

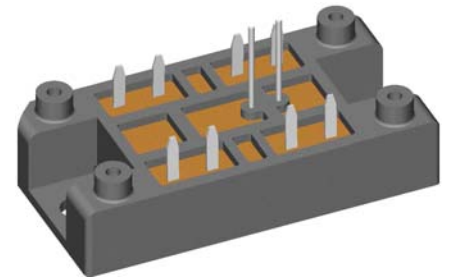
Standard Rectifier Module

3~ Rectifier	Brake Chopper
$V_{RRM} = 1600 \text{ V}$	$V_{CES} = 1200 \text{ V}$
$I_{DAV} = 75 \text{ A}$	$I_{C25} = 58 \text{ A}$
$I_{FSM} = 600 \text{ A}$	$V_{CE(sat)} = 1.85 \text{ V}$

3~ Rectifier Bridge + Brake Unit + NTC

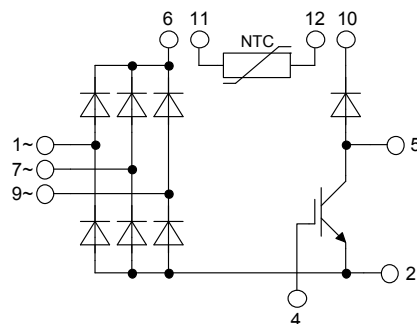
Part number

VUB72-16NOXT



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

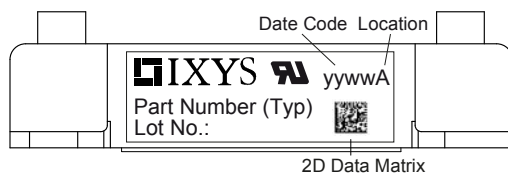
Package: V1-A-Pack

- 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

Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RSM}	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1700	V
V_{RRM}	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1600	V
I_R	reverse current	$V_R = 1600\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			40	μA
		$V_R = 1600\text{ V}$	$T_{VJ} = 150^{\circ}\text{C}$			1.5	mA
V_F	forward voltage drop	$I_F = 25\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.10	V
		$I_F = 75\text{ A}$				1.38	V
		$I_F = 25\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.01	V
		$I_F = 75\text{ A}$				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	} for power loss calculation only		$T_{VJ} = 150^{\circ}\text{C}$		0.79	V
r_F	slope resistance					7.7	m Ω
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	$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 45^{\circ}\text{C}$			600	A
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			650	A
		$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 150^{\circ}\text{C}$			510	A
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			550	A
I^2t	value for fusing	$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 45^{\circ}\text{C}$			1.80	kA ² s
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			1.76	kA ² s
		$t = 10\text{ ms; (50 Hz), sine}$	$T_{VJ} = 150^{\circ}\text{C}$			1.30	kA ² s
		$t = 8,3\text{ ms; (60 Hz), sine}$	$V_R = 0\text{ V}$			1.26	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V; } f = 1\text{ MHz}$		$T_{VJ} = 25^{\circ}\text{C}$		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					± 20	V
V_{GEM}	max. transient gate emitter voltage					± 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	$I_C = 35\text{ A}; V_{GE} = 15\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		1.85	2.15	V
			$T_{VJ} = 125^{\circ}\text{C}$		2.15		V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 1.5\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	5.4	5.9	6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			0.1	mA
			$T_{VJ} = 125^{\circ}\text{C}$		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
RBSOA	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
SCSOA	short circuit safe operating area						
t_{sc}	short circuit duration	$V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$			10	μs
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	} $V_R = 600\text{ V}$ $-di_F/dt = 400\text{ A}/\mu\text{s}$ $I_F = 25\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$		1.2		μC
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_{stg}	storage temperature			-40		125	°C
T_{VJ}	virtual junction temperature			-40		150	°C
Weight					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	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB72-16NOXT	VUB72-16NOXT	Box	10	510741

