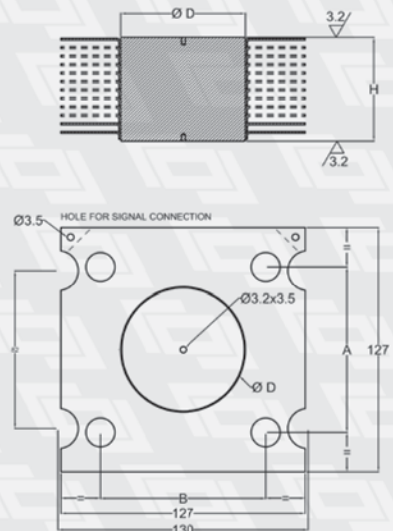
CH2



CH3



CH4



FORCED AIR COPPER HEATSINKS

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**FORCED AIR COPPER HEATSINKS**

Forced Air Copper Heatsink	D Core diameter	Number of fins	H Core thickness	L		W	Number of signal connection	A		B	DH	R <sub>th</sub> Thermal resistance <sup>(*)</sup>	P Weight	Layout
				Dimensions of fins				Distance						
	[mm]		[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[mm]	[°C/W]	[kg]		
F45L102W127S02	45	2	9.0	102	127	2	66	46	11		0.60	0.37	CH1	
F45L102W127S03	45	3	13.5	102	127	2	66	46	11		0.44	0.56	CH1	
F45L102W127S05	45	5	22.2	102	127	2	66	46	11		0.30	0.93	CH1	
F45L102W127S06	45	6	27.0	102	127	2	66	46	11		0.26	1.12	CH1	
F45L102W127S09	45	9	40.5	102	127	2	66	46	11		0.19	1.67	CH1	
F45L102W127S12	45	12	54.0	102	127	2	66	46	11		0.15	2.23	CH1	
F50L102W127S02	50	2	9.0	102	127	2	44	84	13		0.60	0.39	CH1	
F50L102W127S03	50	3	13.5	102	127	2	44	84	13		0.44	0.59	CH1	
F50L102W127S04	50	4	18.0	102	127	2	44	84	13		0.35	0.78	CH1	
F50L102W127S05	50	5	22.2	102	127	2	44	84	13		0.30	0.97	CH1	
F50L102W127S06	50	6	27.0	102	127	2	44	84	13		0.26	1.17	CH1	
F50L102W127S07	50	7	31.5	102	127	2	44	84	13		0.23	1.37	CH1	
F50L102W127S08	50	8	36.0	102	127	2	44	84	13		0.21	1.57	CH1	
F50L102W127S09	50	9	40.5	102	127	2	44	84	13		0.19	1.76	CH1	
F50L102W127S10	50	10	45.0	102	127	2	44	84	13		0.17	1.96	CH1	
F50L102W127S11	50	11	49.5	102	127	2	44	84	13		0.16	2.15	CH1	
F50L102W127S12	50	12	54.0	102	127	2	44	84	13		0.15	2.35	CH1	
F50L127W170S12	50	2	9.0	127	170	2	44	84	17		0.32	0.57	CH2	
F65L127W170S02	65	2	9.0	127	170	2	110	45	17		0.32	0.65	CH2	
F65L127W170S03	65	3	13.5	127	170	2	110	45	17		0.25	0.98	CH2	
F65L127W170S04	65	4	18.0	127	170	2	110	45	17		0.22	1.30	CH2	
F65L127W170S05	65	5	22.5	127	170	2	110	45	17		0.19	1.63	CH2	
F65L127W170S06	65	6	27.0	127	170	2	110	45	17		0.17	1.96	CH2	
F65L127W170S07	65	7	31.5	127	170	2	110	45	17		0.16	2.28	CH2	
F65L127W170S08	65	8	36.0	127	170	2	110	45	17		0.15	2.61	CH2	
F65L127W170S09	65	9	40.5	127	170	2	110	45	17		0.14	2.94	CH2	
F65L127W170S10	65	10	45.0	127	170	2	110	45	17		0.13	3.26	CH2	
F65L127W170S11	65	11	49.5	127	170	2	110	45	17		0.12	3.59	CH2	
F65L127W170S12	65	12	54.0	127	170	2	110	45	17		0.12	3.91	CH2	
F65L127W170S12A	65	12	54.0	127	170	0	110	45	17		0.12	3.91	CH2	
F65L127W170S03L	65	3	13.5	127	170	2	110	86	17		0.25	0.98	CH2	
F65L127W170S06L	65	6	27.0	127	170	2	110	86	17		0.17	1.96	CH2	
F65L127W170S09L	65	9	40.5	127	170	2	110	86	17		0.14	2.94	CH2	
F65L127W170S12L	65	12	54.0	127	170	2	110	86	17		0.12	3.91	CH2	
F50L125W125S13	50	13	53.0	125	125	0	-	-	-		0.11	2.37	CH3	
F65L127W127S06	65	6	27.0	127	127	2	86	86	-		-	1.43	CH4	
F65L127W127S12	65	12	54.0	127	127	2	86	86	-		0.18	2.86	CH4	

(\*) Thermal resistance with air flow 3 m/s



# HEATSINKS AND COOLING SYSTEMS

## NATURAL AIR HEATSINKS

### MAIN CHARACTERISTICS

- Extruded aluminum heatsink type EN AW 6063 T6
- Finishing with silver or black anodization on request
- Customized design
- High quality level of contact surface

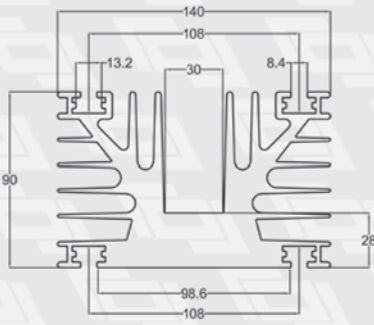
### APPLICATIONS

- Natural air cooling of press-pack and insulated module devices

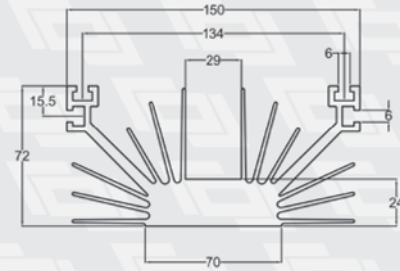


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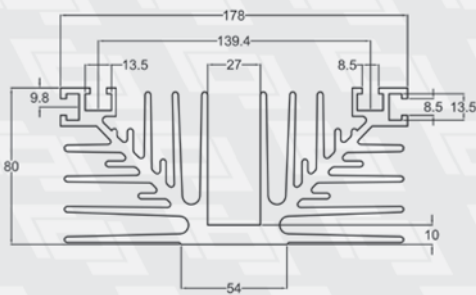
**NH1**



