

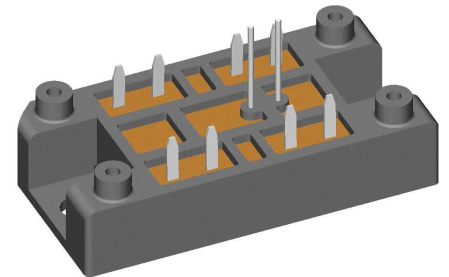
# Standard Rectifier Module

3~ Rectifier	Brake Chopper
$V_{RRM} = 1200\text{ V}$	$V_{CES} = 1200\text{ V}$
$I_{DAV} = 75\text{ A}$	$I_{C25} = 58\text{ A}$
$I_{FSM} = 600\text{ A}$	$V_{CE(sat)} = 1.85\text{ V}$

## 3~ Rectifier Bridge + Brake Unit + NTC

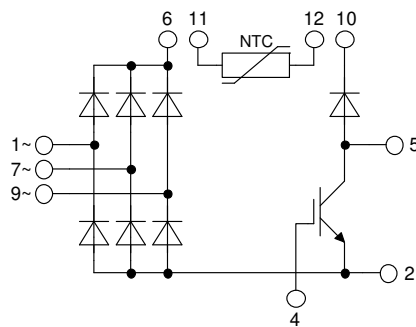
Part number

**VUB72-12NOXT**



Backside: isolated

 E72873



### Features / Advantages:

- Package with DCB ceramic base plate
- Improved temperature and power cycling
- Planar passivated chips
- Very low forward voltage drop
- Very low leakage current
- NTC

### Applications:

- 3~ Rectifier with brake unit for drive inverters

### Package: V1-A-Pack

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

### Disclaimer Notice

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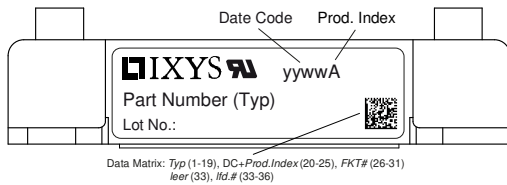
Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM}$	max. non-repetitive reverse blocking voltage					1300	V
$V_{RRM}$	max. repetitive reverse blocking voltage					1200	V
$I_R$	reverse current	$V_R = 1200$ V		$T_{VJ} = 25^\circ\text{C}$		40	$\mu\text{A}$
		$V_R = 1200$ V		$T_{VJ} = 150^\circ\text{C}$		1.5	mA
$V_F$	forward voltage drop	$I_F = 25$ A		$T_{VJ} = 25^\circ\text{C}$		1.10	V
		$I_F = 75$ A				1.38	V
		$I_F = 25$ A		$T_{VJ} = 125^\circ\text{C}$		1.01	V
		$I_F = 75$ A				1.37	V
$I_{DAV}$	bridge output current	$T_C = 110^\circ\text{C}$		$T_{VJ} = 150^\circ\text{C}$		75	A
		rectangular	$d = \frac{1}{3}$				
$V_{FO}$	threshold voltage			$T_{VJ} = 150^\circ\text{C}$		0.79	V
$r_F$	slope resistance					7.7	m $\Omega$
						} for power loss calculation only	
$R_{thJC}$	thermal resistance junction to case					1.1	K/W
$R_{thCH}$	thermal resistance case to heatsink				0.3		K/W
$P_{tot}$	total power dissipation			$T_C = 25^\circ\text{C}$		110	W
$I_{FSM}$	max. forward surge current	$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 45^\circ\text{C}$		600	A
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		650	A
		$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 150^\circ\text{C}$		510	A
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		550	A
$I^2t$	value for fusing	$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 45^\circ\text{C}$		1.80	kA <sup>2</sup> s
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		1.76	kA <sup>2</sup> s
		$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 150^\circ\text{C}$		1.30	kA <sup>2</sup> s
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		1.26	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400$ V; $f = 1$ MHz		$T_{VJ} = 25^\circ\text{C}$		19	pF



