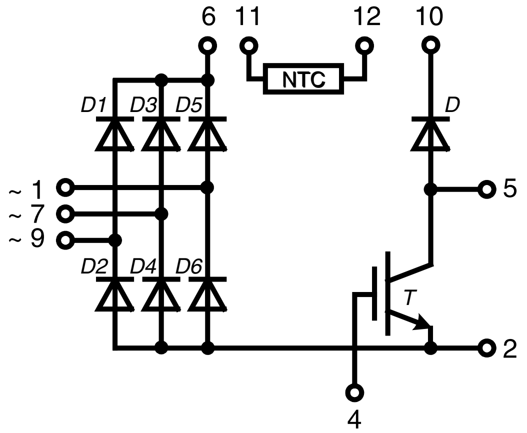
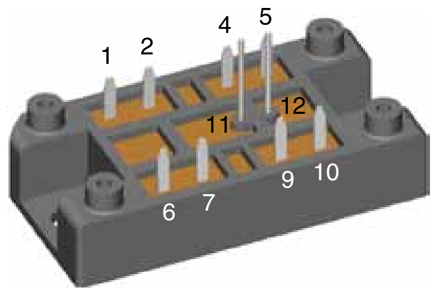
Three Phase Rectifier Bridge
with Brake Chopper

V_{RRM} = 1200/1600 V
I_{dAVM} = 110 A

Part name (Marking on product)

VUB72-12NOXT
VUB72-16NOXT





Features:

- Three phase mains rectifier
- Brake chopper:
  - IGBT with low saturation voltage
  - HiPerFRED™ free wheeling diode

Application:

- Drives with
  - mains input
  - DC link
  - inverter or chopper feeding the machine
  - motor and generator/brake operation

Package:

- High level of integration
- Solder terminals for PCB mounting
- UL pending, E72873
- Isolated DCB ceramic base plate
- Large creepage and strike distances
- High reliability

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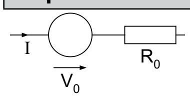
Chopper IGBT T

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
I_{C25} I_{C80}	*collector current*	DC DC	T_C = 25°C T_C = 80°C			58 40	A A
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 35 A; V_{GE} = 15 V	T_{VJ} = 25°C T_{VJ} = 125°C		1.85 2.15	2.2	V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 1 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 T_{VJ} = 125°C		 0.1	0.1	mA mA
I_{GES}	*gate emitter leakage current*	V_{CE} = 0 V; V_{GE} = ±20 V				500	nA
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	*turn-on delay time* *current rise time* *turn-off delay time* *current fall time* *turn-on energy per pulse* *turn-off energy per pulse*	inductive load V_{CE} = 600 V; I_C = 35 A V_{GE} = ±15 V; R_G = 27 Ω; L = 100 μH	T_{VJ} = 125°C		70 40 250 100 3.8 4.1		ns ns ns ns mJ mJ
Q_{Gon}		V_{CE} = 600 V; V_{GE} = 15 V; I_C = 35 A			110		nC
I_{CM} V_{CEK}	*reverse bias safe operating area*	RBSOA; V_{GE} = ±15 V; R_G = 27 Ω; L = 100 μH clamped inductive load;	 T_{VJ} = 125°C		70 $\leq V_{CES}-L_S \cdot d_I/dt$		A V
t_{SC} **(SCSOA)**	*short circuit safe operating area*	V_{CE} = 900 V; V_{GE} = ±15 V; R_G = 27 Ω; non-repetitive	T_{VJ} = 125°C			10	μs
R_{thJC}	*thermal resistance junction to case*					0.65	K/W
R_{thCH}	*thermal resistance case to heatsink*	with heat transfer paste, see mounting instructions			0.9		K/W