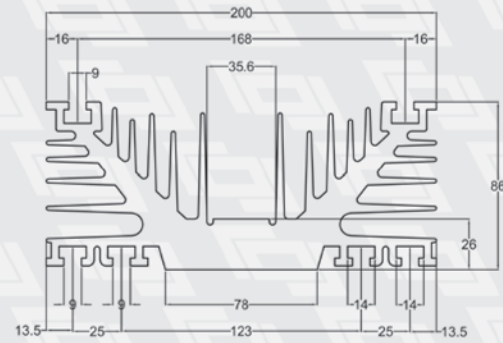
**NH2**



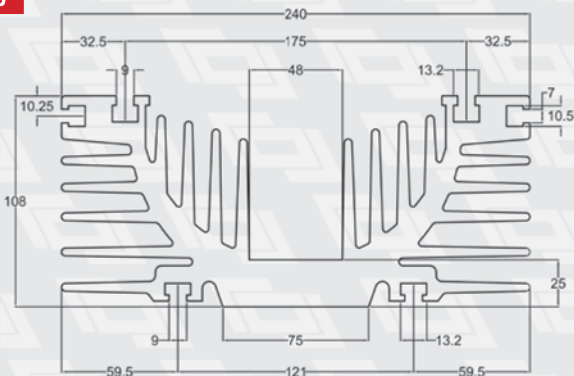
**NH3**



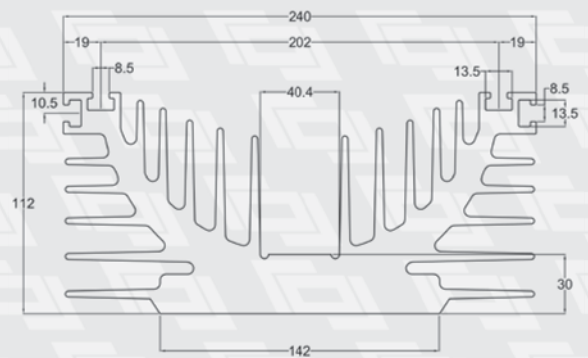
**NH4**



**NH5**



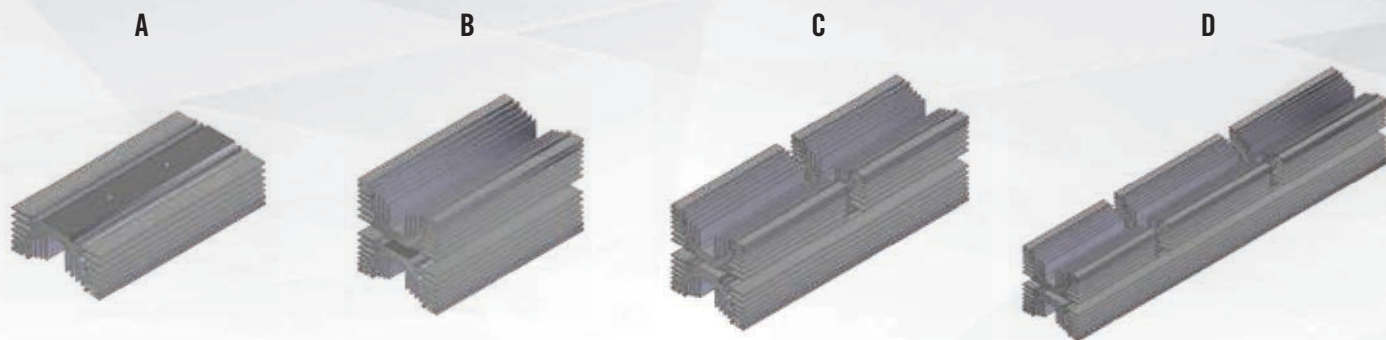
**NH6**



NATURAL AIR HEATSINKS

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## NATURAL AIR HEATSINKS IDENTIFICATION SYSTEM



A 2 2

Shape code (see table)

N 3 0 0

"N" and length of heatsink element

P 8 9

"P" and center distance of clamp system

H 2

"-" and number of elements

B

"B" (optional) for anodized black

Heatsink Code	Poseico extruded reference	Width	Length	Distance between holes center	Number of elements (type of configuration)	Thermal resistance for bilateral cooling (2 elements) $R_{th}(Pd)$	Standard finishing	Shape (see drawings)
		[mm]	[mm]	[mm]		[K/C]		
A10N300P70-2	N8	140	300	70	2 (B)	0.12 @ 150 W	normal	NH1
A10N300P89-2	N8	140	300	89	2 (B)	0.12 @ 150 W	normal	NH1
A14N152P70-2	N6	150	152	70	2 (B)	0.25 @ 150 W	normal	NH2
A14N228P70-2	N6	150	228	70	2 (B)	0.18 @ 150 W	normal	NH2
A22N300P70-2	W180	178	300	70	2 (B)	0.12 @ 400 W	normal	NH3
A22N300P89-2	W180	178	300	89	2 (B)	0.12 @ 400 W	normal	NH3
A28N300P89-2	N5	200	300	89	2 (B)	0.15 @ 400 W	normal	NH4
A12N250P89-2B	N9	240	250	89	2 (B)	0.11 @ 500 W	black	NH5
A12N250P155-2B	N9	240	250	155	2 (B)	0.11 @ 500 W	black	NH5
A12N300P89-2B	N9	240	300	89	2 (B)	0.09 @ 500 W	black	NH5
A12N300P155-2B	N9	240	300	155	2 (B)	0.09 @ 500 W	black	NH5
A12N750P89-3	N9	240	750	89	3 (C)	0.09 @ 500 W	normal	NH5
A12N900P89-4B	N9	240	900	89	4 (D)	see data sheet	black	NH5
A12N900P155-4B	N9	240	900	155	4 (D)	see data sheet	black	NH5
A12N900P155-4B	N10	240	380	180	2 (B)	see data sheet	normal	NH6

NATURAL AIR HEATSINKS

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# CLAMPING SYSTEMS

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# CLAMPING SYSTEMS

## BAR CLAMPS

### MAIN CHARACTERISTICS

- They can be used to clamp in a reliable way press-pack devices up to 100 mm diameter of contact pole
- Mounting force calibration included
- Customized design on request
- Disc springs (Belleville Spring) or torsion bars technologies

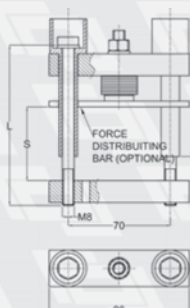
### APPLICATIONS

- Clamping of press-pack devices

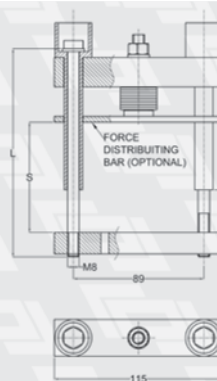


BAR CLAMPS

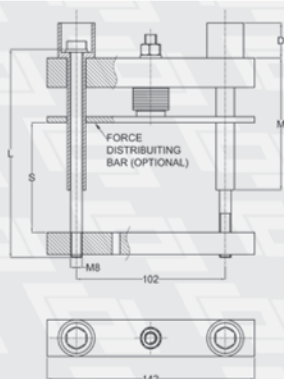
**K70**



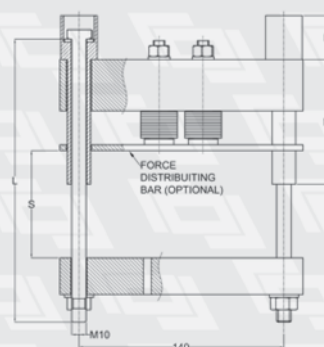
**K89**



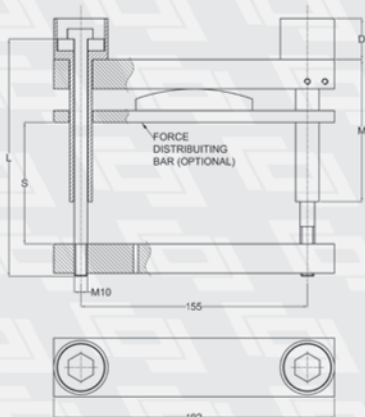
**K102**



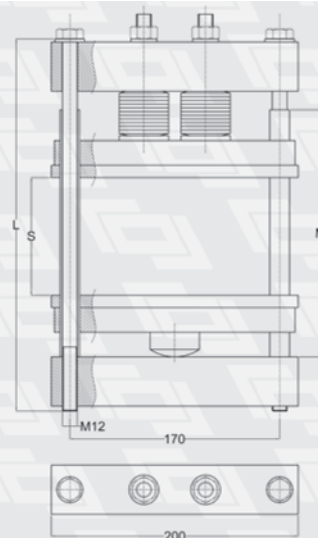
**K140**



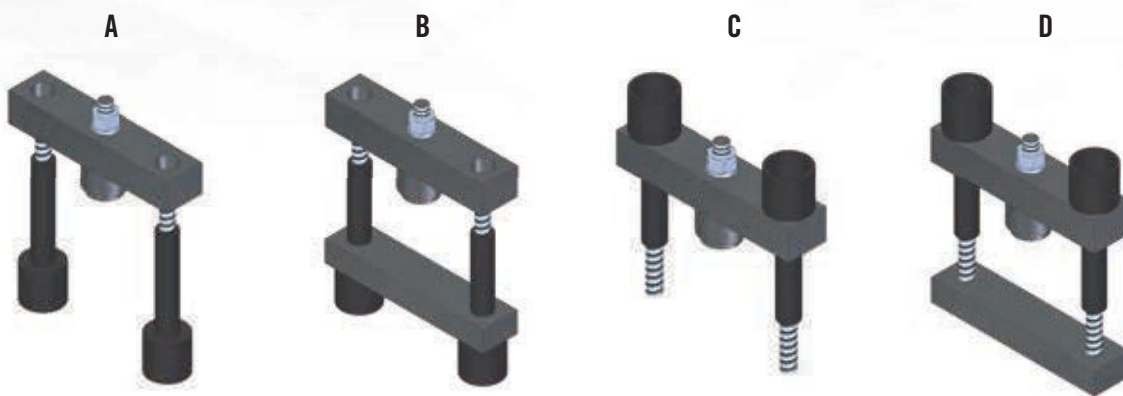
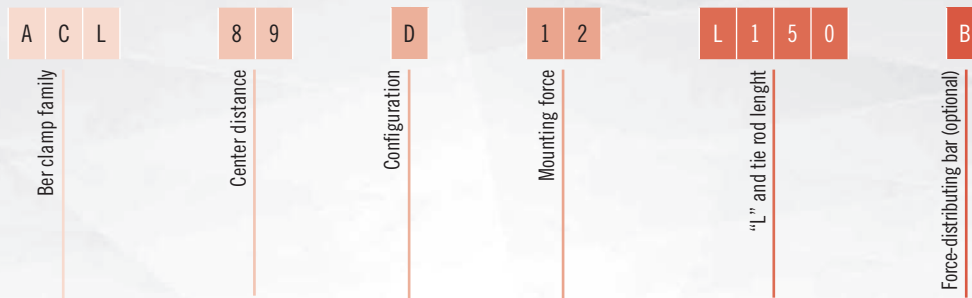
**K155**