Brake IGBT				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{CES}$	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200	V	
$V_{GES}$	max. DC gate voltage				$\pm 20$	V	
$V_{GEM}$	max. transient gate emitter voltage				$\pm 30$	V	
$I_{C25}$	collector current	$T_C = 25^{\circ}\text{C}$			58	A	
$I_{C80}$		$T_C = 80^{\circ}\text{C}$			40	A	
$P_{tot}$	total power dissipation	$T_C = 25^{\circ}\text{C}$			195	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 35\text{ A}; V_{GE} = 15\text{ V}$		1.85	2.15	V	
				2.15		V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 2\text{ mA}; V_{GE} = V_{CE}$	5.4	5.9	6.5	V	
$I_{CES}$	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$			0.1	mA	
				0.1		mA	
$I_{GES}$	gate emitter leakage current	$V_{GE} = \pm 20\text{ V}$			500	nA	
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 35\text{ A}$		110		nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 35\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 27\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$		70	ns	
$t_r$	current rise time				40	ns	
$t_{d(off)}$	turn-off delay time				250	ns	
$t_f$	current fall time				100	ns	
$E_{on}$	turn-on energy per pulse				3.8	mJ	
$E_{off}$	turn-off energy per pulse				4.1	mJ	
<b>RBSOA</b>	reverse bias safe operating area	$V_{GE} = \pm 15\text{ V}; R_G = 27\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$				
$I_{CM}$		$V_{CEK} = 1200\text{ V}$			105	A	
<b>SCSOA</b>	short circuit safe operating area	$V_{CEK} = 1200\text{ V}$					
$t_{SC}$	short circuit duration	$V_{CE} = 900\text{ V}; V_{GE} = \pm 15$	$T_{VJ} = 125^{\circ}\text{C}$		10	$\mu\text{s}$	
$I_{SC}$	short circuit current	$R_G = 27\ \Omega$ ; non-repetitive		140		A	
$R_{thJC}$	thermal resistance junction to case				0.65	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.25		K/W	
Brake Diode							
$V_{RRM}$	max. repetitive reverse voltage		$T_{VJ} = 25^{\circ}\text{C}$		1200	V	
$I_{F25}$	forward current		$T_C = 25^{\circ}\text{C}$		31	A	
$I_{F80}$			$T_C = 80^{\circ}\text{C}$		21	A	
$V_F$	forward voltage	$I_F = 25\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$		2.97	V	
			$T_{VJ} = 125^{\circ}\text{C}$	2.43		V	
$I_R$	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$		0.1	mA	
			$T_{VJ} = 125^{\circ}\text{C}$		0.5	mA	
$Q_{rr}$	reverse recovery charge	$V_R = 600\text{ V}$ $-di_f/dt = 400\text{ A}/\mu\text{s}$ $I_F = 25\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$		1.2	$\mu\text{C}$	
$I_{RM}$	max. reverse recovery current				18	A	
$t_{rr}$	reverse recovery time				130	ns	
$R_{thJC}$	thermal resistance junction to case				1.6	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.55		K/W	



Package V1-A-Pack				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$I_{RMS}$	RMS current	per terminal			100	A	
$T_{VJ}$	virtual junction temperature		-40		150	°C	
$T_{op}$	operation temperature		-40		125	°C	
$T_{stg}$	storage temperature		-40		125	°C	
<b>Weight</b>				37		g	
$M_D$	mounting torque		2		2.5	Nm	
$d_{Spp/App}$	creepage distance on surface / striking distance through air	terminal to terminal	6.0			mm	
$d_{Spb/Apb}$		terminal to backside	12.0			mm	
$V_{ISOL}$	isolation voltage	t = 1 second 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3600			V	
		t = 1 minute	3000			V	



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB72-12NOXT	VUB72-12NOXT	Blister	24	515901