Similar Part	Package	Voltage class
VUB72-12NOXT	V1-A-Pack	1200

Temperature Sensor NTC

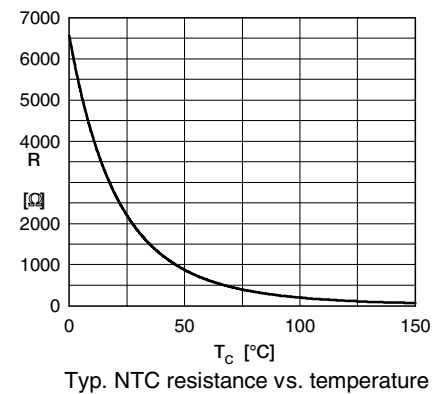
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	resistance	$T_{VJ} = 25^\circ$	2.13	2.2	2.27	k Ω
$B_{25/50}$	temperature coefficient			3560		K

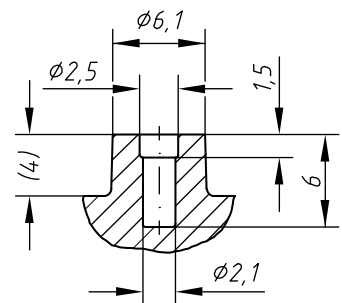
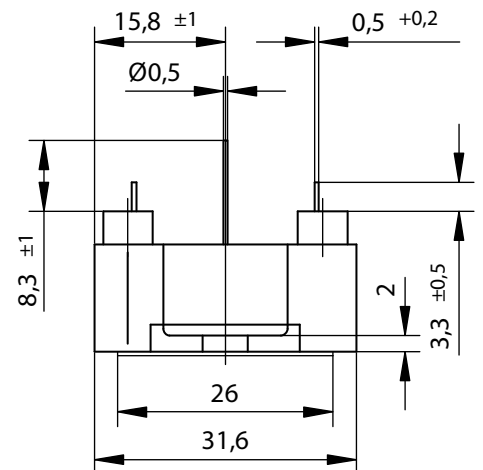
Equivalent Circuits for Simulation

* on die level

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

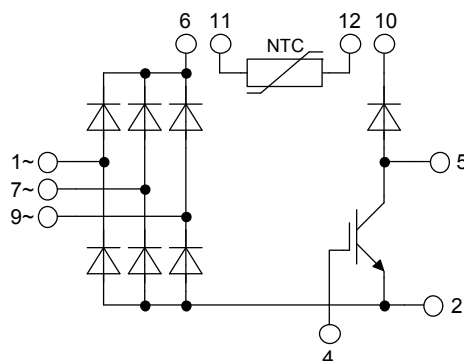
		Rectifier	Brake IGBT	Brake Diode	
$I \rightarrow$	V_0				
$V_{0\max}$	threshold voltage	0.79	1.1	1.16	V
$R_{0\max}$	slope resistance *	6.5	40	43	m Ω





Technical drawing of a mechanical part with dimensions:

- Top horizontal dimension: $0,5 \pm 0,3$
- Left vertical dimension: $1,5$
- Right horizontal dimension: $1 \pm 0,2$
- Bottom horizontal dimension: $2 \pm 0,2$



