

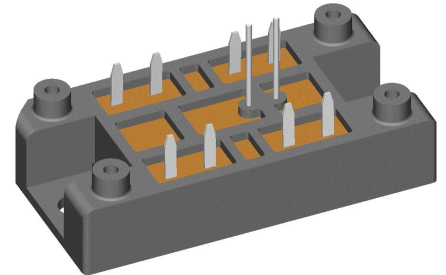
# Standard Rectifier Module

3~ Rectifier	Brake Chopper
$V_{RRM} = 1200$	$V_{CES} = 1200$
$I_{DAV} = 75$	$I_{C25} = 58$
$I_{FSM} = 600$	$V_{CE(sat)} = 1,85$

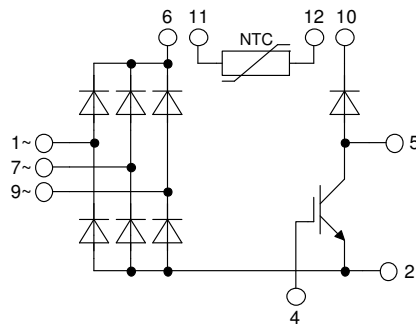
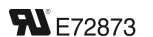
## 3~ Rectifier Bridge + Brake Unit + NTC

Part number

**VUB72-12NOXT**



Backside: isolated



### 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

### Terms Conditions of usage:

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact the sales office, which is responsible for you.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the product in aviation, in health or live endangering or life support applications, please notify. For any such application we urgently recommend

- to perform joint risk and quality assessments;

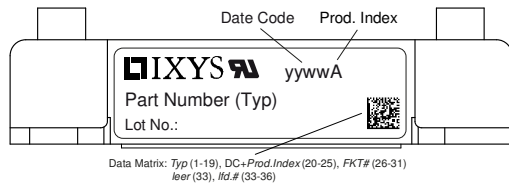
- the conclusion of quality agreements;

- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

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	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	$V_{GE} = \pm 15\text{ V}; R_G = 27\ \Omega$					
$I_{CM}$		$V_{CEK} = 1200\text{ V}$			105	A	
<b>SCSOA</b>	short circuit safe operating area	$V_{CEK} = 1200\text{ V}$					
$t_{SC}$	short circuit duration	$V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V}$			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				1200	V	
$I_{F25}$	forward current				31	A	
$I_{F80}$					21	A	
$V_F$	forward voltage	$I_F = 25\text{ A}$			2,97	V	
					2,43	V	
$I_R$	reverse current	$V_R = V_{RRM}$			0,1	mA	
					0,5	mA	
$Q_{rr}$	reverse recovery charge	$V_R = 600\text{ V}$ $-di_f/dt = 400\text{ A}/\mu\text{s}$ $I_F = 25\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$		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	510734

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

### Temperature Sensor NTC

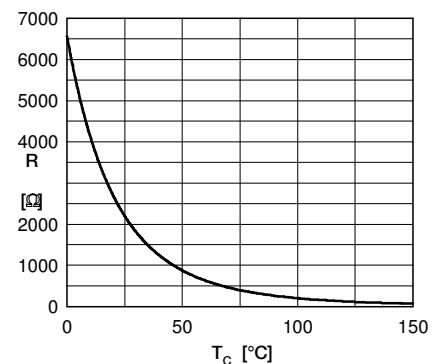
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$R_{25}$	resistance	$T_{VJ} = 25^\circ$	2,13	2,2	2,27	k $\Omega$
$B_{25/50}$	temperature coefficient			3560		K

### Equivalent Circuits for Simulation

\* on die level

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

	Rectifier	Brake IGBT	Brake Diode	
$V_0$	0,79	1,1	1,16	V
$R_0$	6,5	40	43	m $\Omega$



