

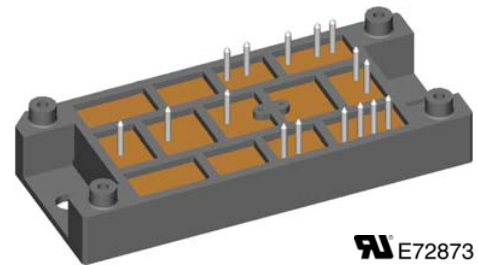
## Standard Rectifier Module

3 ~ Rectifier	Brake Chopper
$V_{RRM} = 1600 \text{ V}$	$V_{CES} = 1200 \text{ V}$
$I_{DAVM} = 188 \text{ A}$	$I_{C25} = 220 \text{ A}$
$I_{FSM} = 1100 \text{ A}$	$V_{CE(sat)} = 1.95 \text{ V}$

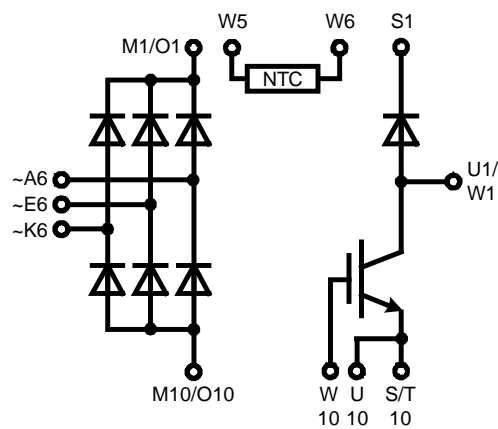
### 3~ Rectifier Bridge + Brake Unit

Part name

VUB160-16NOXT



E72873



#### Features / Advantages:

- Soldering connections for PCB mounting
- Convenient package outline
- NTC

#### Applications:

- 3~ Rectifier with brake unit for drive inverters

#### Package:

- Housing: V2-Pack
- DCB ceramic base plate
- Isolation voltage 3600 V~
- Easy to mount with two screws
- Space and weight savings
- RoHS compliant

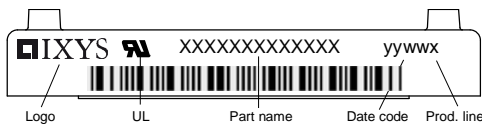
Rectifier				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM}$	max. non-repetitive reverse blocking voltage				1700	V	
$V_{RRM}$	max. repetitive reverse blocking voltage				1600	V	
$I_R$	reverse current, drain current	$V_{RD} = 1600$ V			50	$\mu$ A	
		$V_{RD} = 1600$ V			2	mA	
$V_F$	forward voltage drop	$I_T = 60$ A			1.16	V	
		$I_T = 120$ A			1.36	V	
		$I_T = 60$ A	$T_{VJ} = 125^\circ\text{C}$			1.09	V
		$I_T = 120$ A	$T_{VJ} = 125^\circ\text{C}$			1.35	V
$I_{D(AV)M}$	bridge output current	$T_C = 80^\circ\text{C}$ rectangular $d = 1/3$			188	A	
$V_{FO}$	threshold voltage	} for power loss calculation only			0.81	V	
$r_F$	slope resistance				4.4	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				0.60	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.2		K/W	
$P_{tot}$	total power dissipation				200	W	
$I_{FSM}$	max. forward surge current	$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 45^\circ\text{C}$			1.10	kA
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			1.19	kA
		$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 150^\circ\text{C}$			935	A
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			1.01	kA
$I^2t$	value for fusing	$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 45^\circ\text{C}$			6.05	kA <sup>2</sup> s
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			5.89	kA <sup>2</sup> s
		$t = 10$ ms; (50 Hz), sine	$T_{VJ} = 150^\circ\text{C}$			4.37	kA <sup>2</sup> s
		$t = 8,3$ ms; (60 Hz), sine	$V_R = 0$ V			4.25	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400$ V $f = 1$ MHz	$T_{VJ} = 25^\circ\text{C}$		37	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 collector gate voltage				$\pm 30$	V	
$I_{C25}$	collector current	$T_C = 25^{\circ}\text{C}$			220	A	
$I_{C80}$		$T_C = 80^{\circ}\text{C}$			150	A	
$P_{tot}$	total power dissipation	$T_C = 25^{\circ}\text{C}$			695	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 150\text{ A}; V_{GE} = 15\text{ V}$		1.95	2.25	V	
				2.3		V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 6\text{ mA}; V_{GE} = V_{CE}$	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	$V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 150\text{ A}$		470		nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 150\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 4.7\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$		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				14	mJ	
$E_{off}$	turn-off energy per pulse		16	mJ			
<b>RBSOA</b>	reverse bias safe operating area	$V_{GE} = \pm 15\text{ V}; R_G = 4.7\ \Omega$					
$I_{CM}$		$V_{CEK} = 1200\text{ V}$			450	A	
<b>SCSOA</b>	short circuit safe operating area						
$t_{sc}$	short circuit duration	$V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V}$			10	$\mu\text{s}$	
$I_{sc}$	short circuit current	$R_G = 4.7\ \Omega$ ; non-repetitive		600		A	
$R_{thJC}$	thermal resistance junction to case				0.18	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.1		K/W	