Chopper Diode D

Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 150°C			1200	V
I_{F25} I_{F80}	*forward current*	DC	T_C = 25°C T_C = 125°C			25 15	A A
V_F	*forward voltage*	I_F = 25 A	T_{VJ} = 25°C T_{VJ} = 125°C		2.7 2.0	3.1	V V
I_R	*reverse current*	$V_R = V_{RRM}$	T_{VJ} = 25°C T_{VJ} = 125°C		 0.1	0.1	mA mA
I_{RM} t_{rr}	*reverse recovery current* *reverse recovery time*	I_F = 15 A; V_R = 600 V di_F/dt = -400 A/μs	T_{VJ} = 125°C		16 130		A ns
R_{thJC}	*thermal resistance junction to case*					2.3	K/W
R_{thJH}	*thermal resistance case to heatsink*	with heat transfer paste				3.12	K/W

Equivalent Circuits for Simulation



Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
V_0 R_0	*Diode*	D1 - D6	T_{VJ} = 125°C		0.85 7		V mΩ
V_0 R_0	*IGBT*	T	T_{VJ} = 150°C		1.1 40		V mΩ
V_0 R_0	*Diode*	D	T_{VJ} = 125°C		1.25 32		V mΩ

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Input Rectifier Diode D1 - D6

Symbol	Conditions			Ratings min.	typ.	max.	
V_{RRM}	*max. repetitive reverse voltage*	VUB 72 -12 NO1 VUB 72 -16 NO1	T_{VJ} = 25°C			1200 1600	V V
I_{FAV} $I_{D(AV)M}$ I_{FSM}	*average forward current* *max. average DC output current* *max. surge forward current*	sine 180° rectangular; d = 1/3; bridge t = 10 ms; sine 50 Hz	T_C = 80°C T_C = 80°C T_{VJ} = 25°C			40 110 530	A A A
P_{tot}	*total power dissipation*		T_C = 25°C			100	W
I_R	*reverse current*	$V_R = V_{RRM}$ $V_R = 0.8 \cdot V_{RRM}$	T_{VJ} = 25°C T_{VJ} = 125°C		 0.4	0.02	mA mA
V_F	*forward voltage*	I_F = 25 A	T_{VJ} = 25°C T_{VJ} = 125°C		1.0 0.9	1.1	V V
R_{thJC}	*thermal resistance junction to case*	per diode	T_{VJ} = 25°C			1.2	K/W
R_{thJH}	*thermal resistance case to heatsink*	with heat transfer paste	T_{VJ} = 25°C			1.42	K/W

Temperature Sensor NTC

Symbol	Definitions	Conditions		min.	Ratings typ.	max.	Unit
R_{25} $B_{25/100}$	*resistance*	$\left\{R(T) = R_{25} \cdot e^{B_{25/100}\left[\frac{1}{T} - \frac{1}{298K}\right]}\right\}$	T = 25°C		2.2 3560		kΩ K

Module

Symbol	Definitions	Conditions		min.	Ratings typ.	max.	Unit
I_{RMS}	*RMS current*	per pin				100	A
T_{VJ} T_{VJM} T_{stg}	*operating temperature* *max. virtual junction temperature* *storage temperature*			-40 -40		150 150 125	°C °C °C
V_{ISOL}	*isolation voltage*	$I_{ISOL} \leq$ 1 mA; 50/60 Hz;	t = 1 min			3600	V~
M_d	*mounting torque*	(M5)		2		2.5	Nm
d_S d_A	*creep distance on surface* *strike distance through air*			5 5			mm mm
Weight					35		g

