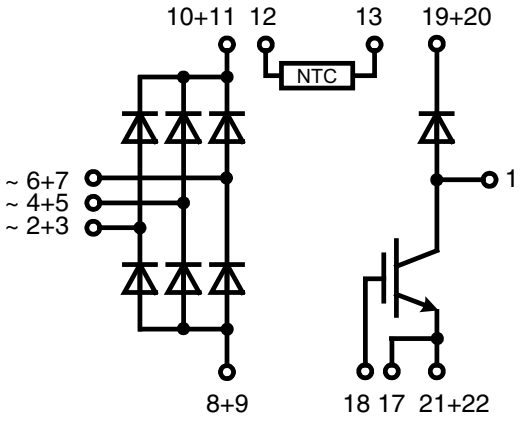
Three Phase Rectifier Bridge

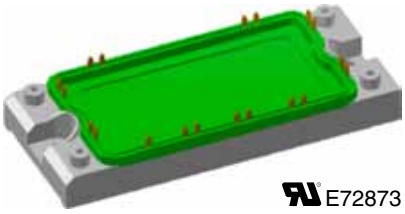
with IGBT and Fast Recovery Diode
for Braking System

Rectifier Diode	Fast Recov. Diode	IGBT
V_{RRM} = 1600 V	V_{CES} = 1200 V	V_{CES} = 1200 V
I_{dAVM} = 145 A	V_F = 2.75 V	I_{C80} = 108 A
I_{FSM} = 1100 A	I_{FSM} = 200 A	V_{CEsat} = 2.35 V

Part name (Marking on product)

VUB145-16NOXT





Features:

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

Application:

- Drive Inverters with brake system

Package:

- Two functions in one package
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability
- UL registered, E72873

IGBT

Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
V_{CES}	*collector emitter voltage*		T_{VJ} = 25°C to 150°C			1200	V
V_{GES}	*max. DC gate voltage*	continuous		-20		+20	V
V_{GEM}	*max. transient collector gate voltage*	transient		-30		+30	V
I_{C25}	*collector current*	DC	T_C = 25°C			155	A
I_{C80}		DC	T_C = 80°C			108	A
P_{tot}	*total power dissipation*		T_C = 25°C			500	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 100 A; V_{GE} = 15 V	T_{VJ} = 25°C		2.05	2.35	V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 4 mA	T_{VJ} = 25°C	5.4		6.5	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C		0.01	0.1	mA
			T_{VJ} = 125°C		0.1		mA
I_{GES}	*gate emitter leakage current*	V_{CE} = 0 V; V_{GE} = ±20 V				500	nA
$Q_{G(on)}$	*total gate charge*	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 100 A			295		nC
$t_{d(on)}$	*turn-on delay time*	inductive load	T_{VJ} = 125°C		70		ns
$t_{d(off)}$	*turn-off delay time*	V_{CE} = 600 V; I_C = 100 A			250		ns
t_r	*current rise time*	V_{GE} = ±15 V; R_G = 6.8 Ω; L = 100 µH			40		ns
t_f	*current fall time*				100		ns
E_{on}	*turn-on energy per pulse*				8.5		mJ
E_{off}	*turn-off energy per pulse*				11.5		mJ
I_{CM}	*reverse bias safe operating area*	RBSOA; V_{GE} = ±15 V; R_G = 6.8 Ω; L = 100 µH			200		A
V_{CEK}		clamped inductive load;	T_{VJ} = 125°C		≤ V_{CES}-L_S·d_i/dt		V
SCSOA	*short circuit safe operating area*						
t_{SC}		V_{CE} = 720 V; V_{GE} = ±15 V;	T_{VJ} = 125°C			10	µs
I_{SC}		R_G = 6.8 Ω; non-repetitive				400	A
RBSOA	*reverse bias safe operating area*	V_{CE} = 1200 V; V_{GE} = ±15 V;	T_{VJ} = 125°C			300	A
		R_G = 6.8 Ω; L = 100 µH; clamped inductive load					
R_{thJC}	*thermal resistance junction to case*					0.25	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.1		K/W