**K170**



## BAR CLAMPS IDENTIFICATION SYSTEM



Bar Clamp	Center distance	Configuration	Housing type	Typical natural hair outline	Mounting force	Tie rod length	Internal free space min	Internal free space max	Insulator length	Insulator cap length	Force distribution bar	Outline
	I				F	L	S	S	M	D		
	[mm]				[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	
<b>ACL STANDARD FAMILY: DISC SPRING TECHNOLOGY</b>												
ACL70D05L130	70	D - Direct on bar	A0 - A1 - A2	NH1 / N8	5	130	68	71	70	24	optional	K70
ACL70D09L130	70	D - Direct on bar	B0	NH1 / N8	9	130	68	71	70	24	optional	K70
ACL89D09L150	89	D - Direct on bar	C0	NH1 / N8	9	150	80	83	80	24	optional	K89
ACL89D12L140	89	D - Direct on bar	C1	NH5 / N9	12	140	72	75	80	24	optional	K89
ACL89D18L110	89	D - Direct on bar	D1	NH3 / W180	18	110	45	48	70	24	optional	K89
ACL89D18L140	89	D - Direct on bar	D1	NH2 / N6	18	140	73	76	80	24	optional	K89
ACL89D19L150	89	D - Direct on bar	D0 - D2	NH5 / N9 NH4 / N5	23	150	72	80	90	24	optional	K89
ACL102D18L150	102	D - Direct on bar	D1	NH2 / N6	18	140	73	76	80	24	optional	K102
ACL102D23L150	102	D - Direct on bar	D0 - D2	NH5 / N9 NH4 / N5	23	150	72	80	90	24	optional	K102
<b>AK2 DOUBLE SPRING PACK TECHNOLOGY</b>												
AK2140D40L200	140	D - Direct on bar	L0	NH1 / N8	40	200	83	98	140	30	optional	K140
AK2140D45L200	140	D - Direct on bar	R0 - N0	NH1 / N8	45	200	83	98	140	30	optional	K140
AK2140D50L200	140	D - Direct on bar	R0 - N0	NH1 / N8	50	200	83	98	140	30	optional	K140
<b>ACB HIGH PRESSURE FAMILY: TORSION BAR TECHNOLOGY</b>												
ACB155D45L160	155	D - Direct on bar	N0 - H0	NH5 / N9	45	160	72	85	88	34	yes	K155
ACB155D45L160	155	D - Direct on bar	M0 - R0	NH5 / N9	45	160	80	85	97	34	yes	K155
<b>AKI HIGH PRESSURE, INSULATED BAR, DOUBLE SPRING PACK TECHNOLOGY</b>												
AKI170D90L300	170	D - Direct on bar	Z0	NH6/N10	90	300	92	97	200	no	yes	K170

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# CLAMPING SYSTEMS

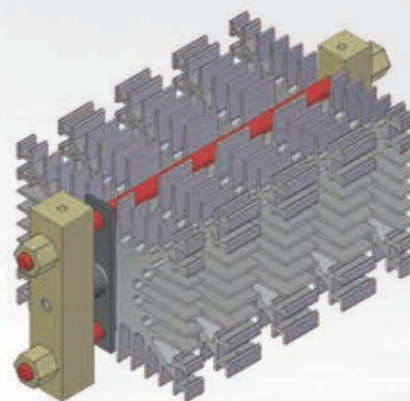
## INSULATED SOLUTIONS FOR CLAMPING SYSTEMS

### MAIN CHARACTERISTICS

- Full insulated clamp system with high mechanical performance and high reliability
- Custom design on request with different rod length, mounting force and center distance

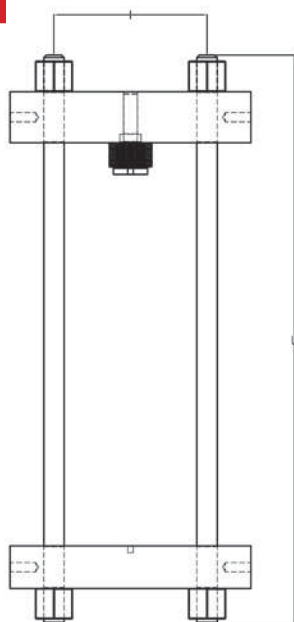
### APPLICATIONS

- Insulated clamping system for press-pack devices

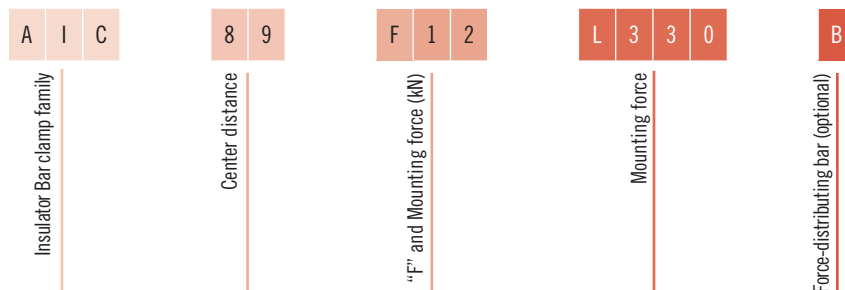


## FULL INSULATED CLAMP SYSTEM

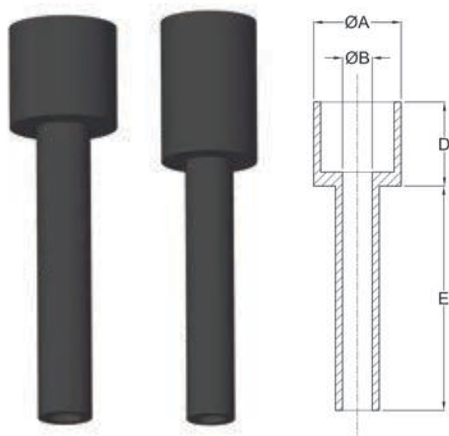
ICS1



Full insulated clamp system	Centers distance	Mounting	Tie rod	Outline
	I [mm]	F [kN]	L [mm]	
AIC89F12L330B	89	12	330	ICS1



## INSULATORS FOR CLAMP ROD TIES



Insulators for clamp rod ties	Rod type	Ø A [mm]	Ø B [mm]	D [mm]	E [mm]	Outline
AIR2524M08	M8	25	8.5	24	80	ICS2
AIR2538M08	M8	25	8.5	38	80	ICS2
AIR2530M10	M10	25	10.5	30	80	ICS2
AIR3734M10	M10	37	10.5	34	80	ICS2
extension rod M8	M8	-	8.5	-	80	-
extension rod M10	M10	-	10.5	-	80	-

INSULATED SOLUTIONS FOR CLAMPING SYSTEMS

# CLAMPING SYSTEMS

## BOX CLAMPS

### MAIN CHARACTERISTICS

- Easy to assembly box clamping system
- Custom design
- Variable clamping force from 5 kN to 12 kN