Typ. NTC resistance vs. temperature



## Rectifier

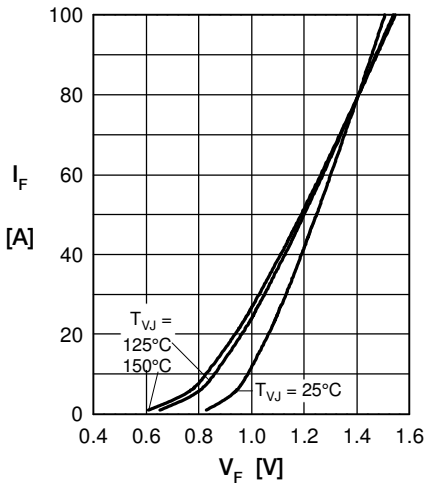


Fig. 1 Forward current vs. voltage drop per diode

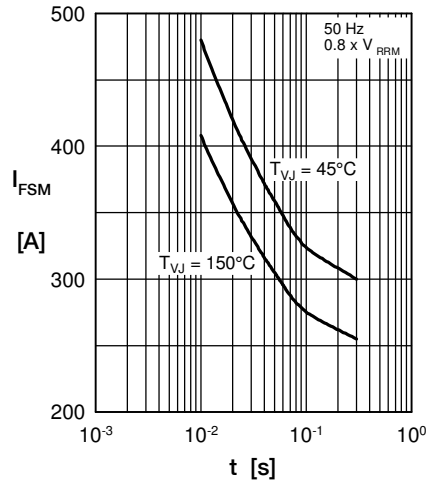


Fig. 2 Surge overload current vs. time per diode

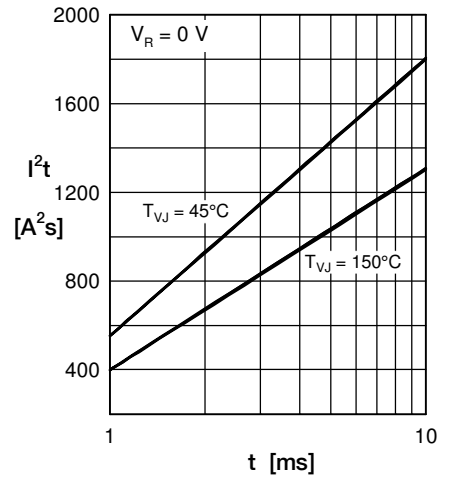


Fig. 3  $I^2t$  vs. time per diode

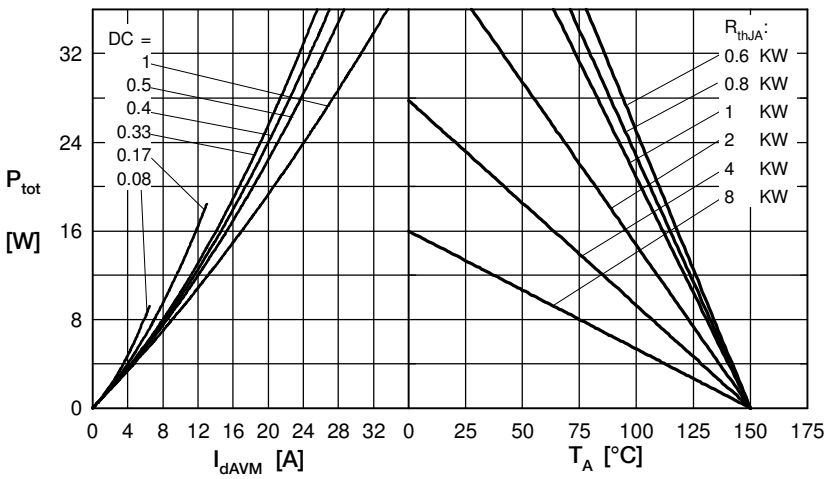


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

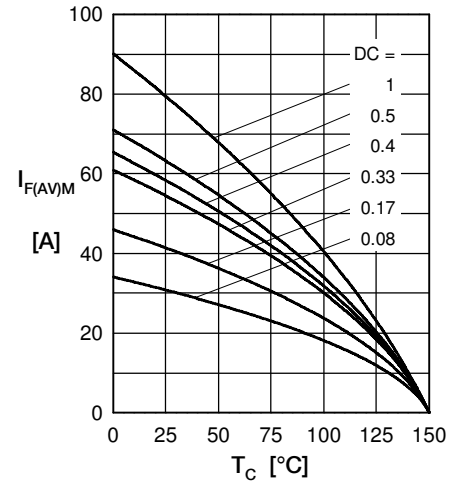


Fig. 5 Max. forward current vs. case temperature per diode