Fast Recovery Diode

Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 150°C			1200	V
I_{FAV}	*average forward current*	rect.; d = 0.5	T_C = 80°C			32	A
I_{FRMS}	*rms forward current*	rect.; d = 0.5	T_C = 80°C			45	A
I_{FSM}	*max. surge forward current*	t = 10 ms	T_{VJ} = 45°C			200	A
P_{tot}	*total power dissipation*		T_C = 25°C			130	W
V_{F0}	*threshold voltage*		T_{VJ} = 150°C			1.3	V
r_F	*slope resistance*	for power loss calculation only				17	mΩ
V_F	*forward voltage*	I_F = 30 A	T_{VJ} = 25°C			2.75	V
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C			0.25	mA
			T_{VJ} = 125°C		1		mA
I_{RM}	*reverse recovery current*	I_F = 50 A; V_R = 100 V; di_F/dt = -100 A/µs			8	11	A
t_{rr}	*reverse recovery time*	I_F = 1 A; V_R = 30 V; di_F/dt = -200 A/µs			40		ns
R_{thJC}	*thermal resistance junction to case*					0.9	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.3		K/W

T_C = 25°C unless otherwise stated

IXYS reserves the right to change limits, test conditions and dimensions.

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Rectifier Diode

Symbol	Conditions			Ratings min.	typ.	max.	
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 25°C			1600	V
I_R	*reverse current*	$V_R = V_{RRM}$	T_{VJ} = 25°C T_{VJ} = 150°C			0.05 2	mA mA
V_F	*forward voltage*	I_F = 150 A	T_{VJ} = 25°C			1.68	V
$I_{D(AV)M}$	*max. average DC output current*	sine; d = $^1/_3$; bridge	T_C = 95°C			145	A
V_{F0} r_F	*threshold voltage* *slope resistance*	*for power loss calculation only*	T_{VJ} = 150°C			0.87 5.9	V mΩ
R_{thJC}	*thermal resistance junction to case*	per diode	T_{VJ} = 25°C			0.5	K/W
R_{thCH}	*thermal resistance case to heatsink*		T_{VJ} = 25°C			0.1	K/W
P_{tot}	*total power dissipation*		T_{VJ} = 25°C			250	W
I_{FSM}	*max. forward surge current*	t = 10 ms (50Hz) V_R = 0 V	T_{VJ} = 45°C T_{VJ} = 150°C			1100 960	A A
I^2t	*value for fusing*	t = 10 ms (50Hz) V_R = 0 V	T_{VJ} = 45°C T_{VJ} = 150°C			6050 4610	A^2s A^2s

Temperature Sensor NTC

Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
R_{25}	*resistance*		T_C = 25°C	4.75	5.0	5.25	kΩ
$B_{25/85}$					3375		K

Module

Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
T_{VJ}	*operating temperature*			-40		125	°C
T_{VJM}	*max. virtual junction temperature*					150	°C
T_{stg}	*storage temperature*			-40		125	°C
V_{ISOL}	*isolation voltage*	$I_{ISOL} \leq$ 1 mA; 50/60 Hz;	t = 1 min. t = 1 s			3000 3600	V~ V~
M_d	*mounting torque*	(M5)		3		6	Nm
d_S	*creep distance on surface*			12.7			mm
d_A	*strike distance through air*			9.6			mm
a	*maximum allowable acceleration*					50	m/s^2
$R_{pin-chip}$	*thermal resistance pin to chip*		T_{VJ} = 25°C		2		mΩ
Weight					180		g