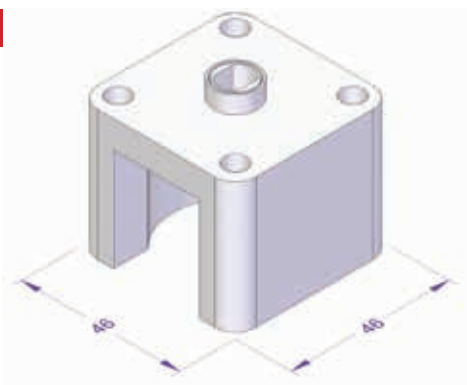
### APPLICATIONS

- Clamping of press-pack devices

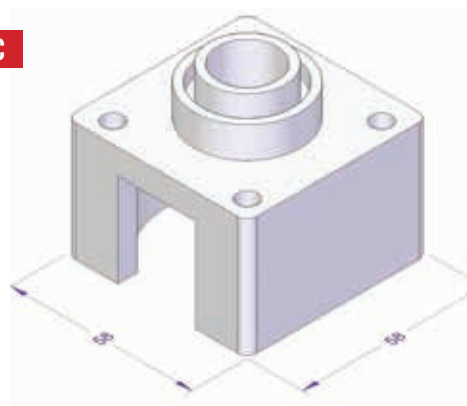


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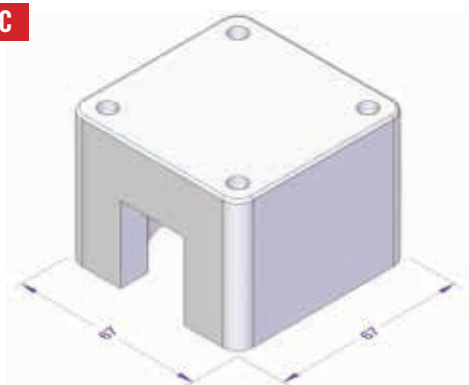
**ABC**



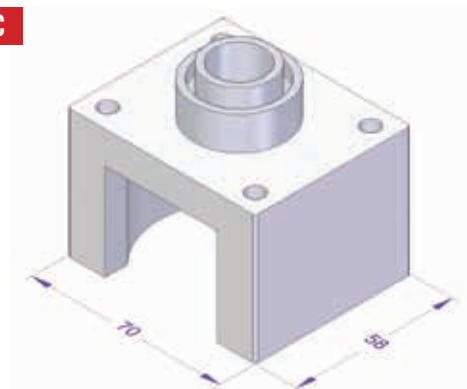
**BBC**



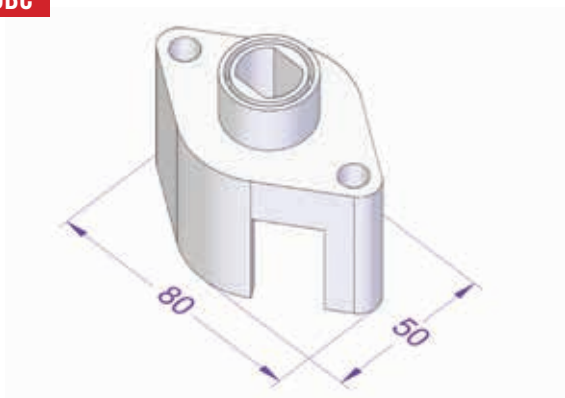
**GBC**



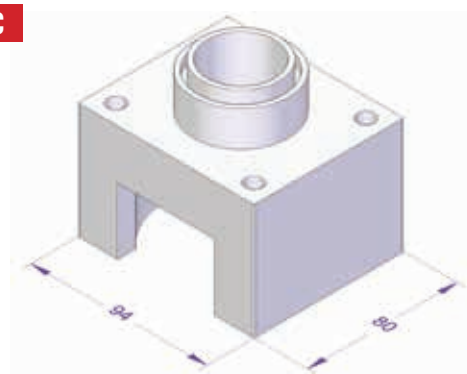
**CBC**



**DBC**



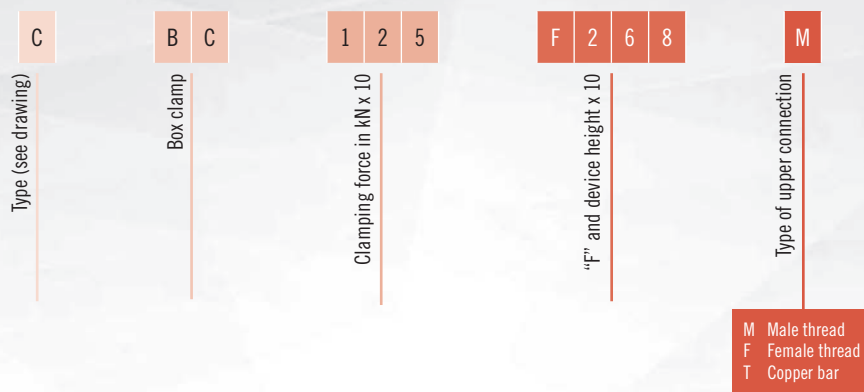
**EBC**



**BOX CLAMPS**

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## BOX CLAMPS IDENTIFICATION SYSTEM



## BOX CLAMPS

Box clamp code	Length	Width	Insulator Height	Maximum Internal Diameter	Mounting Force	Device Height	Poseico Device Outline Housing	Upper connection	Outline Type
	L	W	H	Φ	F	S			
	[mm]	[mm]	[mm]	[mm]	[kN]	[mm]			
ABC045F140	46	46	32.0	42	4.5	14.0	A0	M, F, T	ABC
ABC045F143	46	46	32.0	42	4.5	14.3	A1	M, F, T	ABC
ABC045F145	46	46	32.0	42	4.5	14.5	A2	M, F, T	ABC
ABC090F140	46	46	32.0	42	8.0	14.0	B0	M, F, T	ABC
ABC090F146	46	46	32.0	42	8.0	14.6	B0	M, F, T	ABC
BBC080F146	58	58	49.5	51	8.0	14.6	B0	M, F, T	BBC
GBC090F260	67	67	51.0	61	9.0	26.0	C0	T	GBC
GBC125F260	67	67	51.0	61	12.5	26.0	C1	T	GBC
CBC090F268	58	70	65.5	60	9.0	26.8	C0	M, F, T	CBC
CBC125F268	58	70	65.5	60	12.5	26.8	C1	M, F, T	CBC
CBC125F221	58	70	65.5	60	12.5	22.1	C0	M, F, T	CBC
DBC230F268	50	80	39.3	54	8.0	14.6	B0	M, F, T	DBC
EBC230F260	80	94	74.0	80	23.5	26.0	D0	M, F, T	EBC
EBC200F270	80	94	74.0	80	20.0	27.0	D1	M, F, T	EBC
EBC230F270	80	94	74.0	80	23.5	27.0	D2	M, F, T	EBC