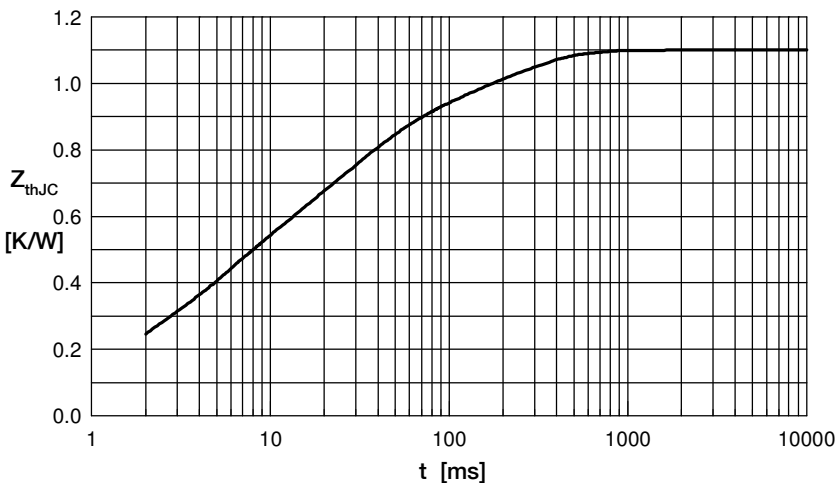


Fig. 6 Transient thermal impedance junction to case vs. time per diode

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**

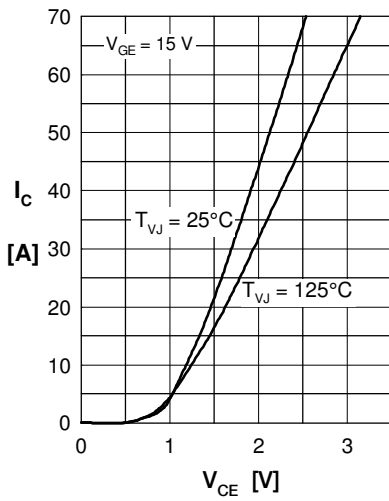


Fig. 1 Typ. output characteristics

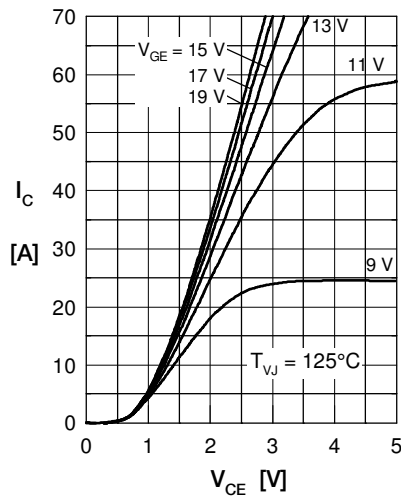


Fig. 2 Typ. output characteristics

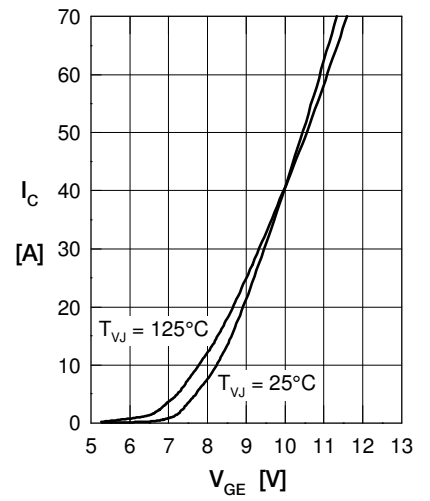


Fig. 3 Typ. transfer characteristics

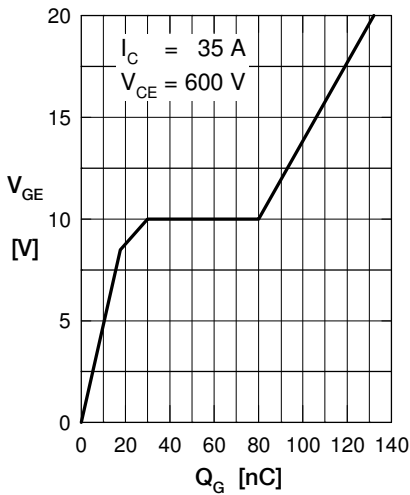


Fig. 4 Typ. turn-on gate charge