Rectifier

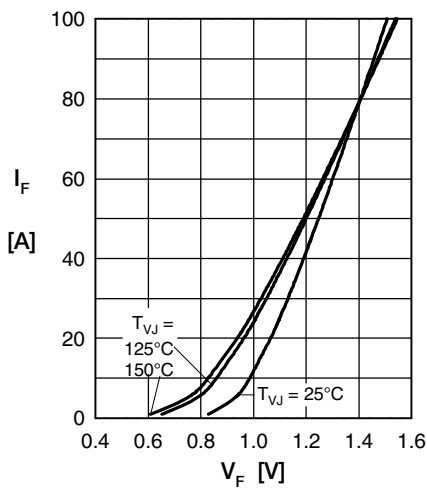


Fig. 1 Forward current vs. voltage drop per diode

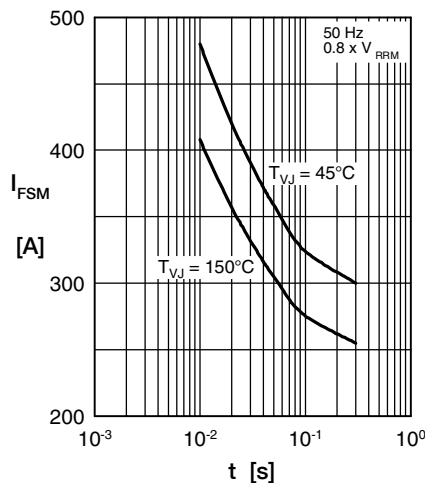


Fig. 2 Surge overload current vs. time per diode

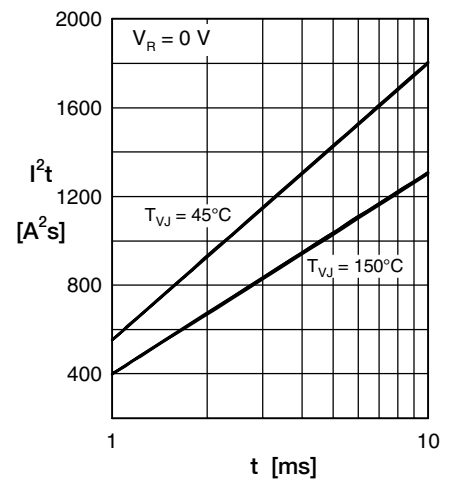


Fig. 3 I^2t vs. time per diode

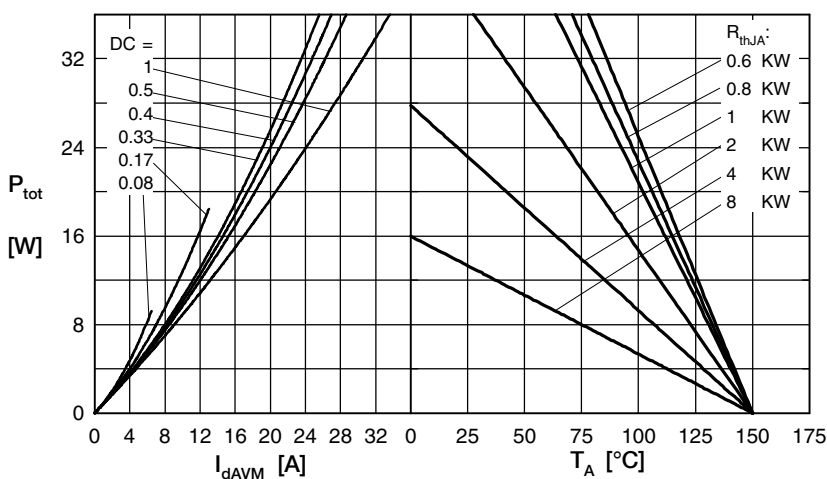


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

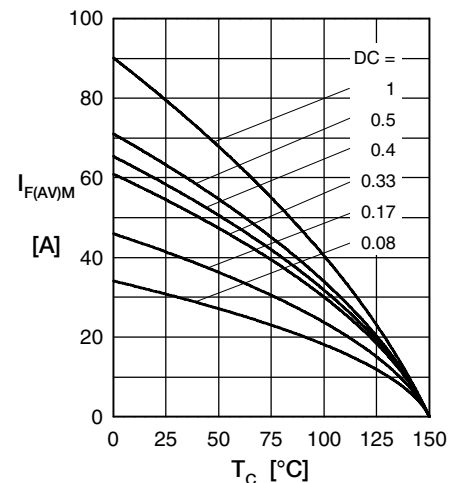


Fig. 5 Max. forward current vs. case temperature per diode