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# POWER ASSEMBLIES

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# POWER ASSEMBLIES

## POWER ASSEMBLIES AN EFFICIENT MODULAR INTEGRATED TECHNOLOGY FOR THE POWER CORE OF ELECTRONIC CONVERTER

### MAIN CHARACTERISTICS

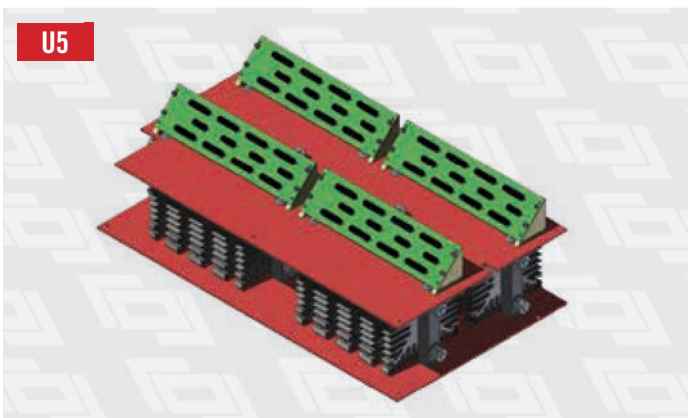
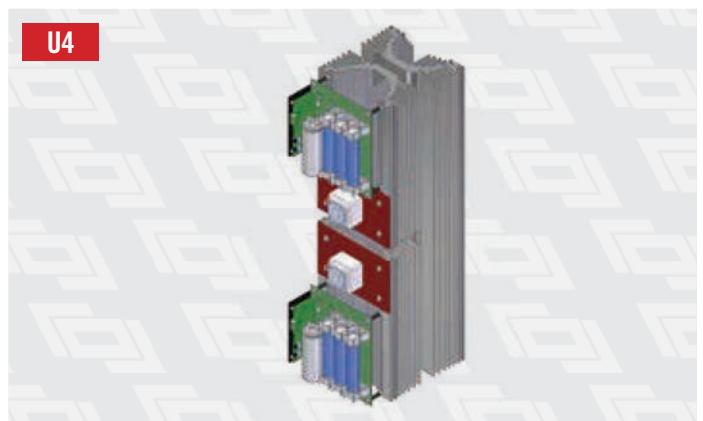
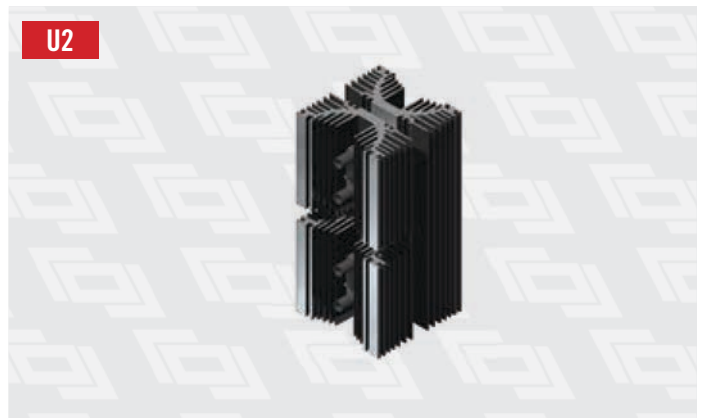
- Using proprietary devices as well as semiconductors and water heatsink
- High power density, high efficiency and reliability
- Custom design available. Full compliance with Customer's specifications
- Natural, forced air cooling or water cooling system
- Semiconductor: Thyristors, Diodes, GTO, and IGBT (press-pack and insulated modules)
- Connection technology both copper and aluminum

### APPLICATIONS

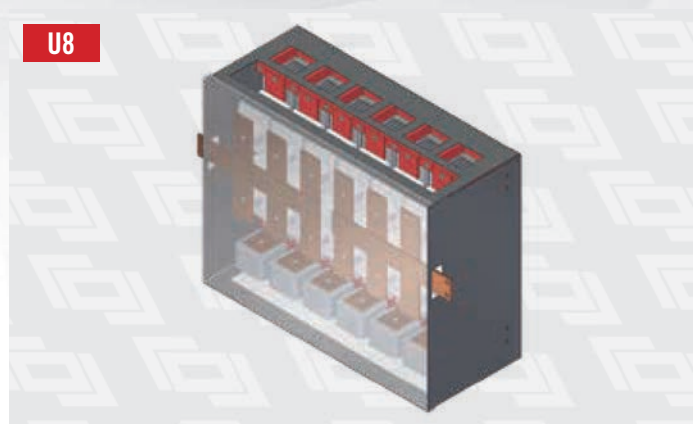
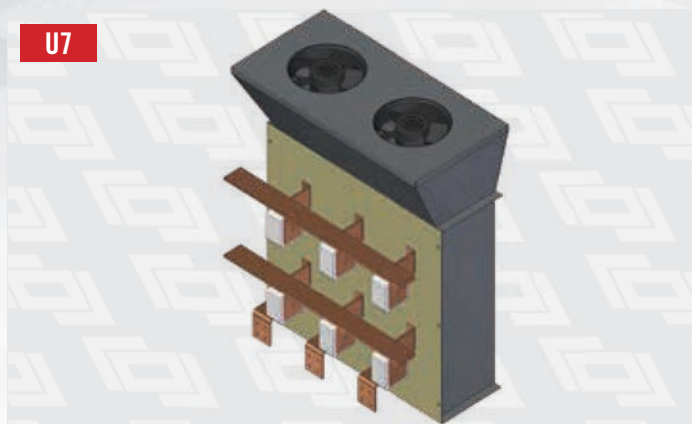
- Industrial converters
- Traction converters
- Converter for research applications
- Replacement and refurbishment of power electronic assemblies

POWER ASSEMBLIES

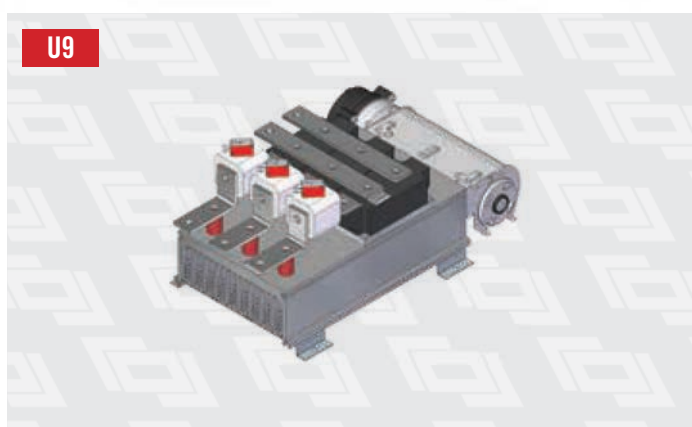
## NATURAL AIR COOLED POWER ASSEMBLIES WITH PRESS-PACK DISC DEVICES



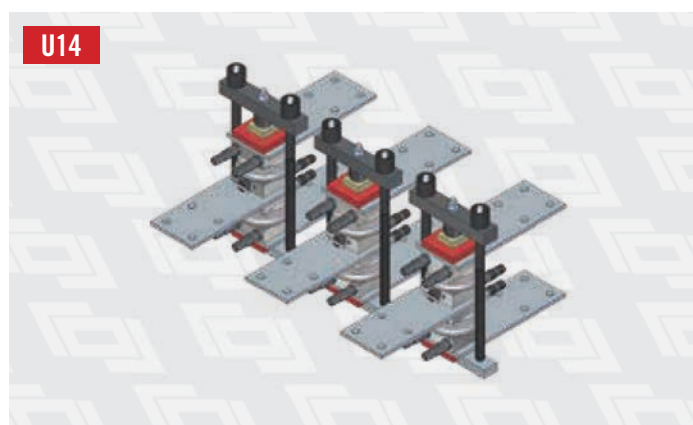
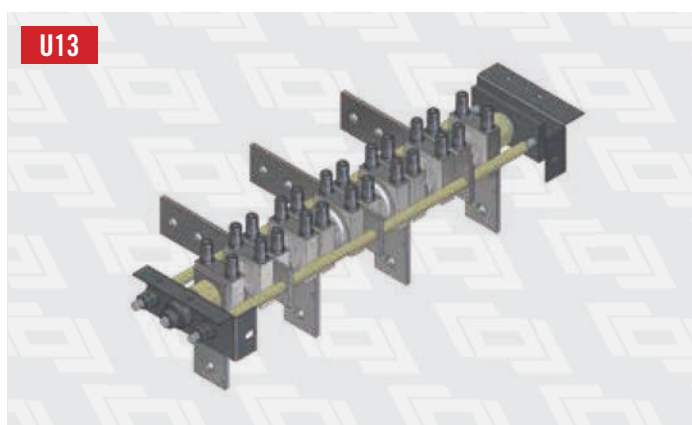
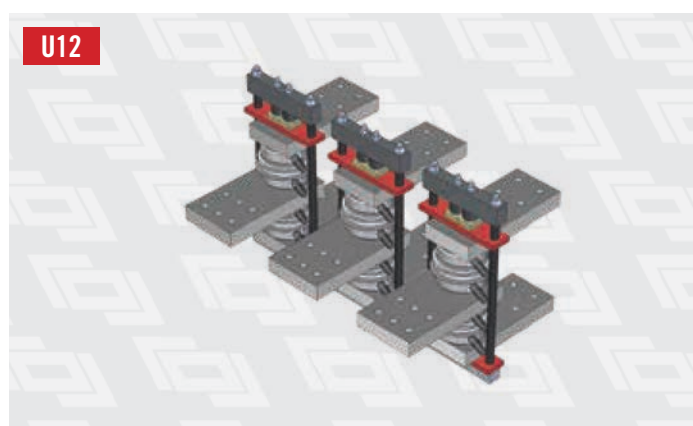
## FORCED AIR COOLED POWER ASSEMBLIES WITH PRESS-PACK DISC DEVICES