Brake Diode				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RRM}$	max. repetitive reverse voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200	V	
$I_{F25}$	forward current	$T_C = 25^{\circ}\text{C}$			62	A	
$I_{F80}$		$T_C = 80^{\circ}\text{C}$			40	A	
$V_F$	forward voltage	$I_F = 30\text{ A}$			2.71	V	
					1.94	V	
$I_R$	reverse current	$V_R = V_{RRM}$			0.25	mA	
					1	mA	
$Q_{rr}$	reverse recovery charge	$V_R = 600\text{ V}$ $-di_F/dt = 400\text{ A}/\mu\text{s}$ $I_F = 30\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$		1.8	$\mu\text{C}$	
$I_{RM}$	max. reverse recovery current				23	A	
$t_{rr}$	reverse recovery time				150	ns	
$R_{thJC}$	thermal resistance junction to case				0.9	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.3		K/W	

Temperature Sensor NTC				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$R_{25}$	resistance	$T_{VJ} = 25^{\circ}\text{C}$	4.75	5	5.25	k $\Omega$	
$B_{25/50}$	temperature coefficient			3375		K	

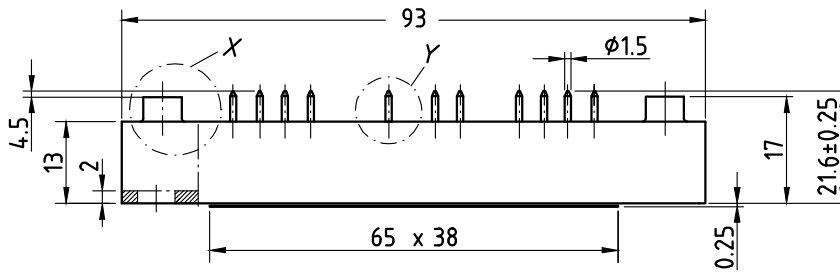
Package V2-Pack			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	$I_{RM}$ current	per terminal			100	A
$T_{stg}$	storage temperature		-40		125	°C
$T_{vj}$	virtual junction temperature		-40		150	°C
<b>Weight</b>				76		g
$M_D$	mounting torque		2		2.5	Nm
$V_{ISOL}$	isolation voltage	t = 1 second	3600			V
		t = 1 minute	3000			V
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	6.0			mm
$d_{Spb/Apb}$		terminal to backside	12.0			mm