Similar Part	Package	Voltage class
VUB72-16NOXT	V1-A-Pack	1600

**Temperature Sensor NTC**

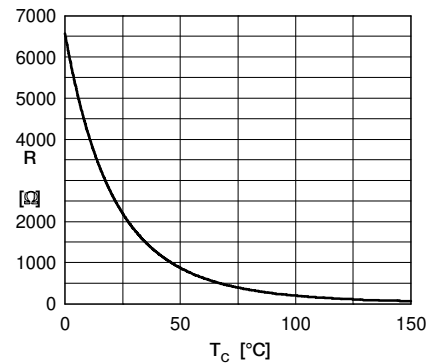
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$R_{25}$	resistance	$T_{VJ} = 25^\circ$	2.13	2.2	2.27	kΩ
$B_{25/50}$	temperature coefficient			3560		K

**Equivalent Circuits for Simulation**

\* on die level

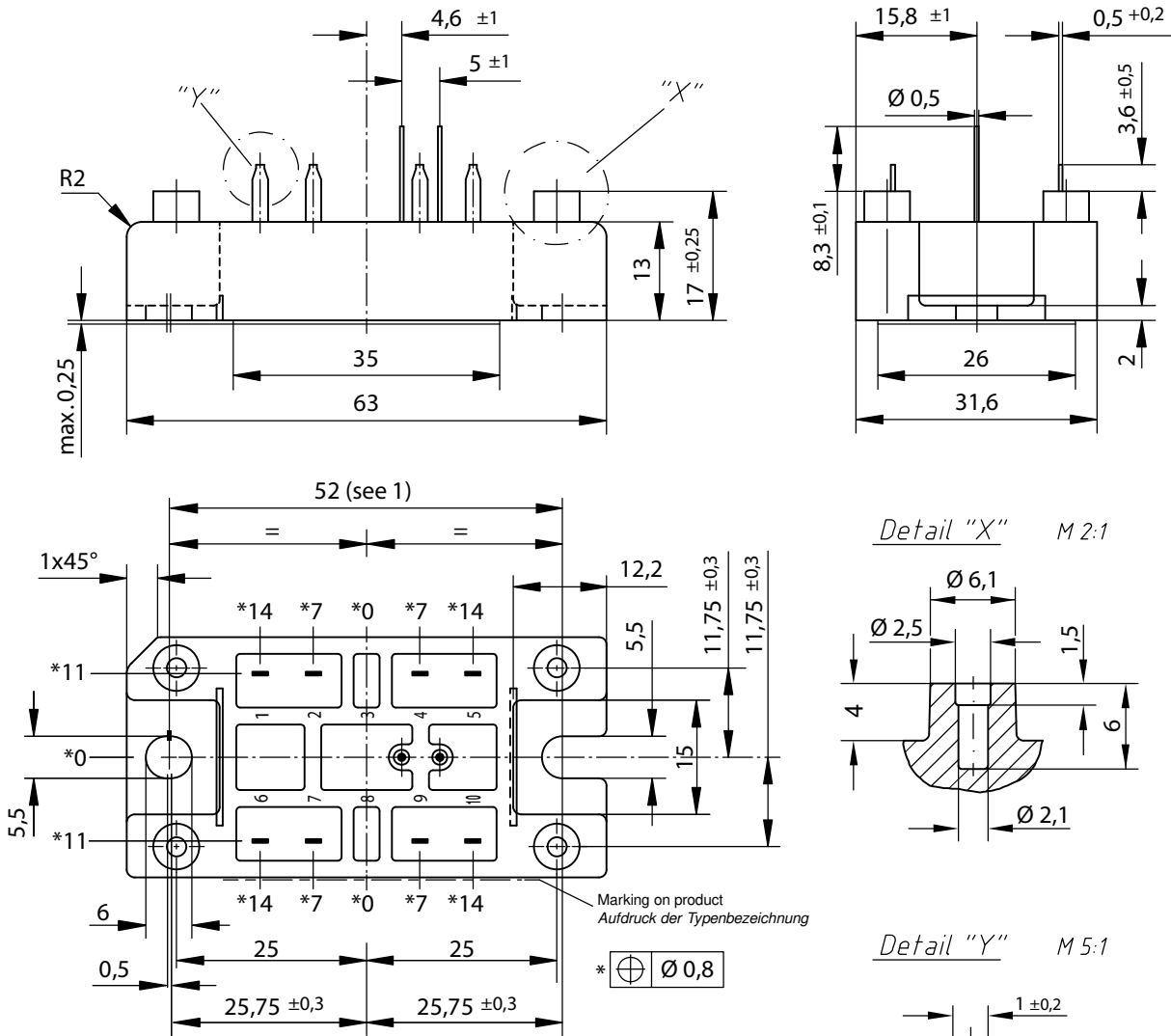
$T_{VJ} = 150^\circ\text{C}$

		Rectifier	Brake IGBT	Brake Diode	
$V_0$	threshold voltage	0.79	1.1	1.16	V
$R_0$	slope resistance *	6.5	40	43	mΩ



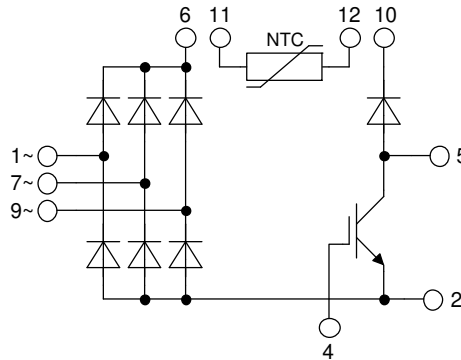


**Outlines V1-A-Pack**



**Remarks / Bemerkungen:**

1. Nominal distance mounting screws on heat sink: 52 mm / Nennabstand Befestigungsschrauben auf Kühlkörper: 52 mm
2. General tolerance / Allgmeintoleranz: DIN ISO 2768 - T1-c
3. Surface treatment of pins: tin plated (Sn) in hot dip / Oberflächenbehandlung der Pins: verzinkt (Sn) im Tauchbad
4. **Detail X:**  
EJOT PT® self-tapping screws (dimension K25) to be recommended for mounting on PCB  
*selbstschneidende Schraube (Größe K25) empfohlen für die PCB-Montage*  
Take care on the maximum screw length according to board thickness and the maximum hole depth of 6 mm<sup>-1</sup>  
*Bei der Wahl der Schraubenlänge die PCB-Dicke und die maximale Lochtiefe von 6mm beachten*  
Recommended mounting torque: 1.5 Nm / Empfohlenes Drehmoment: 1.5 Nm