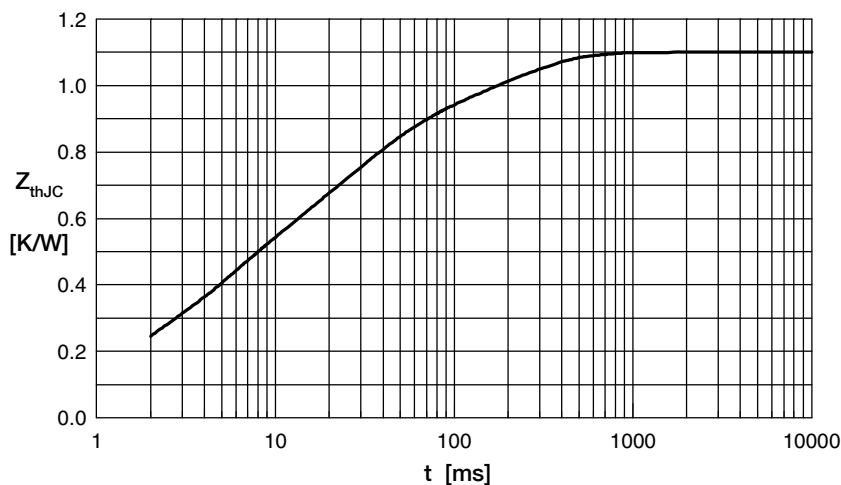


Fig. 6 Transient thermal impedance junction to case vs. time per diode

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

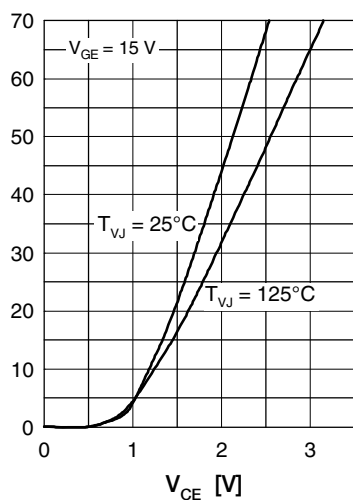


Fig. 1 Typ. output characteristics

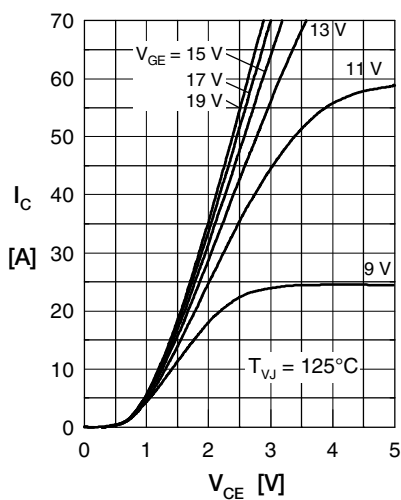


Fig. 2 Typ. output characteristics

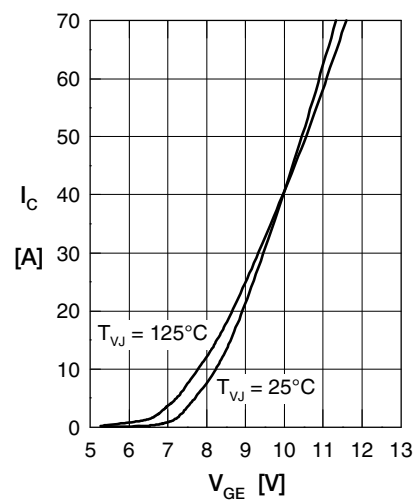


Fig. 3 Typ. transfer characteristics

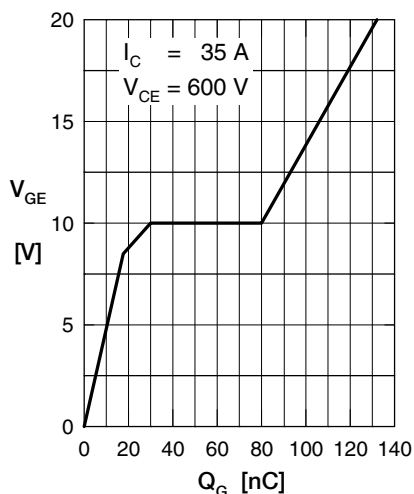


Fig. 4 Typ. turn-on gate charge