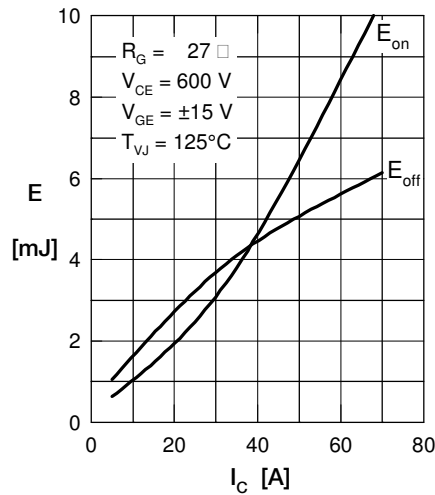


Fig. 5 Typ. switching energy versus collector current

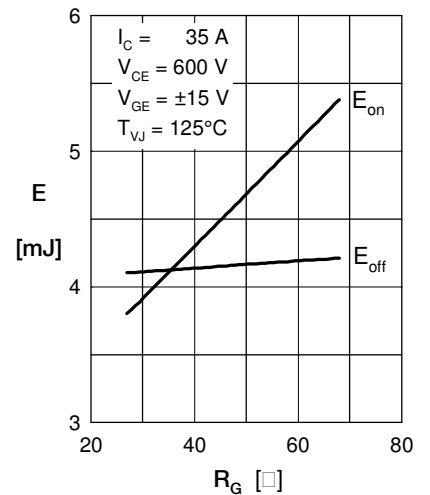


Fig. 6 Typ. switching energy versus gate resistance

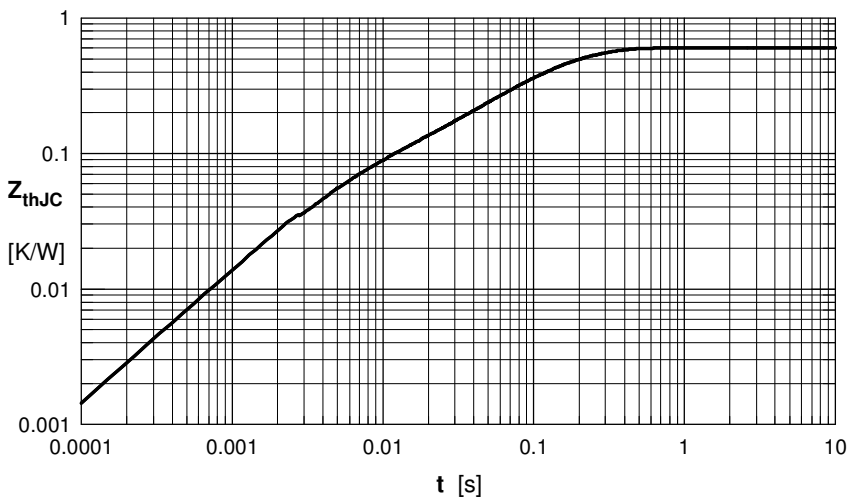


Fig. 7 Typ. transient thermal impedance

**Brake Diode**

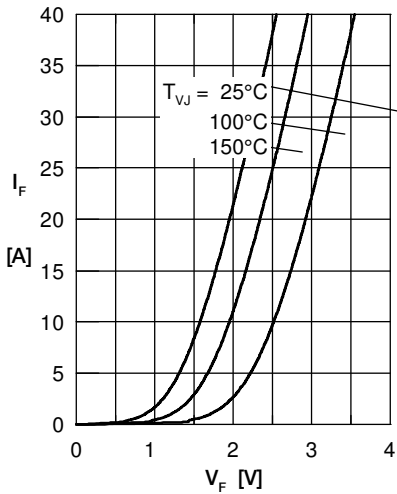


Fig. 1 Forward current  $I_F$  versus  $V_F$

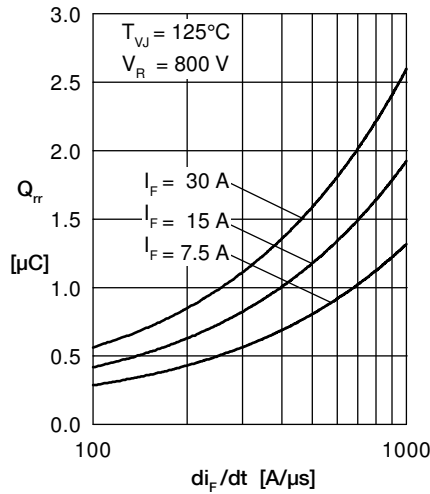


Fig. 2 Typ. reverse recov. charge  $Q_{rr}$  versus  $di_F/dt$