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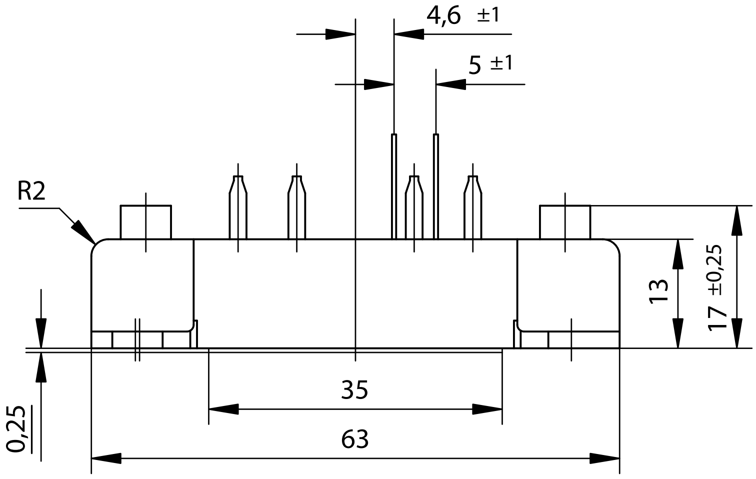
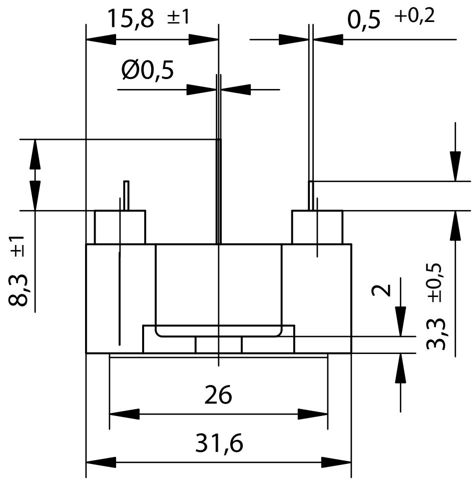
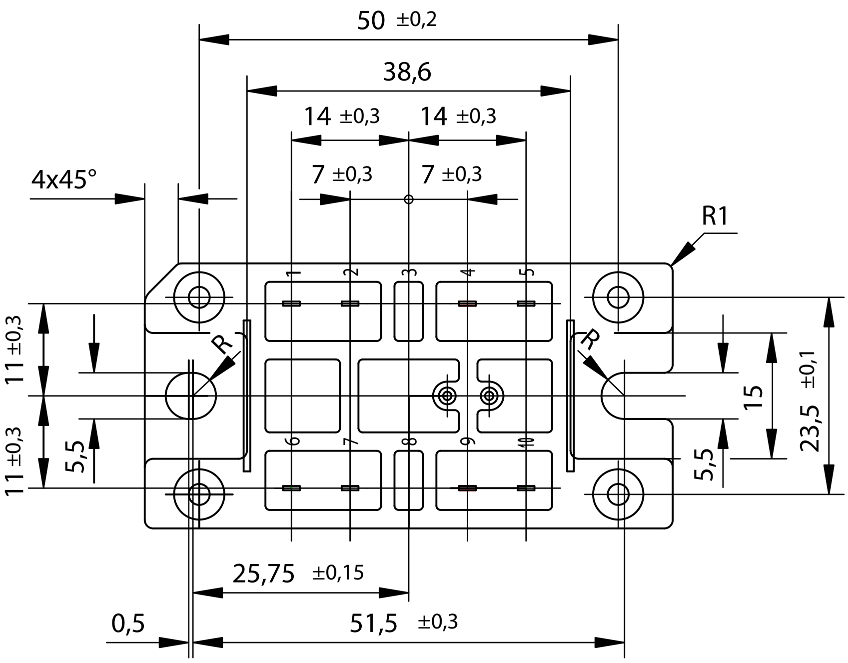
Outline Drawing Dimensions in mm (1 mm = 0.0394“)







Product Marking

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	VUB 72-12NOXT	VUB72-12NOXT	Box	10	510734
Standard	VUB 72-16NOXT	VUB72-16NOXT	Box	10	510741

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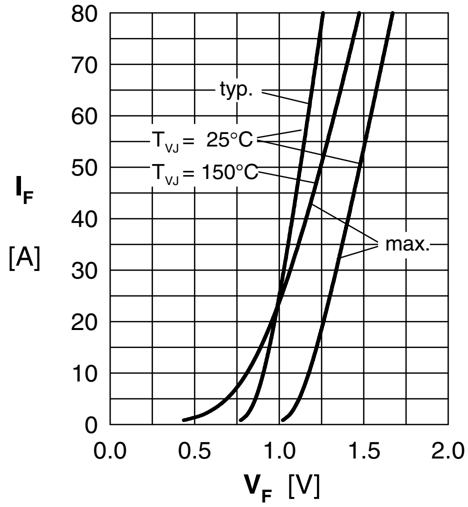