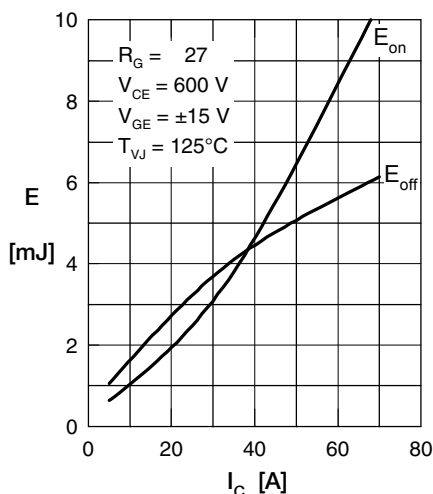


Fig. 5 Typ. switching energy versus collector current

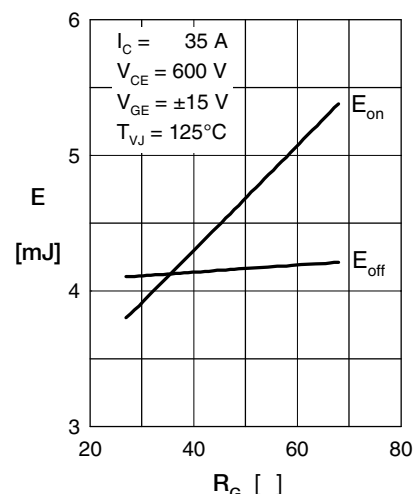


Fig. 6 Typ. switching energy versus gate resistance

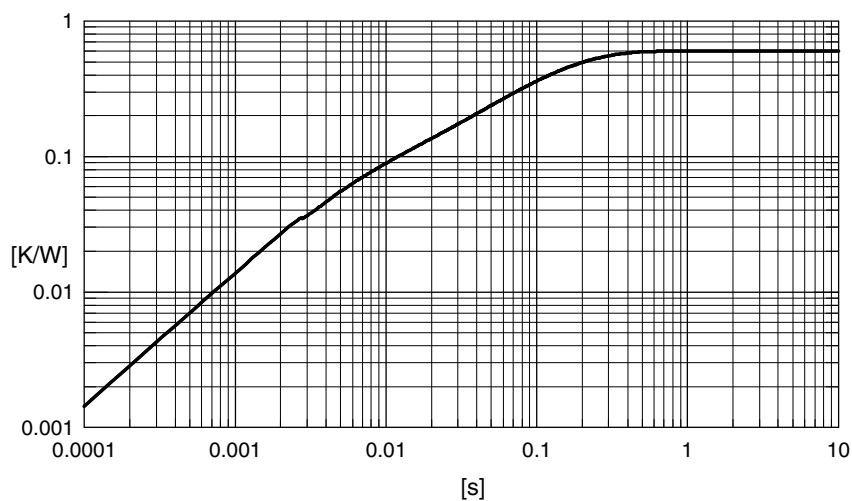


Fig. 7 Typ. transient thermal impedance

Brake Diode

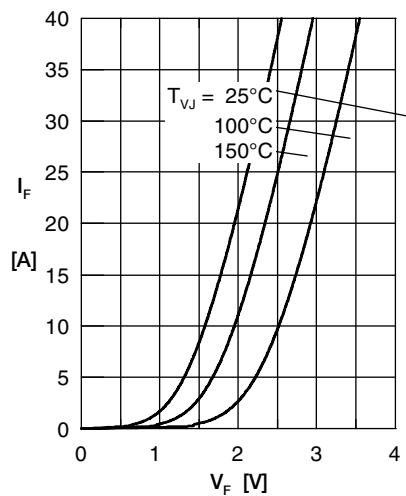


Fig. 1 Forward current I_F versus V_F

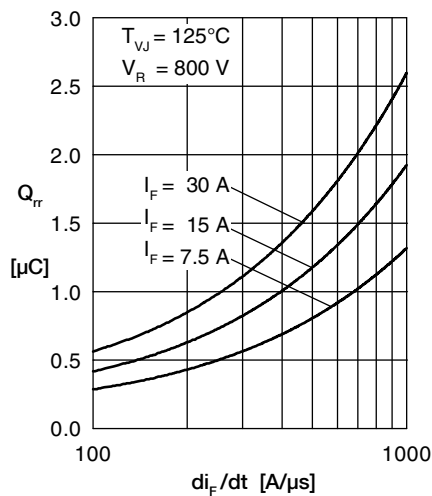


Fig. 2 Typ. reverse recov. charge Q_{rr} versus di_F/dt