**Rectifier**

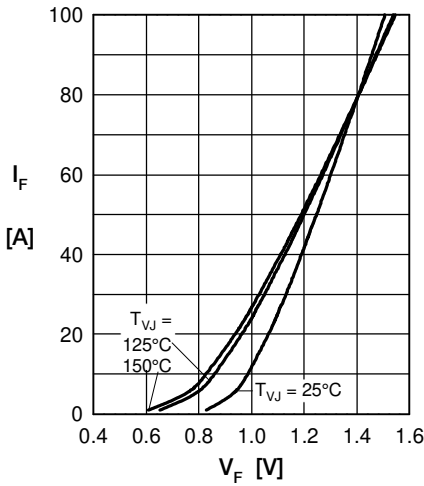


Fig. 1 Forward current vs. voltage drop per diode

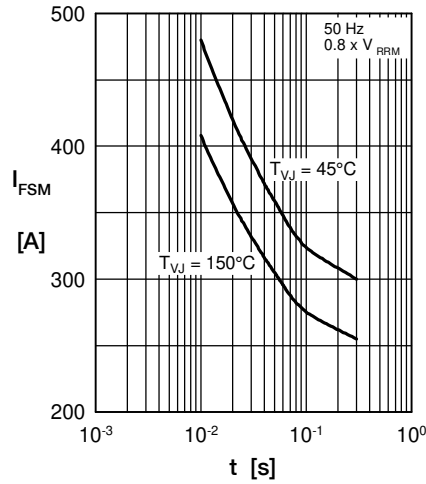


Fig. 2 Surge overload current vs. time per diode

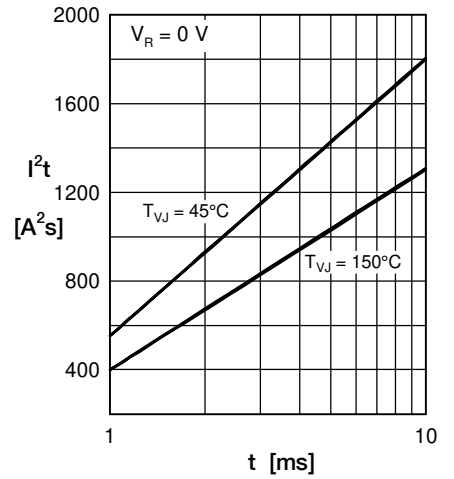


Fig. 3  $I^2t$  vs. time per diode

