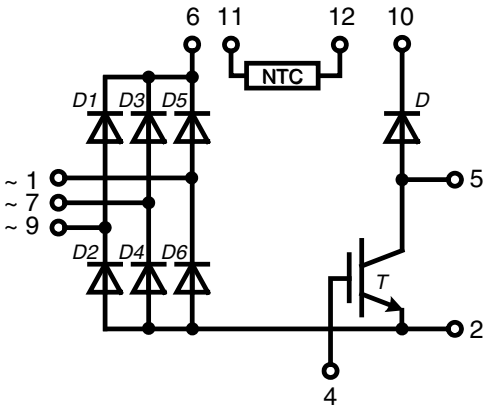
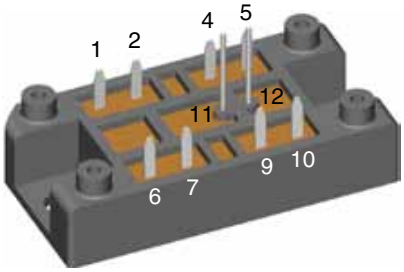
Three Phase Rectifier Bridge
with Brake Chopper

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

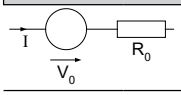
Chopper IGBT T

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}	*collector current*	DC	T_C = 25°C			58	A
I_{C80}		DC	T_C = 80°C			40	A
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 35 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.85	2.2	V
			T_{VJ} = 125°C		2.15		
$V_{GE(th)}$	*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			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
$t_{d(on)}$	*turn-on delay time*	inductive load	T_{VJ} = 125°C		70		ns
t_r	*current rise time*	V_{CE} = 600 V; I_C = 35 A			40		ns
$t_{d(off)}$	*turn-off delay time*	V_{GE} = ±15 V; R_G = 27 Ω; L = 100 µH			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
Q_{Gon}		V_{CE} = 600 V; V_{GE} = 15 V; I_C = 35 A			110		nC
I_{CM}	*reverse bias safe operating area*	RBSOA; V_{GE} = ±15 V; R_G = 27 Ω; L = 100 µH			70		A
V_{CEK}		clamped inductive load;	T_{VJ} = 125°C		≤ V_{CES}-L_S·d_I/dt		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}	*forward current*	DC	T_C = 25°C			25	A
I_{F80}			T_C = 125°C			15	A
V_F	*forward voltage*	I_F = 25 A	T_{VJ} = 25°C		2.7	3.1	V
			T_{VJ} = 125°C		2.0		V
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C			0.1	mA
			T_{VJ} = 125°C		0.1		mA
I_{RM}	*reverse recovery current*	I_F = 15 A; V_R = 600 V	T_{VJ} = 125°C		16		A
t_{rr}	*reverse recovery time*	di_F/dt = -400 A/µs			130		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	*Diode*	D1 - D6	T_{VJ} = 125°C		0.85		V
R_0					7		mΩ
V_0	*IGBT*	T	T_{VJ} = 150°C		1.1		V
R_0					40		mΩ
V_0	*Diode*	D	T_{VJ} = 125°C		1.25		V
R_0					32		mΩ

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

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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	T_{VJ} = 25°C			1200	V
		VUB 72 -16 NO1				1600	V
I_{FAV}	*average forward current*	sine 180°	T_C = 80°C			40	A
$I_{D(AV)M}$	*max. average DC output current*	rectangular; d = $^1/_3$; bridge	T_C = 80°C			110	A
I_{FSM}	*max. surge forward current*	t = 10 ms; sine 50 Hz	T_{VJ} = 25°C			530	A
P_{tot}	*total power dissipation*		T_C = 25°C			100	W
I_R	*reverse current*	$V_R = V_{RRM}$	T_{VJ} = 25°C			0.02	mA
		$V_R = 0.8 \cdot V_{RRM}$	T_{VJ} = 125°C		0.4		mA
V_F	*forward voltage*	I_F = 25 A	T_{VJ} = 25°C		1.0	1.1	V
			T_{VJ} = 125°C		0.9		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		Ratings min.	typ.	max.	Unit
R_{25}	*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		kΩ
$B_{25/100}$					3560		K

Module

Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
I_{RMS}	*RMS current*	per pin				100	A
T_{VJ}	*operating temperature*			-40		150	°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			3600	V~
M_d	*mounting torque*	(M5)		2		2.5	Nm
d_S	*creep distance on surface*			5			mm
d_A	*strike distance through air*			5			mm
Weight					35		g