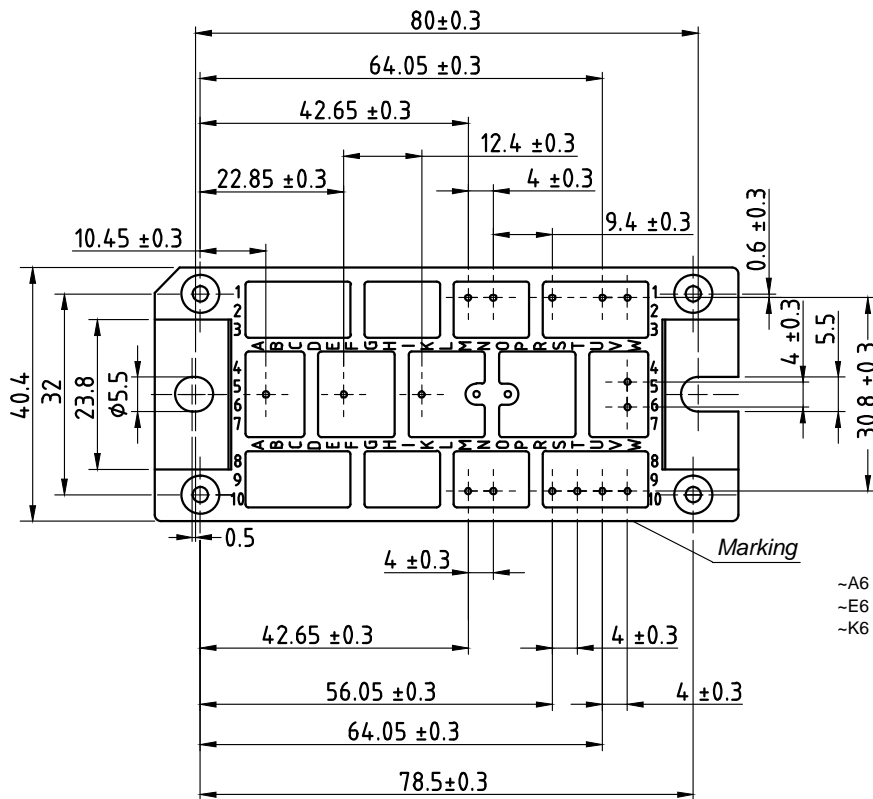
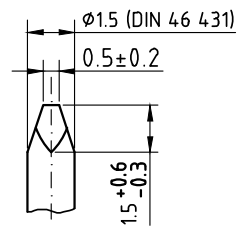
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB160-16NOXT	VUB160-16NOXT	Box	6	510148

Similar Part	Package	Voltage class
VUB160-16NOX	V2-Pack	1600

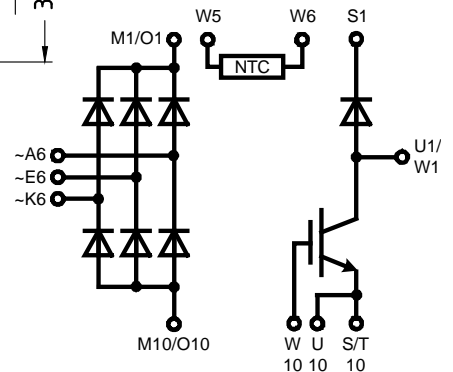
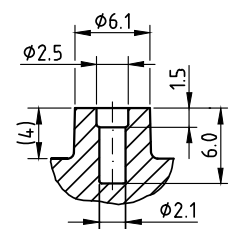
**Outlines**