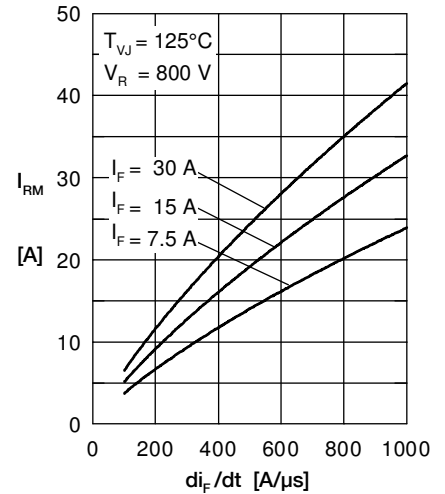


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $di_F/dt$

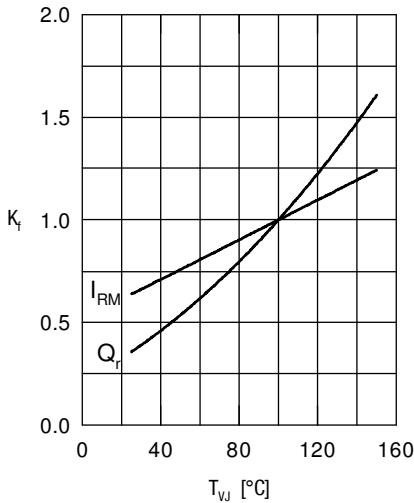


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

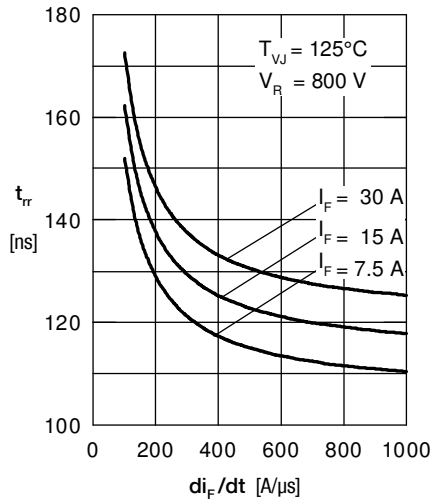


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $di_F/dt$

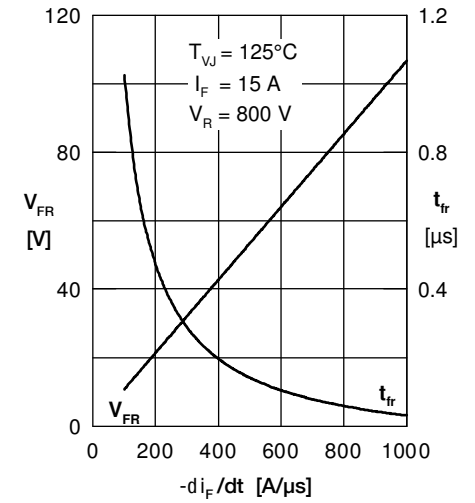


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

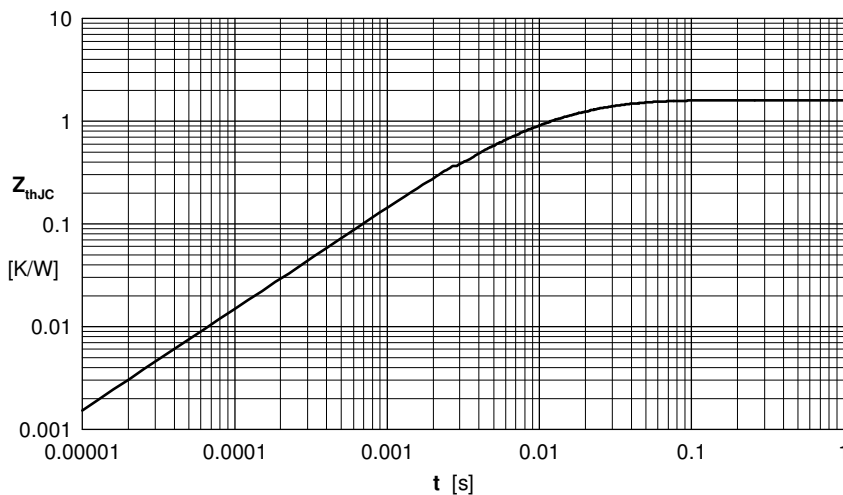


Fig. 7 Transient thermal impedance junction to case