Fig. 1 Forward current vs. voltage drop per rectifier diode

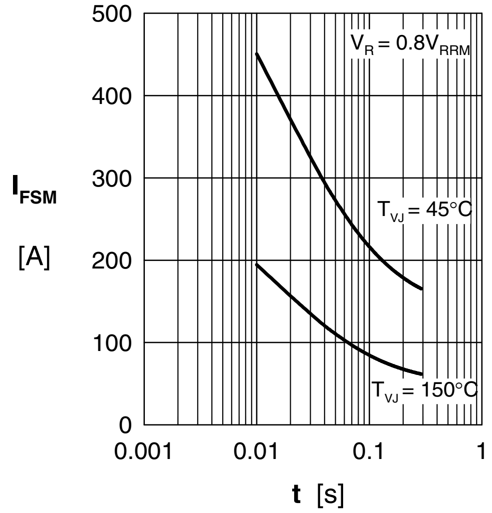

Fig. 2 Surge overload current per rectifier diode

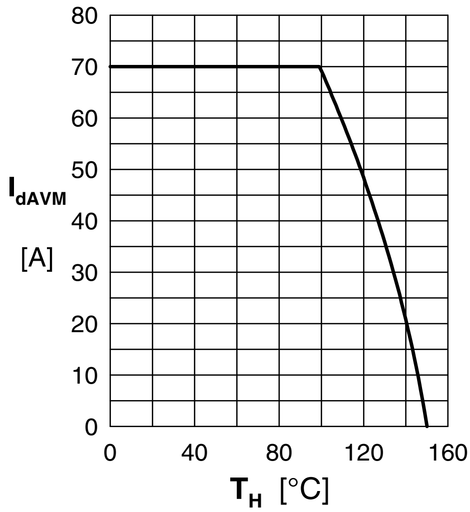

Fig. 3 Max. forward current vs. heatsink temperature (Rectifier bridge)

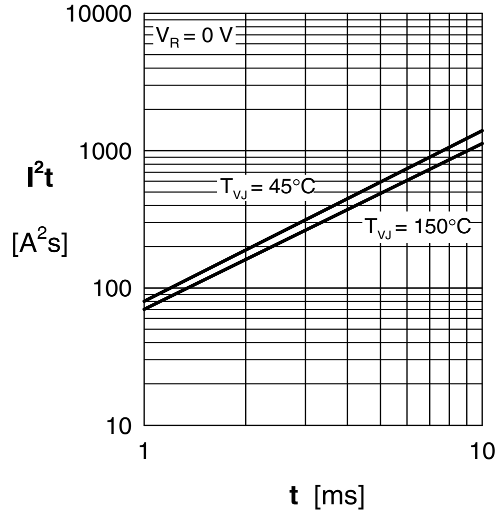

Fig. 4 I^2t versus time per rectifier diode

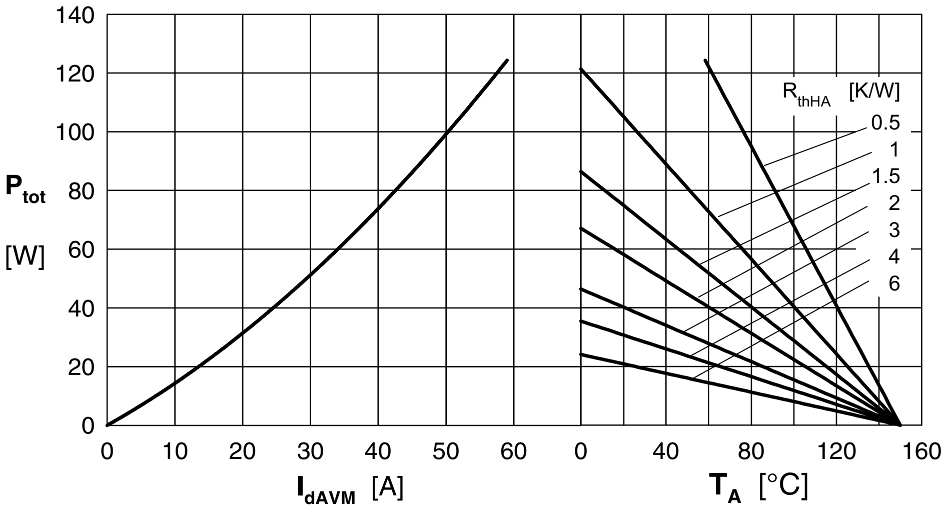

Fig. 5 Power dissipation vs. direct output current & ambient temperature (Rectifier bridge)