**Detail Y M 5:1**



**Detail X M 2:1**



Rectifier

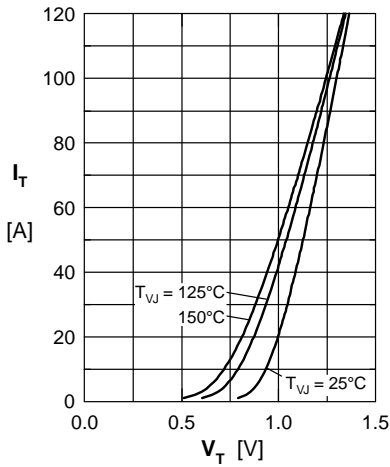


Fig.1 Forward current versus voltage drop per diode

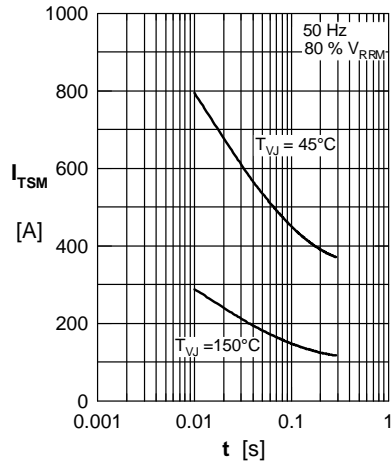


Fig.2 Surge overload current

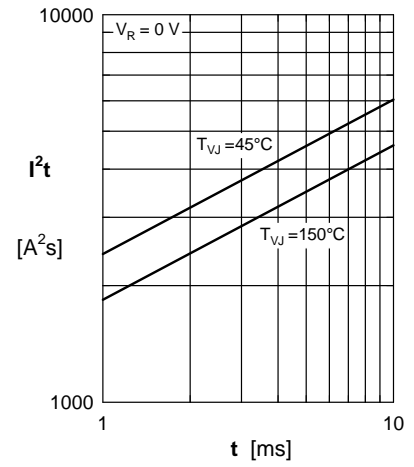


Fig.3  $I^2t$  versus time per diode

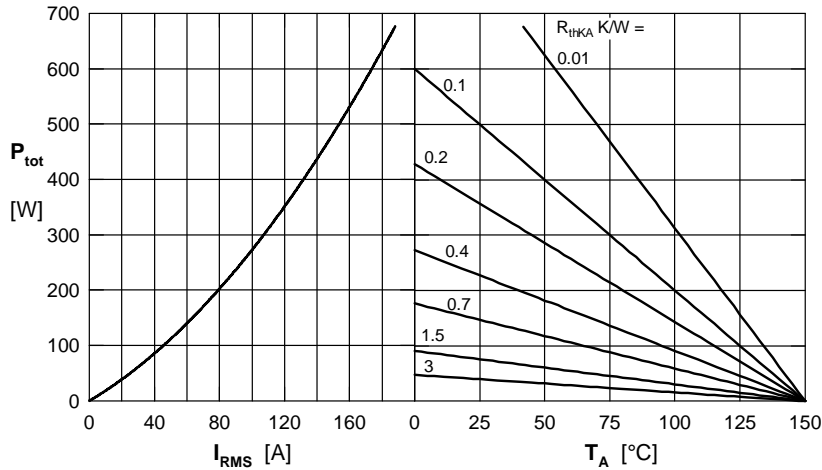


Fig.4 Power dissipation versus direct output current and ambient temperature, sine 180°