## FORCED AIR COOLED POWER ASSEMBLIES WITH INSULATED MODULES



## WATER COOLED POWER ASSEMBLIES WITH PRESS-PACK DISC DEVICES



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POWER ASSEMBLIES

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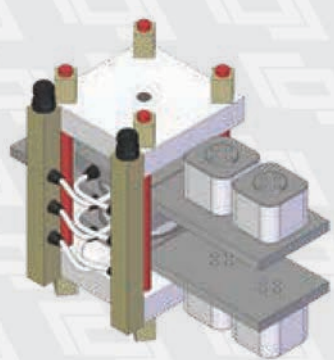
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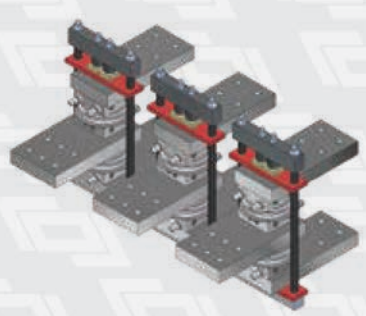
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POWER ASSEMBLIES

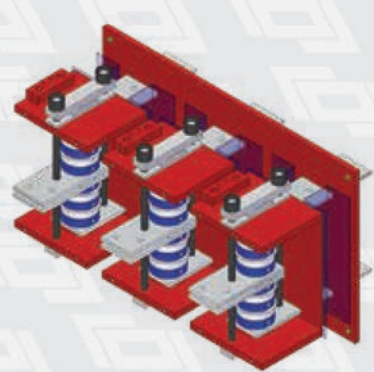
U15



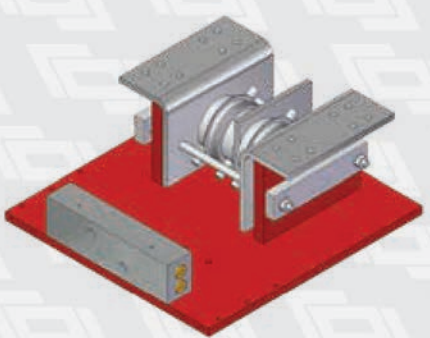
U16



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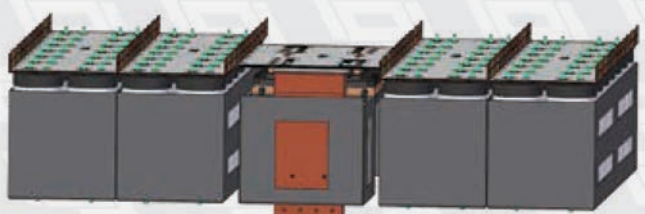


WATER COOLED POWER ASSEMBLIES WITH INSULATED MODULES OR IGBT

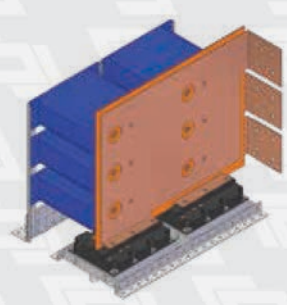
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U21

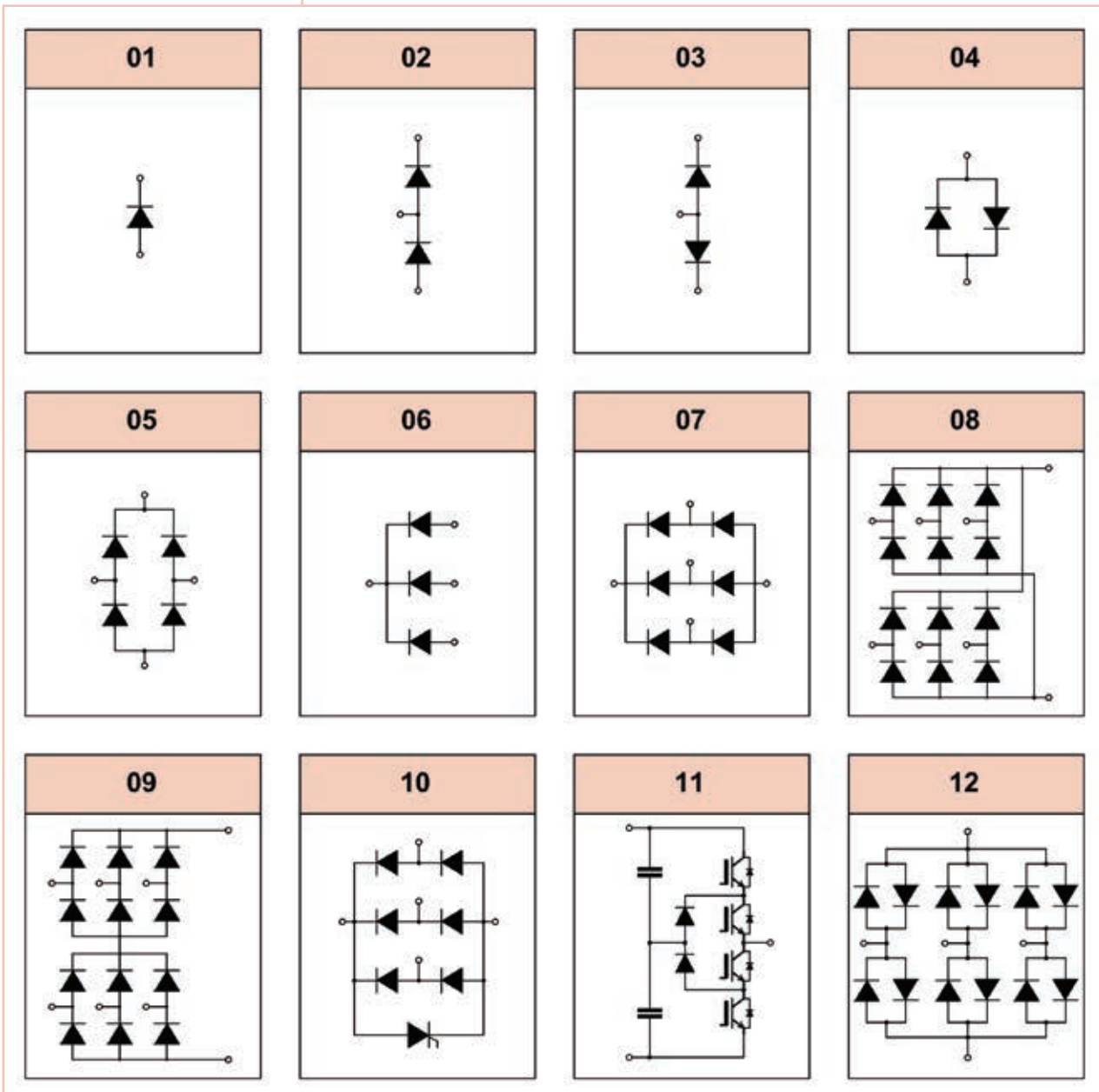
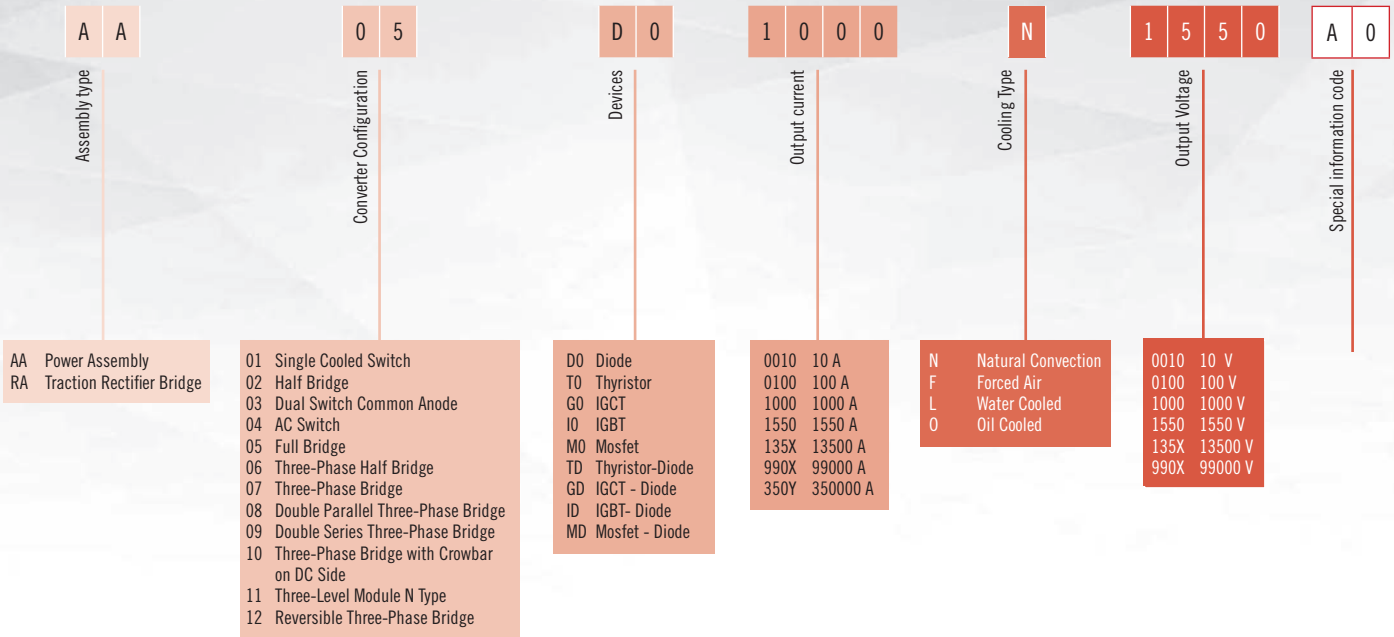