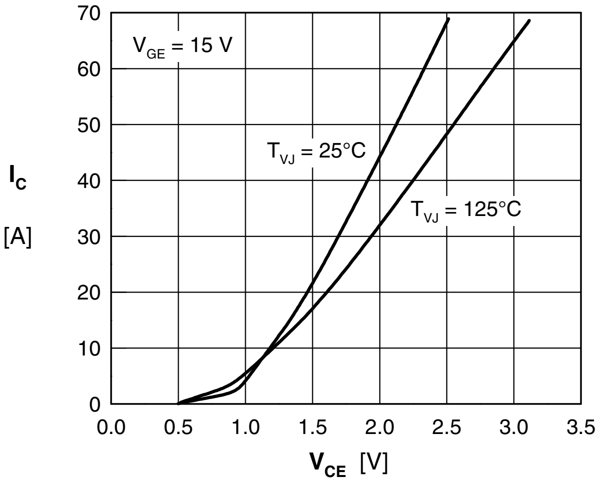

Fig. 6 IGBT, typ. output characteristics

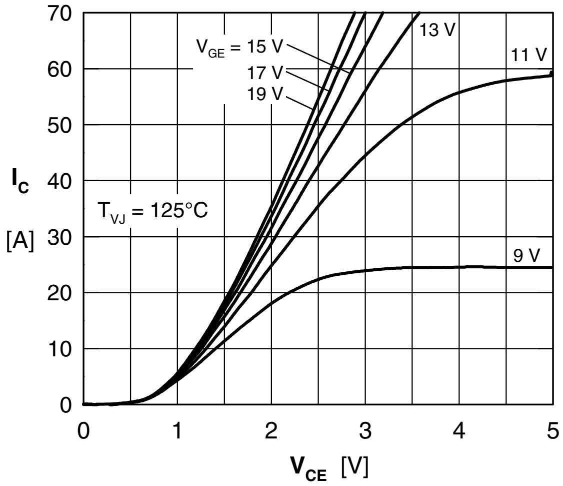

Fig. 7 IGBT, typ. output characteristics

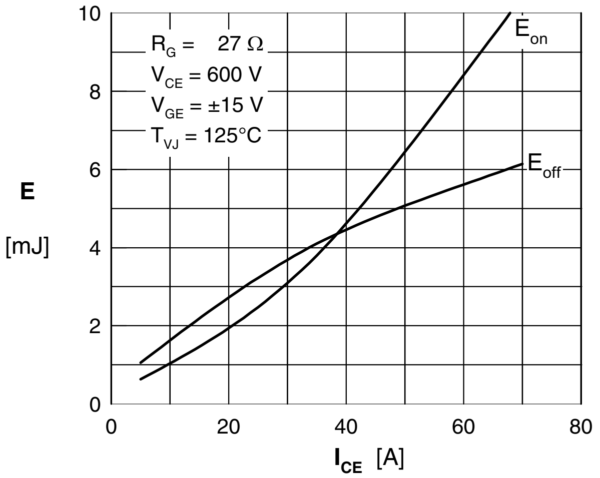

Fig. 8 IGBT, typ. switching energy versus collector current

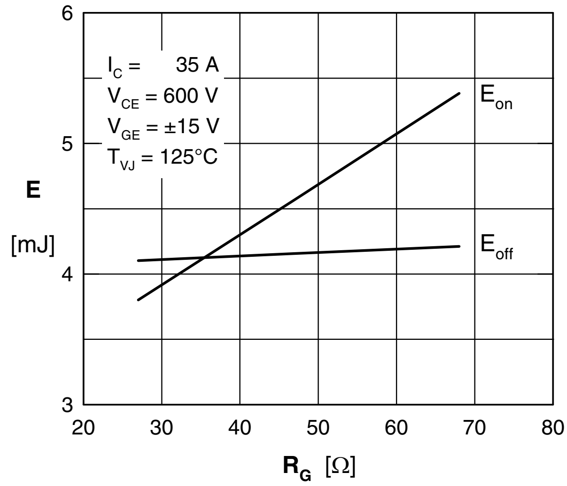