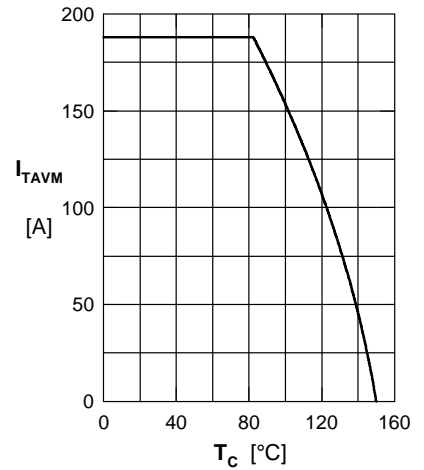


Fig.5 Max. forward current vs. case temperature

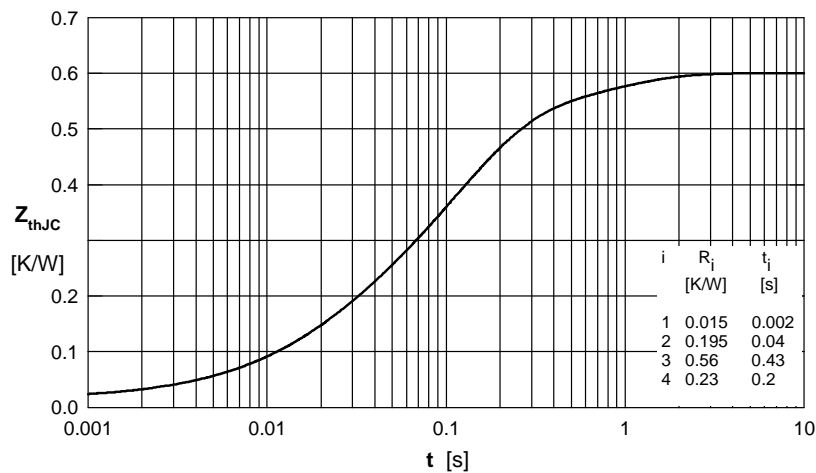


Fig.6 Transient thermal impedance junction to case

**Brake IGBT**

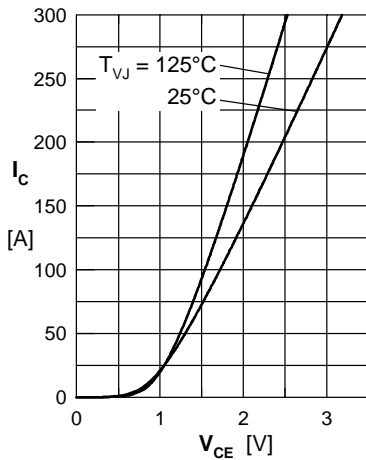


Fig. 1 Typ. output characteristics

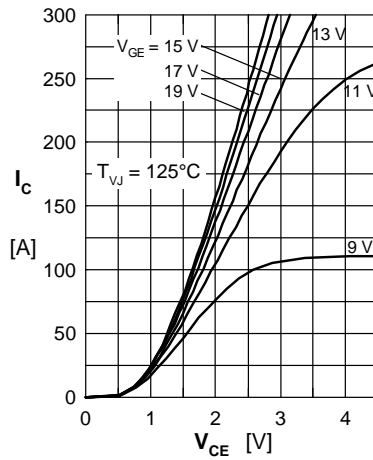


Fig. 2 Typ. output characteristics

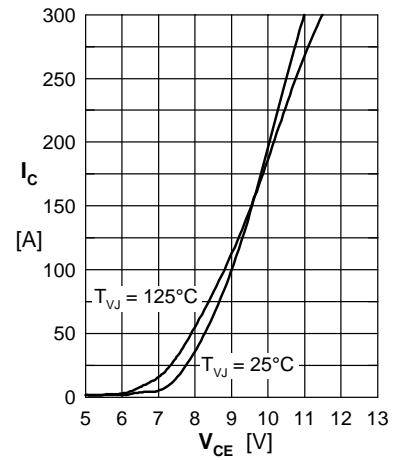


Fig. 3 Typ. transfer characteristics

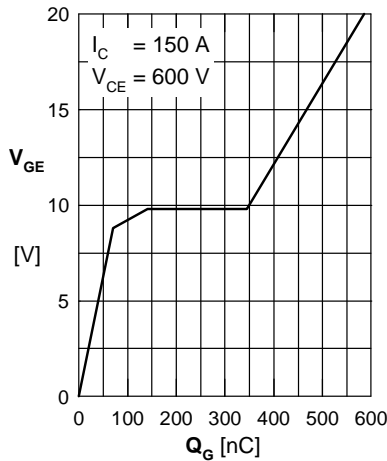


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