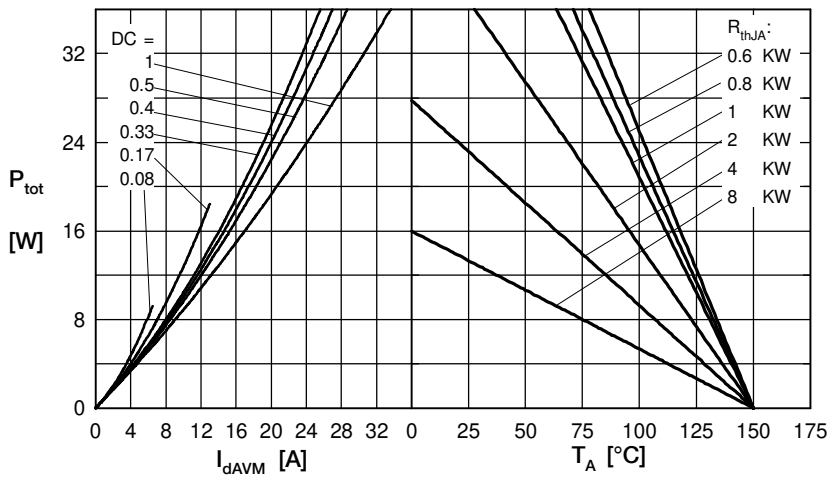


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

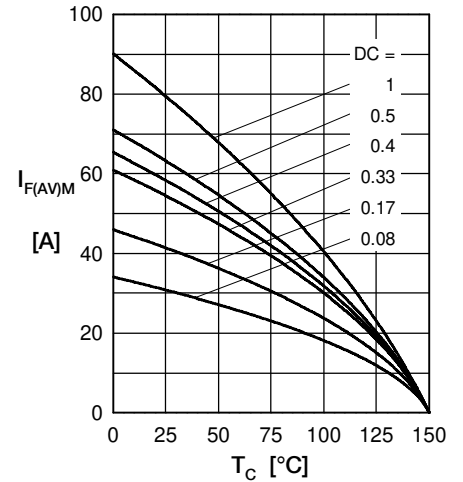


Fig. 5 Max. forward current vs. case temperature per diode

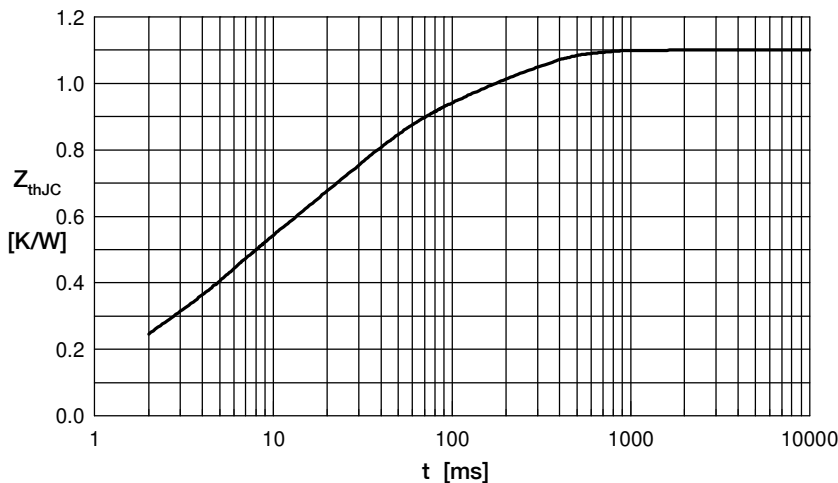