T_C = 25°C unless otherwise stated

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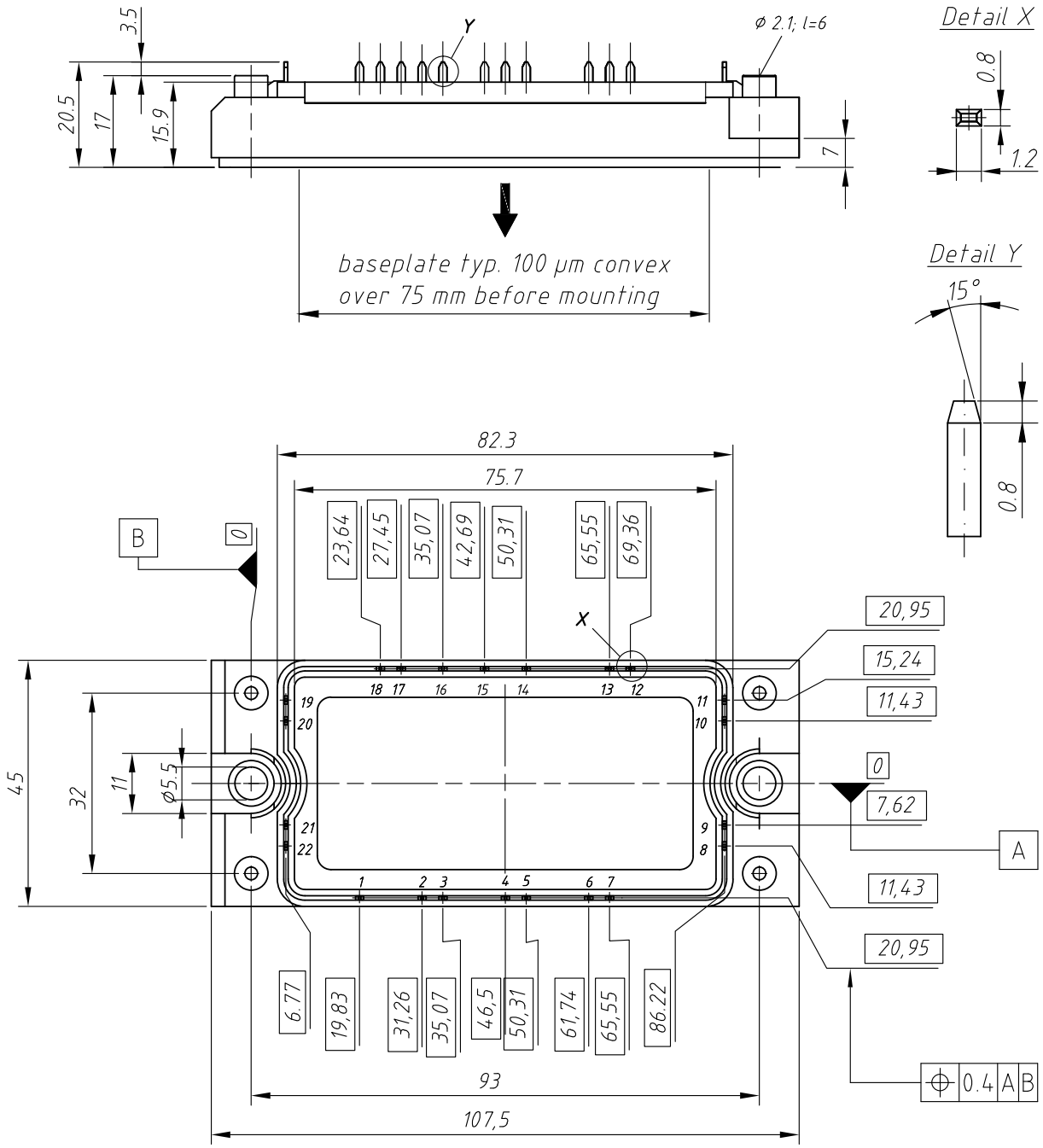
Outline Drawing

Dimensions in mm (1 mm = 0.0394“)



Product Marking

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	VUB 145-16NOXT	VUB145-16NOXT	Box	6	510475