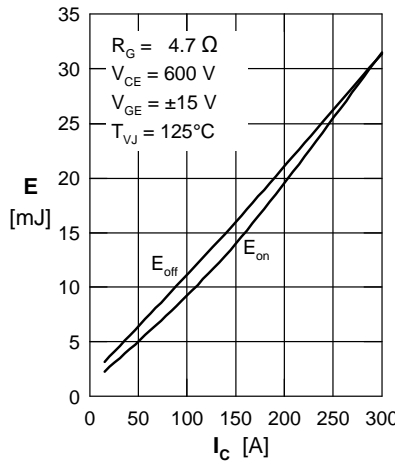


Fig. 5 Typ. recovery time  $t_{tr}$  vs.  $-di_F/dt$

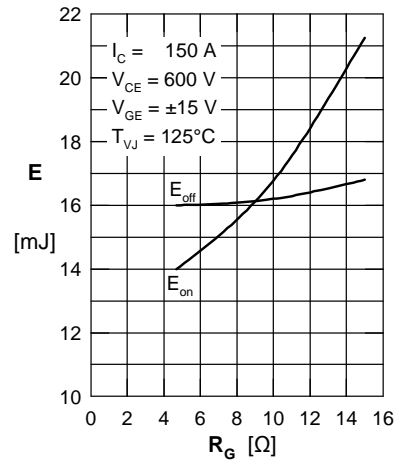


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

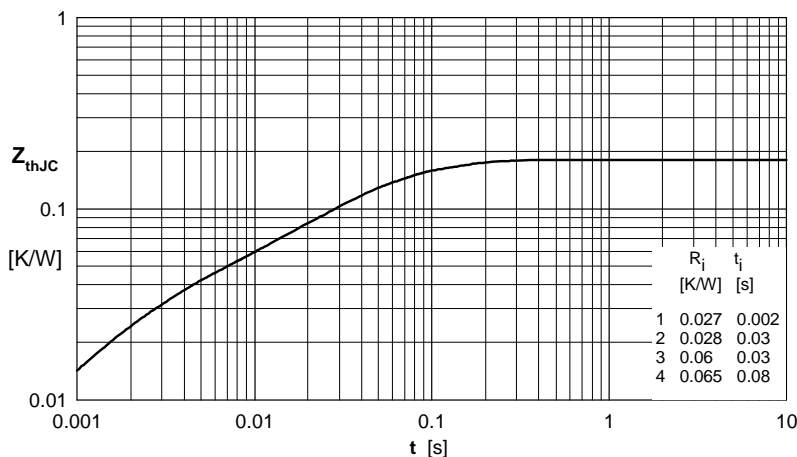


Fig. 7 Transient thermal impedance junction to case

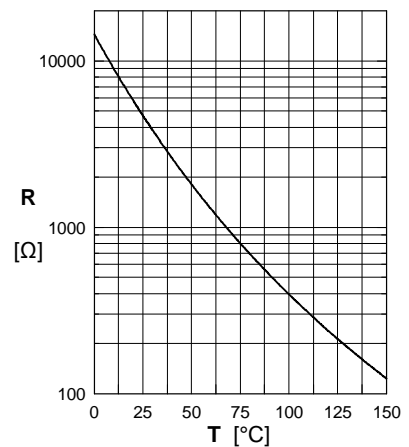


Fig. 8 Typ. thermistor resistance versus temperature

Brake Diode

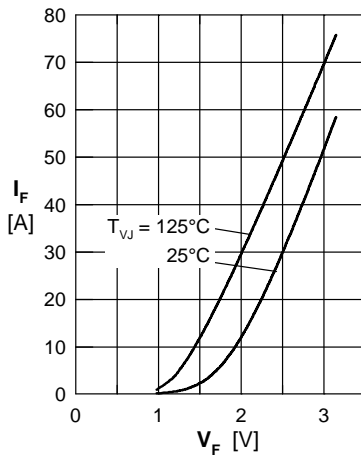


Fig. 1 Typ. forward current  $I_F$  vs.  $V_F$

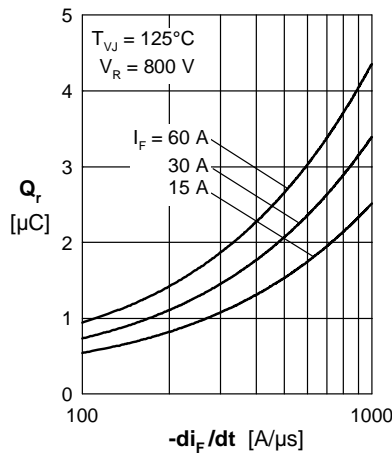