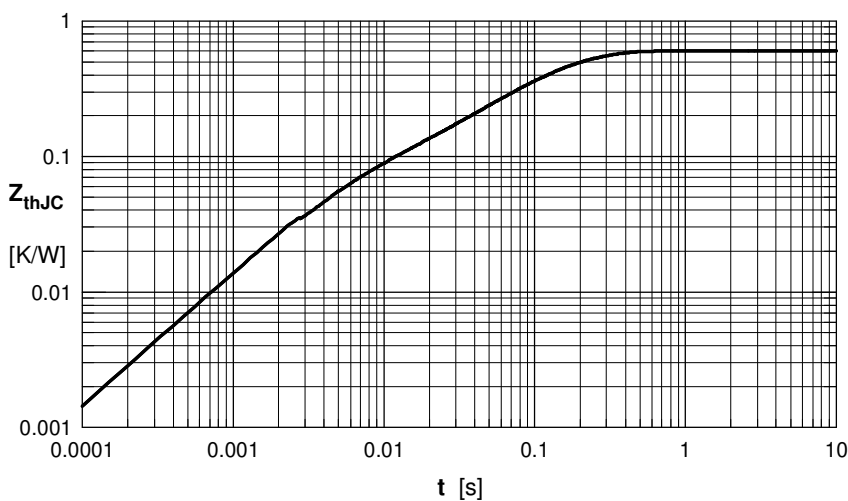
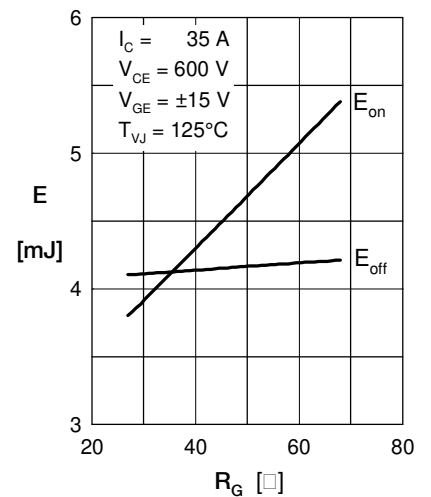
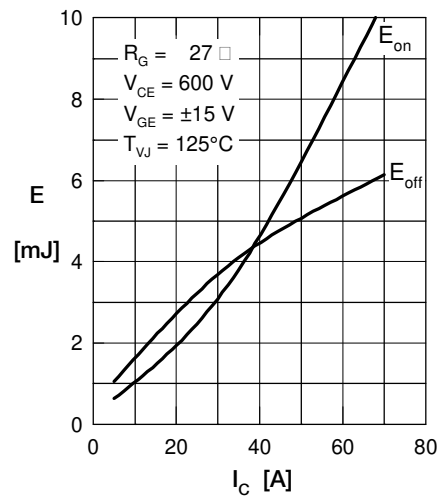
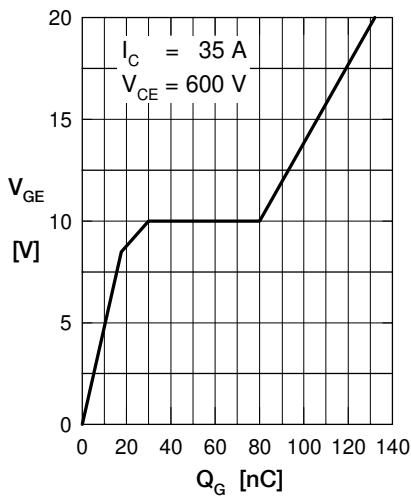
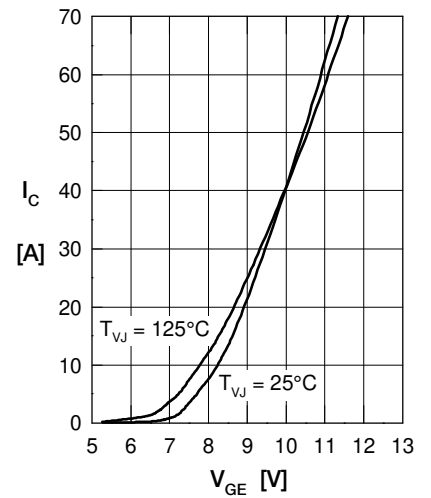
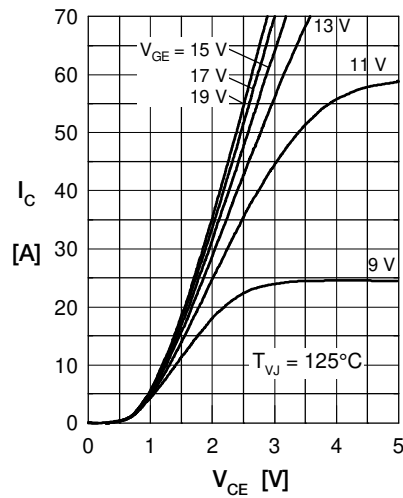
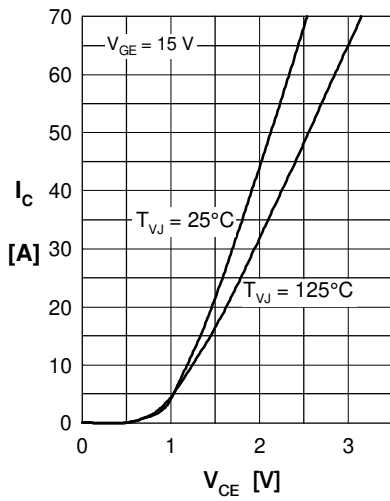