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Rectifier Diode

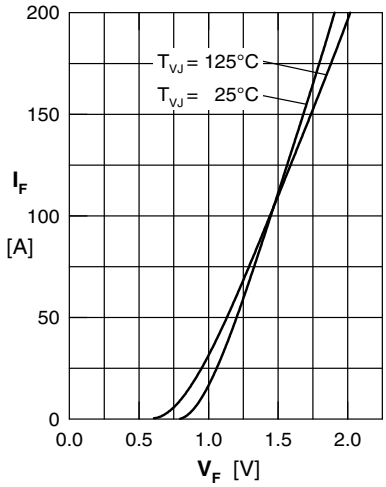

Fig. 1 Typ. forward current vs. voltage drop per diode

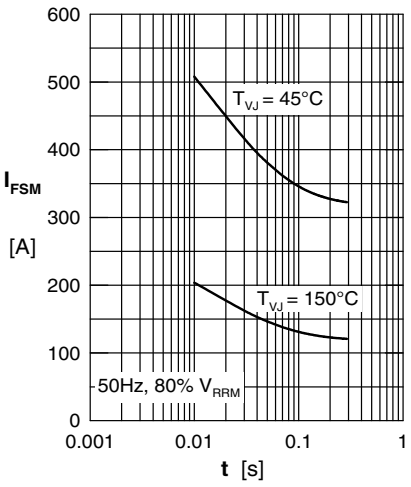

Fig. 2 Surge overload current

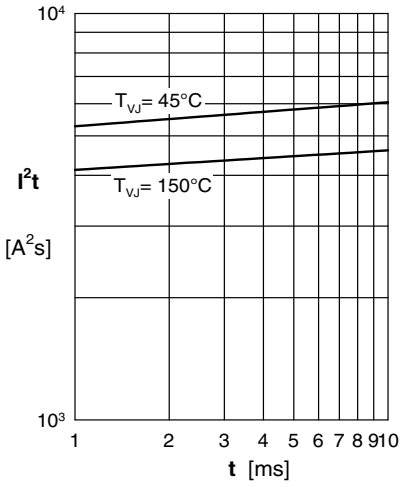

Fig. 3 I^2t versus time per diode

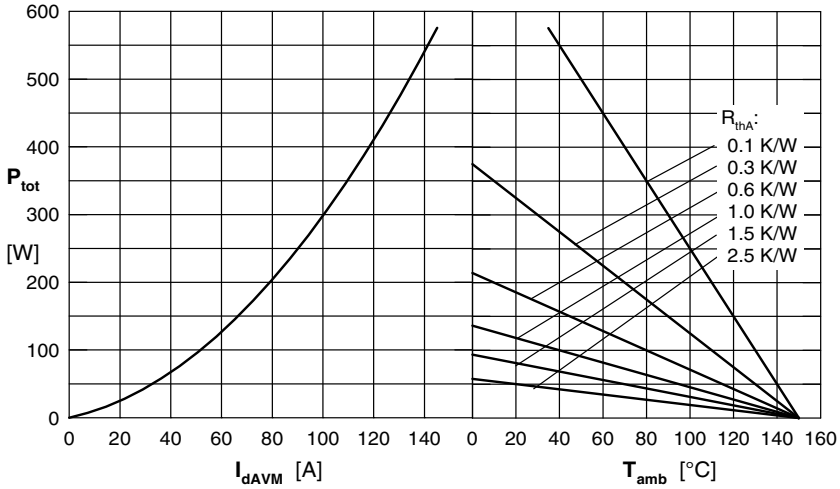

Fig. 4 Typ. power dissipation versus direct output current and ambient temperature, sine 120°