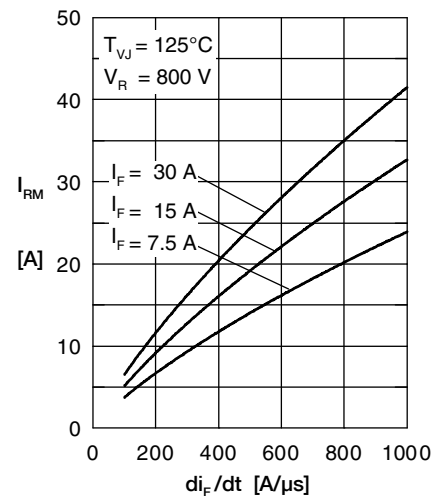


Fig. 3 Typ. peak reverse current I_{RM} versus di_F/dt

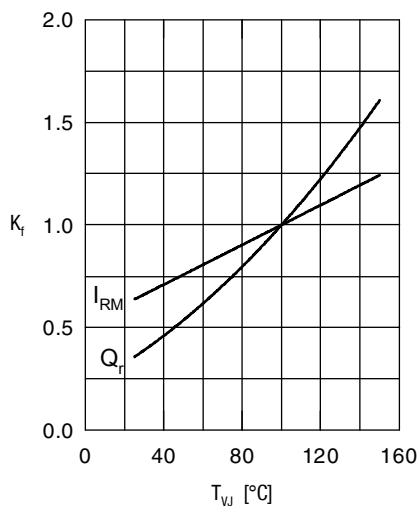


Fig. 4 Dynamic parameters Q_r , I_{RM} versus T_{VJ}

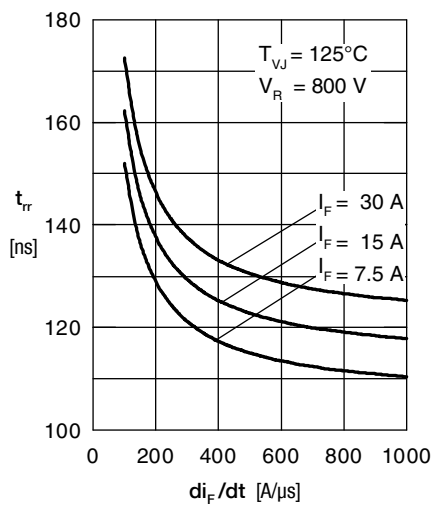


Fig. 5 Typ. recovery time t_{rr} versus di_F/dt

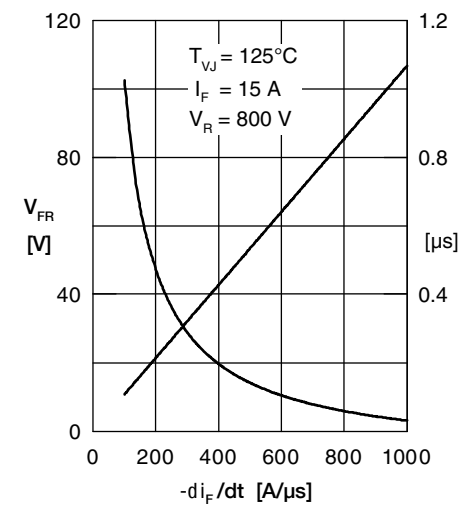


Fig. 6 Typ. peak forward voltage V_{FR} and t_{rr} versus di_F/dt

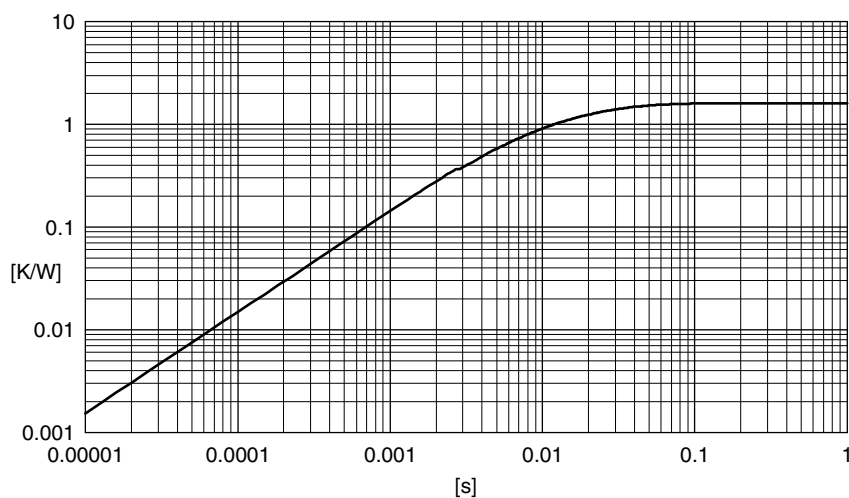


Fig. 7 Transient thermal impedance junction to case