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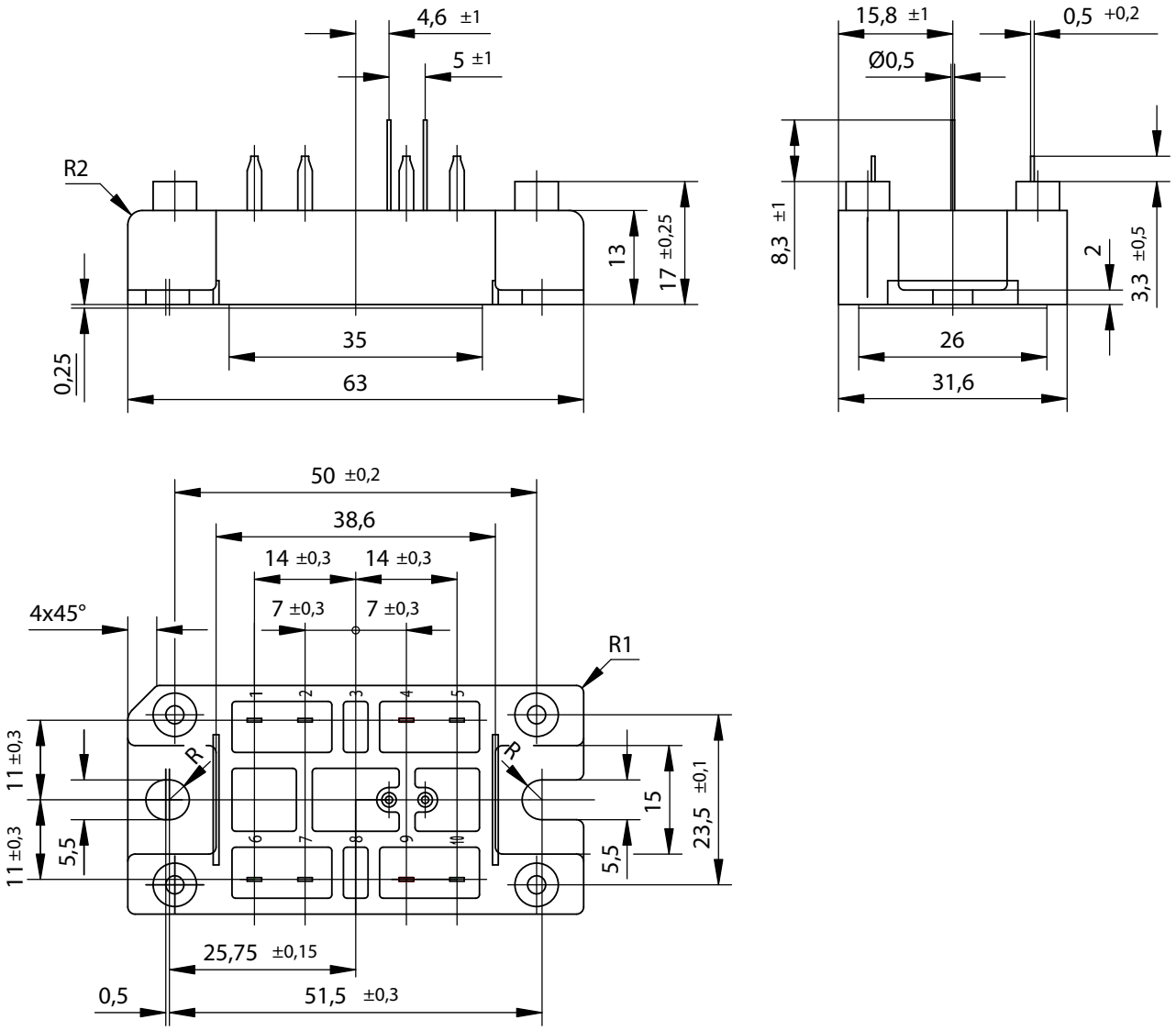
Outline Drawing