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for  $Z_{thJC}$  calculation:

i	$R_{th}$ (K/W)	$t_i$ (s)
1	0.0607	0.0004
2	0.1230	0.00256
3	0.2305	0.0045
4	0.4230	0.0242
5	0.2628	0.1800

**Brake IGBT**


**Brake Diode**

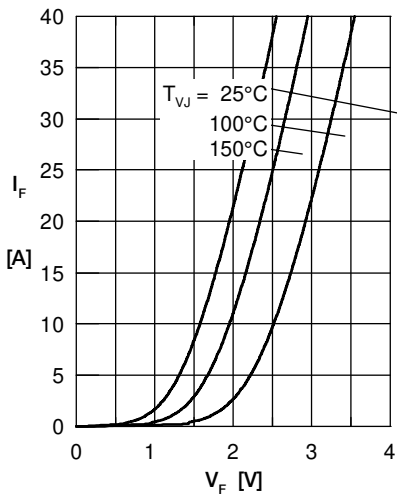


Fig. 1 Forward current  $I_F$  versus  $V_F$

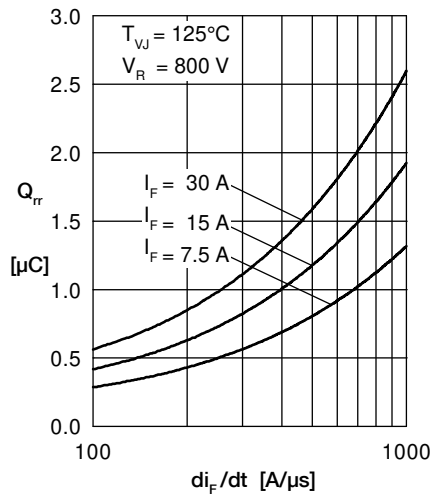


Fig. 2 Typ. reverse recov. charge  $Q_{rr}$  versus  $di_F/dt$

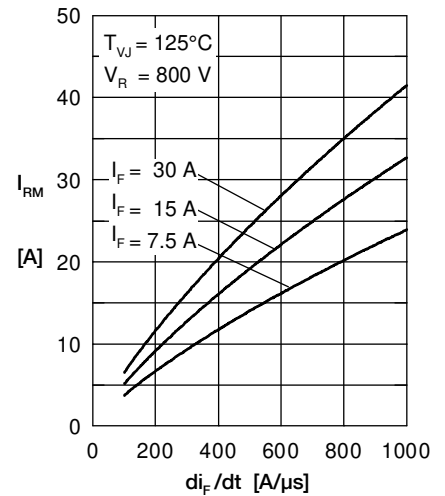


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $di_F/dt$

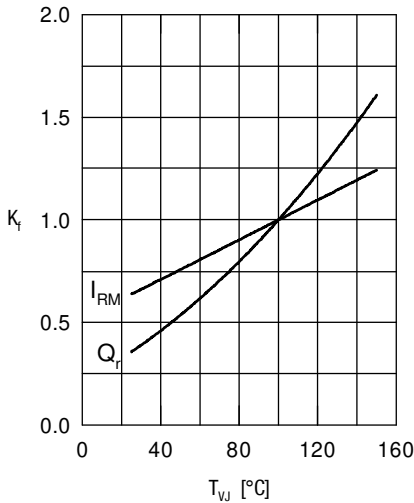


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

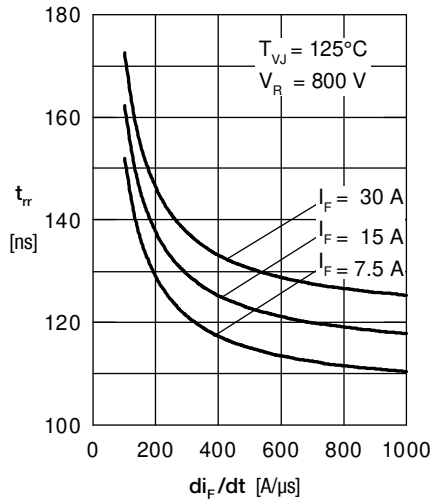


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $di_F/dt$

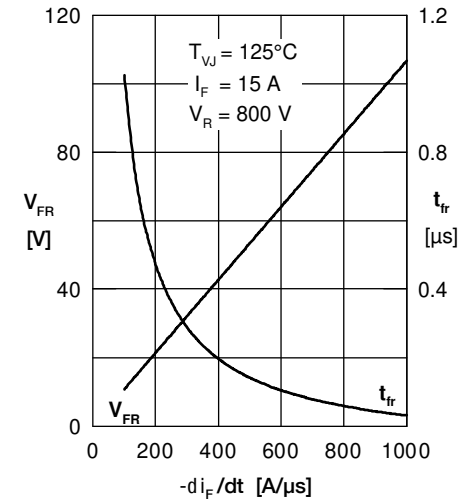


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

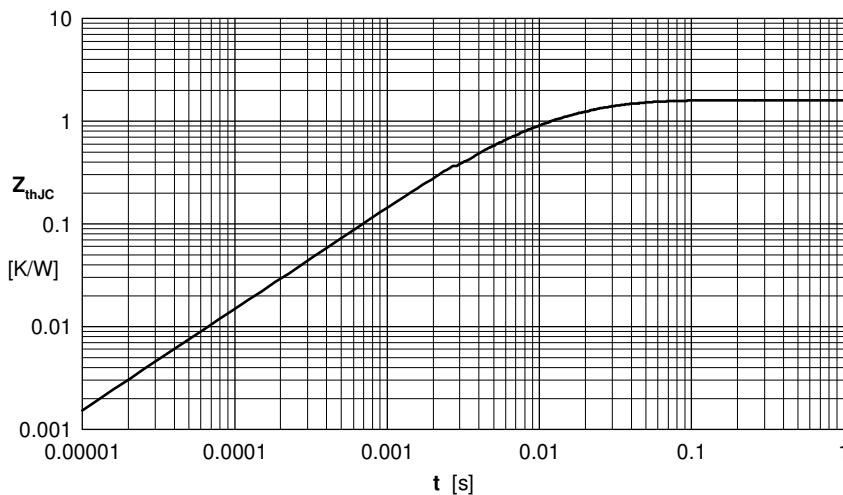


Fig. 7 Transient thermal impedance junction to case