Fig. 9 IGBT, typ. switching energy versusgate resistance

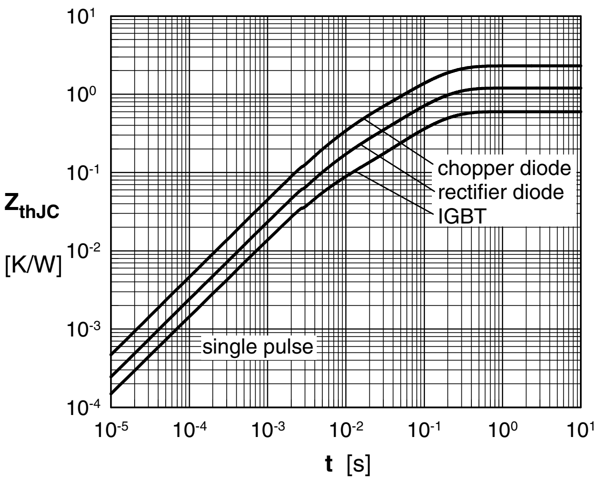

Fig. 10 Typ. transient thermal impedance

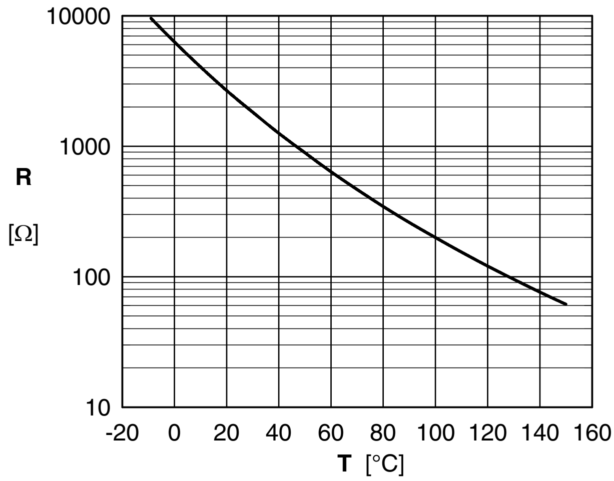

Fig. 11 Typ. thermistor resistace vs. temperature

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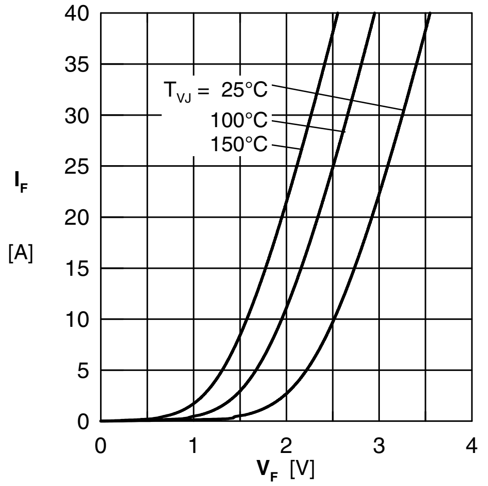