U22



# POWER ASSEMBLIES IDENTIFICATION SYSTEM

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POWER ASSEMBLIES

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## MAIN ASSEMBLIES CHARACTERISTICS

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Power Assembly	Short description	V <sup>(1)</sup> [V]	IT <sup>(2)</sup> [A]	Device	Outline
AA01D00400N2600A0	Natural air single diode stack	2600	400	Diode	U1
AA04T00900N0700A0	Natural air thyristor crowbar	700	900	Thyristor	U2
AA06T01450N1200A0	Natural air thyristor three-phase bridge	1200	1450	Thyristor	U3
AA02D00440N0750A0	Natural air diode bridge arm with fuse and diode RC	750	440	Diode	U4
RA05D00050N4500A0	Natural air mono-phase bridge with 4 diode in series	4500	50	Diode	U5
AA01T00600N2200A1	Natural air single diode stack with over temperature switch	2200	600	Thyristor	U6
AA07T02500F0700A0	Forced air thyristor three-phase bridge	700	2500	Thyristor	U7
AA12T01000F0580A0	Forced air reversible three-phase bridge	580	1000	Thyristor	U8
AA06T00600F0690A0	Forced air thyristors three-phase bridge	690	600	Thyristor	U9
AA08D00800F0030A0	Forced air diode 12-pulse bridge	30	800	Diode	U10
AA04T01550L1600A1	Water cooled AC-switch, busbar in opposite direction	1600	1550	Thyristor	U11
AA06T0120XL0200A0	Water cooled thyristor bridge	200	4000	Thyristor	U12
AA06T3500L0600A0	Water cooled thyristor bridge	600	3500	Thyristor	U13
AA06T02500L0200A0	Water cooled thyristor bridge with over temperature switch	200	2500	Thyristor	U14
AA02T1800L1000A10	Water cooled 100 mm thyristor bridgearm with fuses	1000	1800	Thyristor	U15
AA06T0100XL0200A0	Water cooled thyristor bridge	200	3300	Thyristor	U16
AA06D01060L2500A1	Water cooled three-phase diode bridge with 2 diodes in series	2500	1060	Diode	U17
AA01T02000L4000A0	Water cooled 2 thyristors in series switch	2 x 4000	2000	Thyristor	U18
AA04T00500L1600A0	Water cooled AC switch	1600	500	Thyristor	U19
AA05I01300L1500A0	Water cooled IGBT Inverter mono-phase	1500	1300	IGBT	U20
AA02I00800L0460A0	Water cooled single leg of IGBT three-phase Inverter	460	800	IGBT	U21
AA11I00500L2800A0	Water cooled IGBT NPC Inverter phase	2800	500	IGBT	U22

(1) V = Device voltage (for single stack) or output dc voltage for rectifier arm, complete rectifier bridge or other converter

(2) I = I<sub>T(AV)</sub> (sin wave 180°C) for single devices or output current for rectifier bridges or other converter

POWER ASSEMBLIES

FOR CUSTOMIZED SOLUTIONS PLEASE CONTACT OUR SALES DEPARTMENT

# TESTING SERVICES

# 1 TESTING SERVICES

## 3 TESTING AND FAILURE ANALYSIS SERVICES

### 4 MAIN CHARACTERISTICS

- A complete set of know how, methods, equipment and testers for:
  - high power semiconductors characterization
  - natural air, forced air and liquid cooled heatsink characterization
  - contact surfaces quality evaluation
  - power assemblies characterization
  - ISO9001:2015 and IRIS rev.3 certification

### 6 APPLICATIONS

- Routine tests
- Type tests
- Reliability tests
- Failure analyses
- Authenticity checks

## TESTING SERVICES

### ROUTINE AND TYPE TESTS OF POWER SEMICONDUCTORS

Devices	Type of test	Capability	Temperature range
Press-pack Diodes Press-pack Thyristors Press-pack GTOs Insulated Module Diodes Insulated Module Thyristors	Repetitive and non repetitive on-state and reverse voltage	up to 7 kV; 400 mA;	-70 °C ÷ +190 °C
	On state voltage	up to 10 V; 10 kA	+25 °C ÷ +190 °C
	Recovery characteristics	I = 10 ÷ 4000 A; di/dt = 0.4 ÷ 1000 A/μs; VR = 10 ÷ 100 V;	+25 °C ÷ +190 °C
Press-pack Thyristors Insulated Module Thyristors	Trigger characteristics		-70 °C ÷ +190 °C
	Turn off dv/dt	I = 10 ÷ 4000 A; di/dt = 0.4 ÷ 300 A/μs; VR = 10 ÷ 100 V; VD = 200 ÷ 3000 V; dv/dt = 20 ÷ 2000 V/μs;	+25 °C ÷ +140 °C
Press-pack GTOs	Dynamic characteristics	up to IT=3500 A; VD = 4500 V	+25 °C ÷ +120 °C
Press-pack IGBTs Insulated Module IGBTs	Static characteristics	up to 7 kV; up to 6 kA	+25 °C ÷ +150 °C
Press-pack Diodes Press-pack Thyristors Press-pack GTOs Press-pack IGBTs	Sealing tests	Mass spectrometer, Tracer gas: He	+25 °C
Press-pack Diodes Press-pack Thyristors Press-pack GTOs Insulated Module Diodes Insulated Module Thyristors	Surge tests	1 kA - 70 kA with or without reverse voltage reapplied	+25 °C ÷ +175 °C
Press-pack Devices and Insulated Modules	High temperature blocking life test	up to 6 kV	+80 °C ÷ +150 °C
Press-pack Devices	Thermal resistance junction - heatsink tests		

### ROUTINE AND TYPE TESTS OF POWER ASSEMBLIES

Type of test	Equipment	Capability
Input regulator for power assemblies testing area	Three phases high power variable voltage supply	0 ÷ 400 V (120 kVA)
No load high voltage test	Three phases high voltage supply	0 ÷ 3 kV (50 kVA); 0 ÷ 8 kV (3,5 kVA)
High current supply for thermal tests on rectifier bridge	Three phases high current supply	continuous current up to 10 kA (75 kVA) 1 min pulse 16 kA
Insulation tests	Electric strength voltage test equipment	up to 25 kV
Source of DC voltage equivalent to railway line	DC voltage supply	up to 4 kV - 30 A or 400 V - 300 A
Source for DC link supply	Adjustable high voltage power supply	up to 10 kV, 1A
Static and dynamic test for power modules and assemblies	Multitester for module and assemblies	Static 6000 V; 1000 A Dynamic 2000 V; 1000 A



## MECHANICAL TESTS OF POWER SEMICONDUCTORS AND POWER ASSEMBLIES

Type of test	Equipment	Capability
Dimensional	Micrometer	0,001 mm
Visual inspection	Optic microscope	1000 x
Rugosity	Roughness tester	up to Ra = 0,4
Flatness	Flatness tester	0,001 mm
Thickness of plating layer	Fischerscope X-rays	Different plating layers and substrates

## RELIABILITY TESTS OF POWER SEMICONDUCTORS

	Test condition	Typical test duration
Thermal power cycling tests	Sine wave current 50 Hz $\Delta T = 70 - 80 \text{ }^\circ\text{C}$ I conduction (A) = up to 3000 A Cooled by water flow t cycle (s) = from 1 sec to 10 mins	Higher than 1000 cycles
High temperature blocking life test	Sine wave voltage 50 Hz $T_j = T_{j\text{max}}$ $V = 0.8 V_{\text{DRM}} (V_{\text{RRM}})$	T = 4 - 168 h
High temperature storage test	T ( $^\circ\text{C}$ ) = high value of storage Temperature (up to 200 $^\circ\text{C}$ )	T = 168 h
Low temperature store test	T ( $^\circ\text{C}$ ) = low value of storage Temperature (down to -70 $^\circ\text{C}$ )	T = 168 h
Passive cycling test	$T_{\text{hi}} = 150 \text{ }^\circ\text{C}$ $T_{\text{lo}} = -70 \text{ }^\circ\text{C}$	10 cycles

## FAILURE ANALYSIS ON HIGH POWER SEMICONDUCTORS

Poseico may perform a failure analysis on failed devices (press-pack or insulated module devices) in order to evaluate the potential failure causes occurred during the device operation on field. Thanks to its own database, Poseico may provide a quick and deep evaluation of failure conditions and perform specific laboratory tests (mechanical and electrical) to help the Customer to mitigate potential wrong working conditions of the final application.