Fig. 2 Typ. reverse recovery charge  $Q_r$  versus  $-di_F/dt$

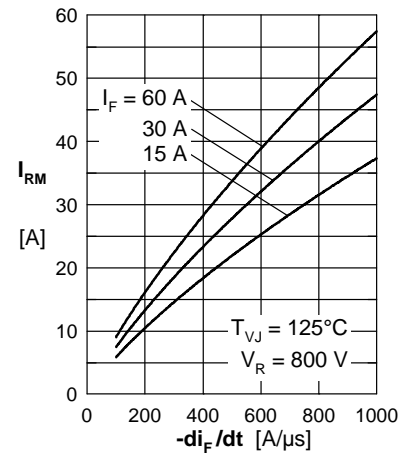


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

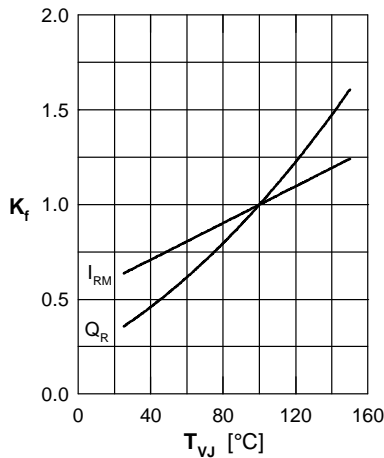


Fig. 4 Typ. dynamic parameters  $Q_r$ ,  $I_{RM}$ , versus  $T_{VJ}$

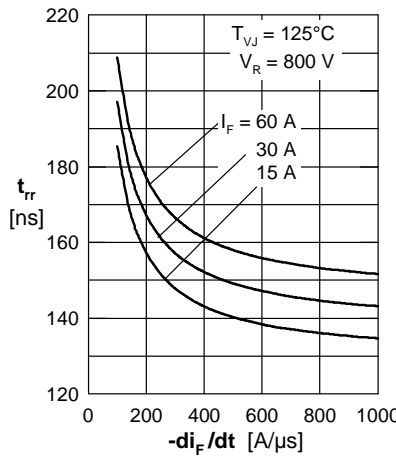


Fig. 5 Typ. recovery time  $t_{rr}$  vs.  $-di_F/dt$

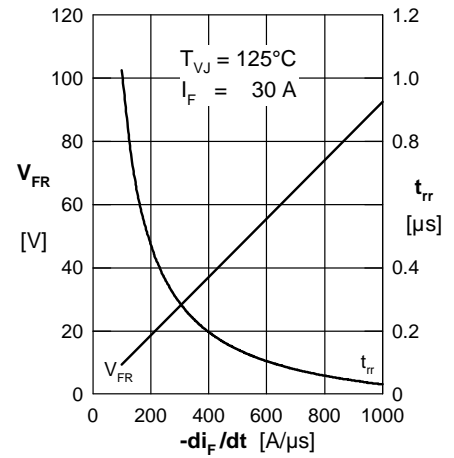


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

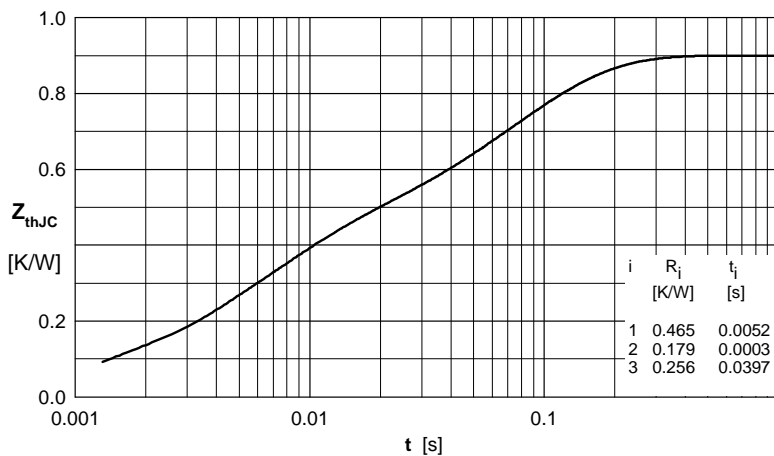


Fig. 7 Typ. transient thermal impedance junction to case