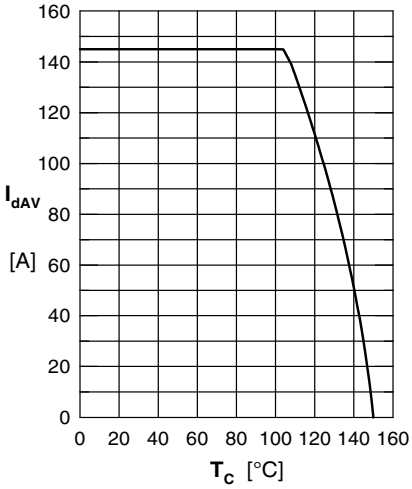

Fig. 5 Max. forward current vs. case temperature

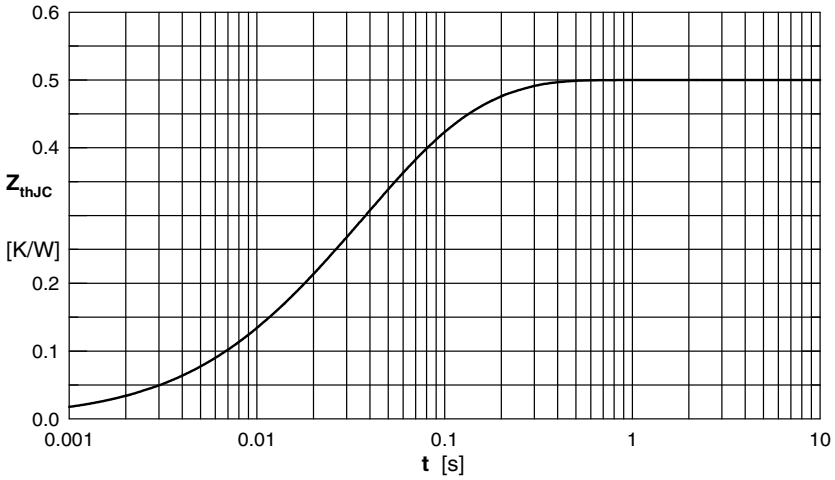

Fig. 6 Typ. transient thermal impedance junction to case

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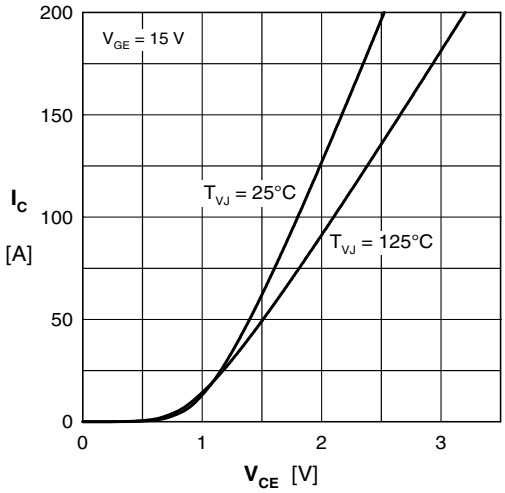