## AUTHENTICITY CHECKS

Counterfeit goods span across multiple industries including the Power Electronics one. Poseico is fighting against this unpolite competition and it offers a complete service in order to analyze if semiconductors, branded Poseico or other, are original or fake.

## LIST OF SYMBOLS

## MOUNTING RECOMMENDATIONS

SYMBOL	UNIT	DESCRIPTION
$V_{RRM}$	[V]	Repetitive peak reverse voltage
$V_{DRM}$	[V]	Repetitive peak off-state voltage
$I_{RRM}$	[mA]	Repetitive peak reverse current
$I_{DMR}$	[mA]	Repetitive peak off-state current
$I_{F(AV)}$	[A]	Mean Forward current (diodes)
$I_{T(AV)}$	[A]	Mean on-state current (thyristors)
$I_{RMS}$	[A]	RMS Current
$I_{FSM}$	[kA]	Surge, non-repetitive, forward current (diodes)
$I_{TSM}$	[kA]	Surge, non-repetitive, on-state current (thyristors)
$I^2t$	[A <sup>2</sup> ·s·10 <sup>3</sup> ]	Value for fusing coordination
$V_{F(TO)}$	[V]	Forward threshold voltage (diodes)
$V_{T(TO)}$	[V]	On-state threshold voltage (thyristors; GTOs)
$r_F$	[mΩ]	Forward slope resistance (diodes)
$r_T$	[mΩ]	On-state slope resistance (thyristors; GTOs)
$V_{GT}$	[V]	Gate trigger voltage
$I_{GT}$	[mA]	Gate trigger current
(di/dt) crit	[A/μs]	Critical rate of rise of on-state current (repetitive)
(dv/dt) crit	[V/μs]	Critical rate of rise of on-state voltage (repetitive)
$Q_{rr}$	[μC]	Reverse recovery charge
$t_{rr}$	[μs]	Reverse recovery time
$I_F$	[A]	Current before recovery phenomena
(di <sub>F</sub> /dt)	[A/μs]	Slope of recovery current (diodes)
(di <sub>T</sub> /dt)	[A/μs]	Slope of recovery current (thyristors)
$I_{rr}$	[A]	Peak reverse recovery current
$t_d$	[μs]	Delay time
$t_q$	[μs]	Circuit commutation turn-off time
$t_{gt}$	[μs]	Gate controlled turn-on time
$t_{gq}$	[μs]	Gate controlled turn-off time
$I_{TCM}$	[A]	Controllable peak-on state current
$V_{DSP}$	[V]	Spike turn-off voltage
$R_{th(j-h)}$	[°C/kW]	Thermal resistance junction to heatsink
$R_{th(j-c)}$	[°C/kW]	Thermal resistance junction to case
$R_{th(c-h)}$	[°C/kW]	Thermal resistance case to heatsink
$R_{th(j-w)}$	[°C/kW]	Thermal resistance junction to water
$V_{ins(RMS)}$	[V]	Insulation voltage
$F$	[kN]	Mounting force
$V_{FM}$	[V]	Forward voltage
$V_{DCLINK}$	[V]	DC Link Voltage
$V_{CES}$	[V]	Collector-emitter voltage
$I_{CES}$	[mA]	Collector cut-off current
$I_C$	[A]	Collector current
$I_{CM}$	[A]	Repetitive peak collector current
$V_{CES(sat)}$	[V]	Collector-emitter saturation voltage
$t_{on}$	[μs]	Turn-on time
$t_{off}$	[μs]	Turn-off time
$V_{GEth}$	[V]	Gate-emitter threshold voltage
$V_{GES}$	[V]	Gate-emitter peak voltage
$C_{IES}$	[nF]	Input capacitance
$T_j$	[°C]	Virtual Junction temperature
$T_{STG}$	[°C]	Storage temperature
$T_C$	[°C]	Case temperature
$T_h$	[°C]	Heatsink temperature

In order to ensure effective cooling, good current conduction and reliability, in the assembly of Power Semiconductors, it's important to observe some recommendations with a particular focus on heatsink preparation and clamping system. The recommended procedure is reported below:

### USING BAR CLAMPING SYSTEM

- clean the mounting area (a) of both heatsinks before with “abrasive rubber” and than with alcohol.
- clean the mounting surfaces of the semiconductor with alcohol.
- apply a thin film of mounting grease (b) on both mounting surfaces of the heatsinks.
- put the semiconductor between the two heatsinks and rotate it to spread the contact grease.

#### CAUTION: each guide pin should be located in the center hole.

- pre-assemble the clamp housing if necessary
- place the pre-assembled portion of the clamp through the heatsink and the semiconductor assembly.
- place over the upper heatsink the second part of the clamp, equipped with its spring system and hardware parts.
- tighten by “fingers” the screws and put all the assembly in position.

#### CAUTION: all the surfaces must be parallel before tightening.

- tighten the screws half a turn until the pressure indicating system shows that the required pressure has been achieved.

### USING BOX CLAMPING SYSTEM

- clean the mounting area (a) of both heatsinks before with “abrasive rubber” and than with alcohol.
- clean the mounting surfaces of the semiconductor with alcohol.
- apply a thin firm of mounting grease (b) on the surfaces of the device.
- put the box clamp over the device ensuring that the pins are correctly located.
- put the square steel plate over the central rod, putting bolts through the clamp whilst holding it firmly in place.
- screw the bolts “finger tight” then alternatively, clockwise, half a turn until the box touches the heatsink all the way round.

#### CAUTION: use a torque wrench to apply the right clamping force.

- recommended tolerances over the device mounting area: flatness 30 micron, roughness 2 micron
- recommended mounting grease: contactal hpg

Note: before mounting the assembly, a leakage test must be performed to verify the electrical integrity.

### Maximum allowable average current

In this catalogue the average current ratings are mostly specified for temperatures of:  $T_h = 55^\circ\text{C}$ .  $T_c = 85^\circ\text{C}$  at  $180^\circ$  sine wave. For other temperatures, the current can be calculated using the following formulas applicable up to 400 Hz:

$$I_{(AV)} = \frac{-V_0 + \sqrt{V_0^2 + 4K^2 rP}}{2K^2 r}$$

$$\text{where } P = \frac{T_j \max - T}{R_{th}}$$

- $I_{(AV)} = I_{T(AV)}$  for thyristors,  $I_{F(AV)}$  for diodes
- $V_0 = V_{T(TO)}$  for thyristors,  $V_{F(TO)}$  for diodes
- $T = T_c$  or  $T_h$
- $R_{th} = R_{th(j-c)}$  or  $R_{th(j-h)}$
- $r = r_T$  for thyristors,  $r_F$  for diodes
- $K = 1$  for direct current
- $K = (\pi/2)$  for  $180^\circ$  sine wave
- $K = \sqrt{3}$  for  $120^\circ$  rectangular wave
- $K = \sqrt{2}$  for  $160^\circ$  rectangular wave

## A EUROPEAN POWER SEMICONDUCTORS FACTORY



Headquarters, Research and Development Department and Manufacturing Lines are located in Genoa, Italy

### FULL COMPLIANCE WITH STANDARDS

Poseico S.p.A. is certified ISO 9001:2015 (Quality Management System), ISO 14001:2015 (Environmental Management System) and IRIS Certification rules:2017 (ISO / TS 22163:2017).



Poseico S.p.A. devices are fully compliant with the High Power Semiconductor standards (IEC60747-01; IEC60747-02; IEC60747-06).



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