Fig. 12 Forward current I_F versus V_F

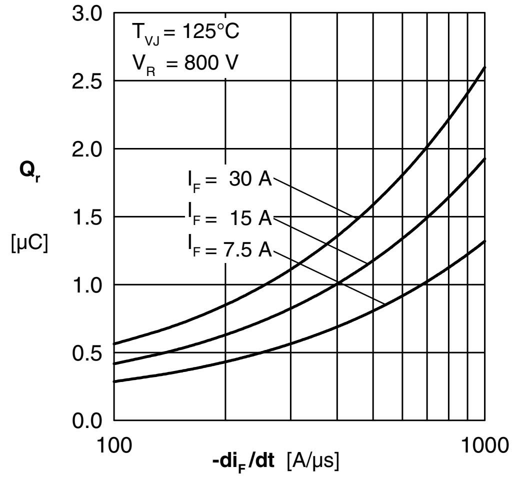

Fig. 13 Typ. reverse recovery charge Q_r versus $-di_F/dt$

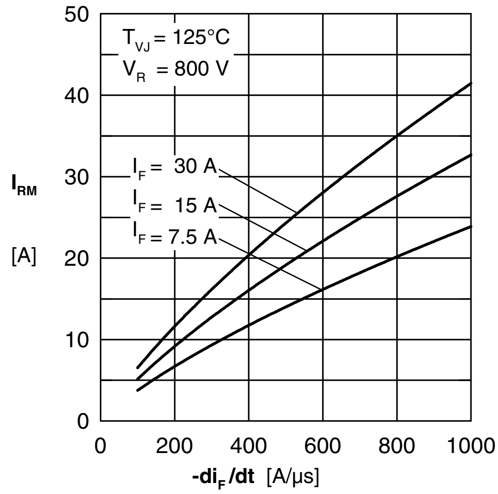

Fig. 14 Typ. peak reverse current I_{RM} versus $-di_F/dt$

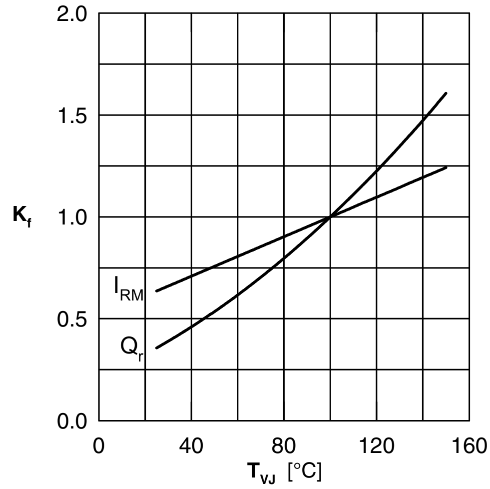

Fig. 15 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

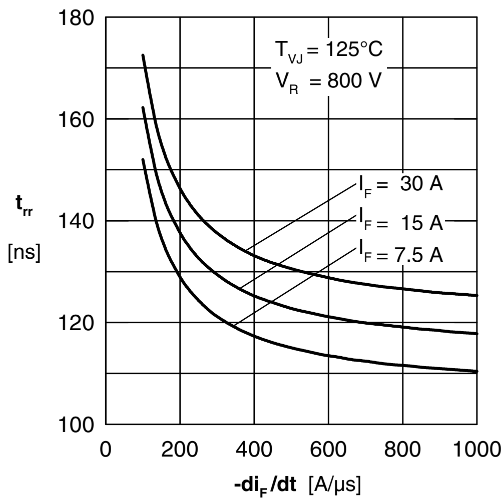

Fig. 16 Typ. recovery time t_{rr} versus $-di_F/dt$

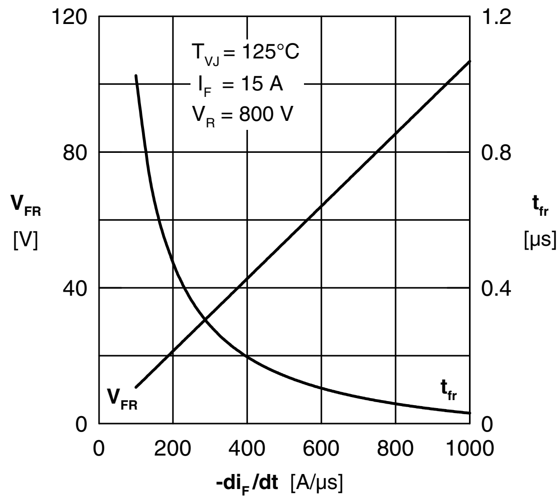

Fig. 17 Typ. peak forward voltage V_{FR} and t_{fr} versus di_F/dt

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