Fig. 1 Typ. output characteristics on die level

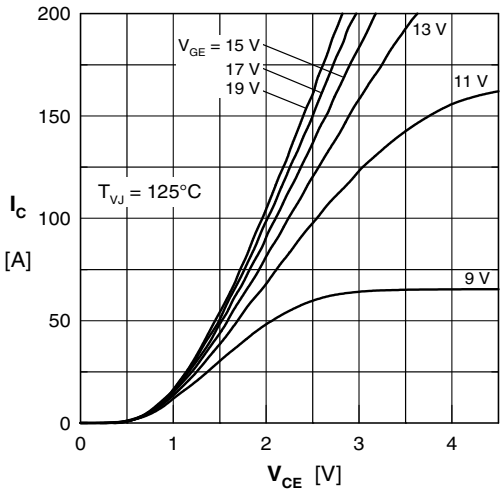

Fig. 2 Typ. output characteristics on die level

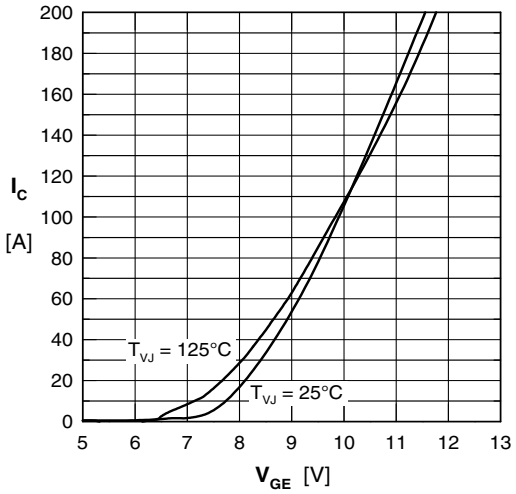

Fig. 3 Typ. tranfer characteristics

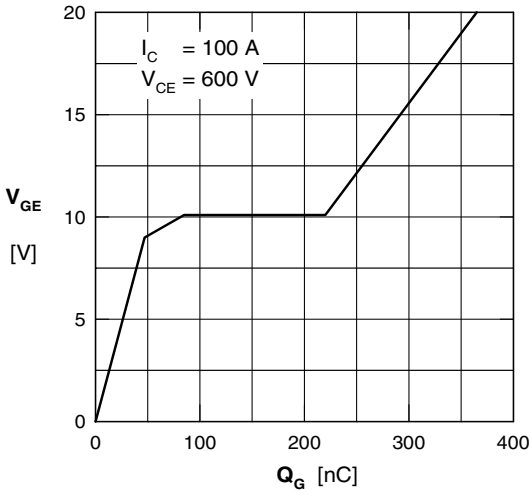

Fig. 4 Typ. turn-on gate charge

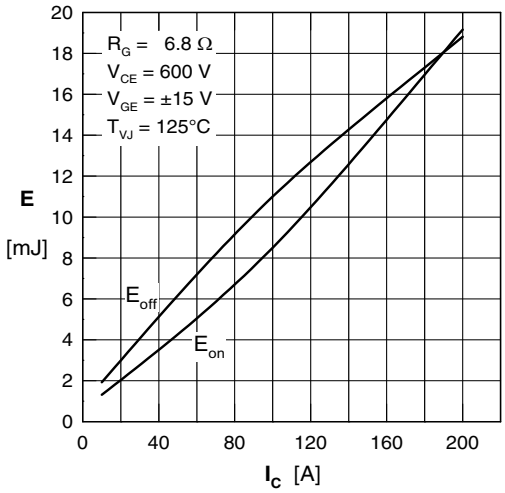

Fig. 5 Typ. switching energy vs. collector current

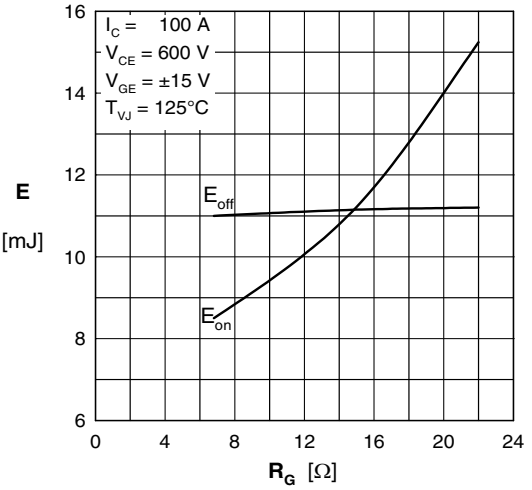

Fig. 6 Typ. switching energy vs. gate resistance

Fast Recovery Diode

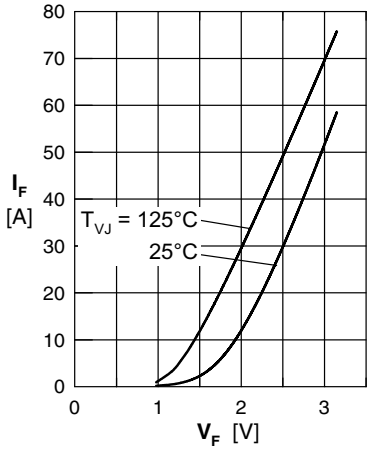

Fig. 1 Typ. forward current I_F vs. V_F

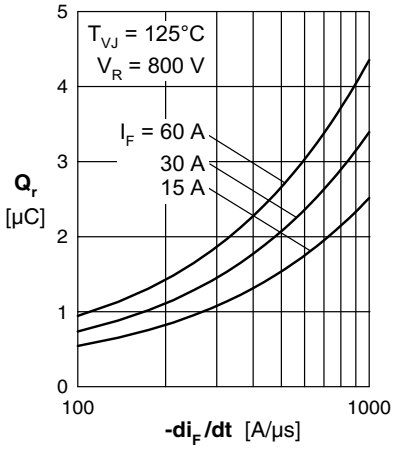

Fig. 2 Typ. reverse recovery charge Q_r versus -di_F/dt

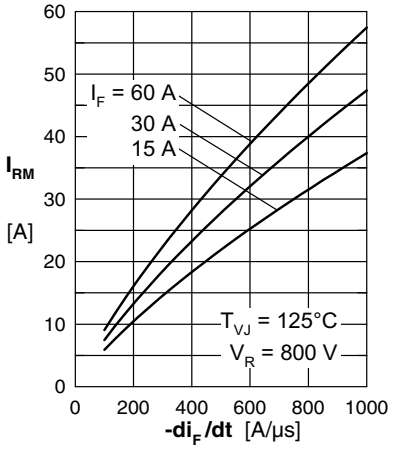

Fig. 3 Typ. peak reverse current I_{RM} versus -di_F/dt

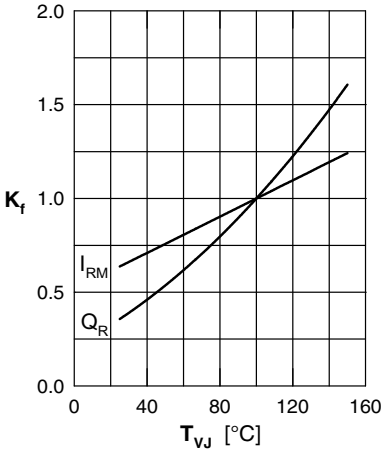

Fig. 4 Typ. dynamic parameters Q_r, I_{RM}, versus T_{VJ}

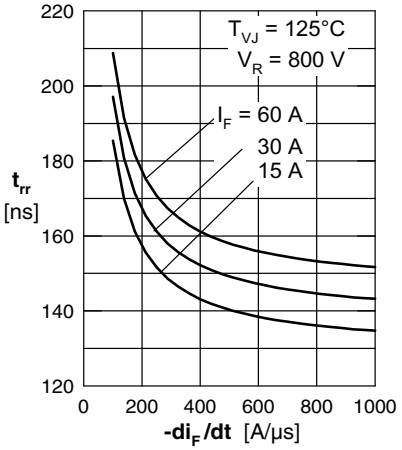

Fig. 5 Typ. recovery time t_{rr} vs. -di_F/dt

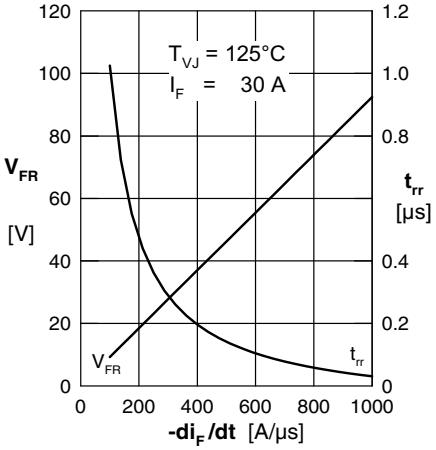

Fig. 6 Typ. peak forward voltage V_{FR} and t_{fr} versus di_F/dt

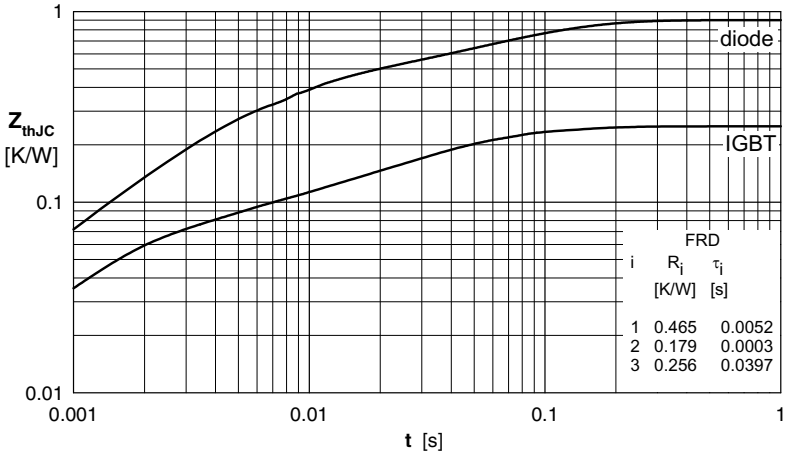

Fig. 7 Typ. transient thermal impedance junction to case

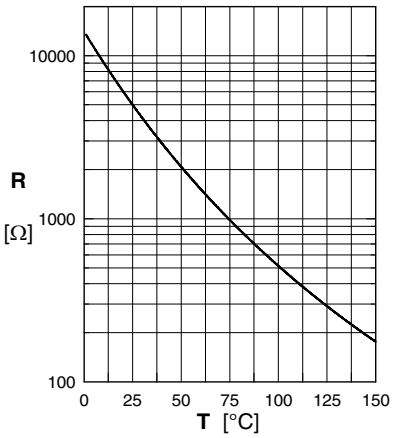

Fig. 8 Typ. thermistor resistance versus temperature