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

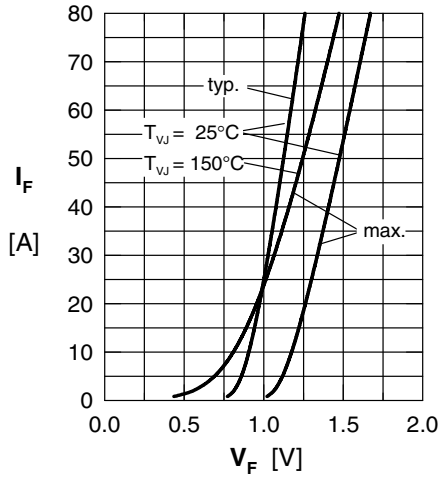


Fig. 1 Forward current vs. voltage drop per rectifier diode

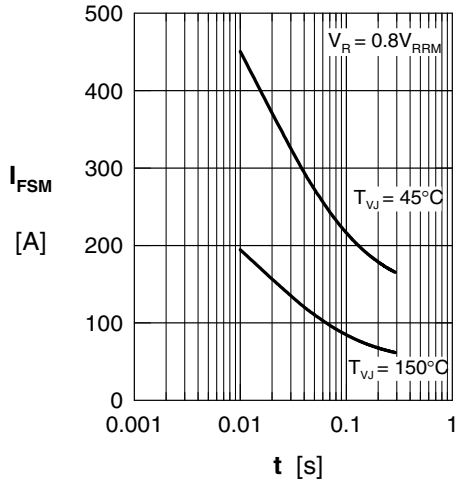


Fig. 2 Surge overload current per rectifier diode

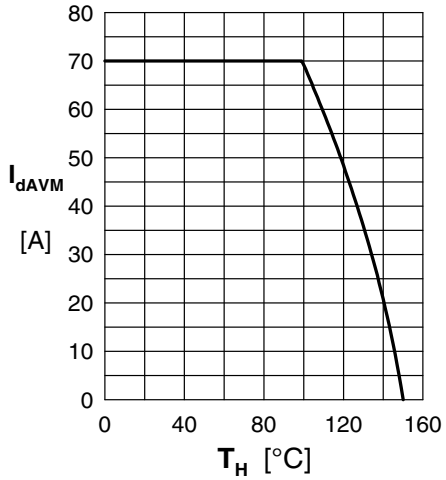


Fig. 3 Max. forward current vs. heatsink temperature (Rectifier bridge)

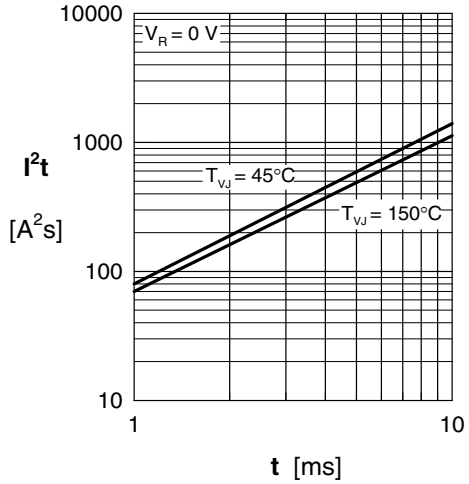


Fig. 4 I^2t versus time per rectifier diode

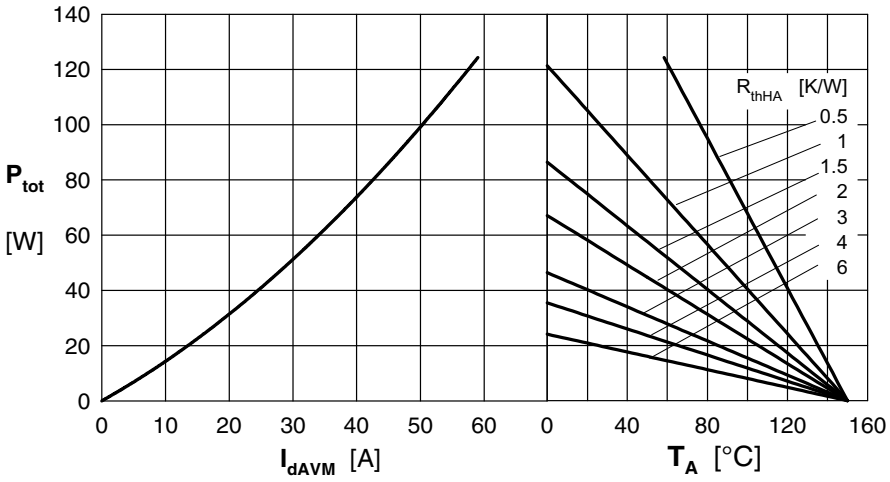


Fig. 5 Power dissipation vs. direct output current & ambient temperature (Rectifier bridge)

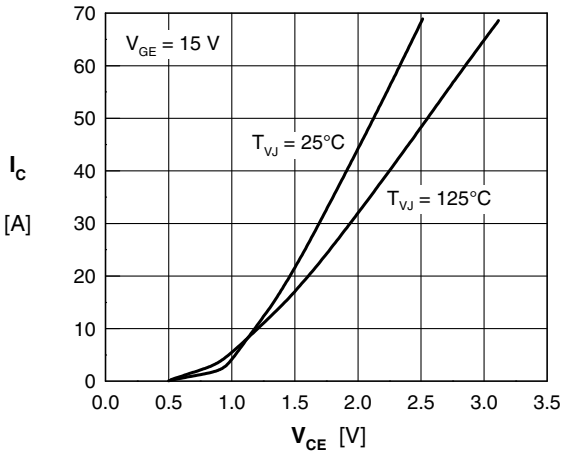


Fig. 6 IGBT, typ. output characteristics

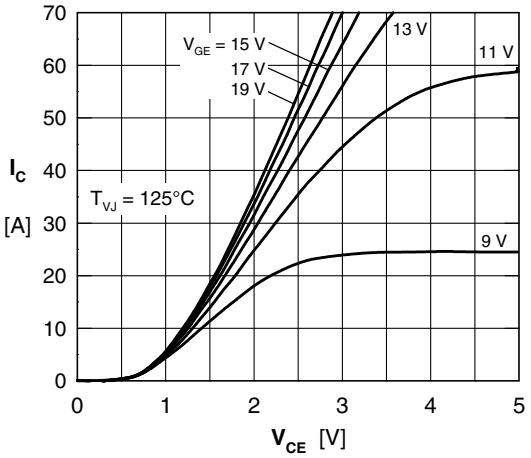


Fig. 7 IGBT, typ. output characteristics

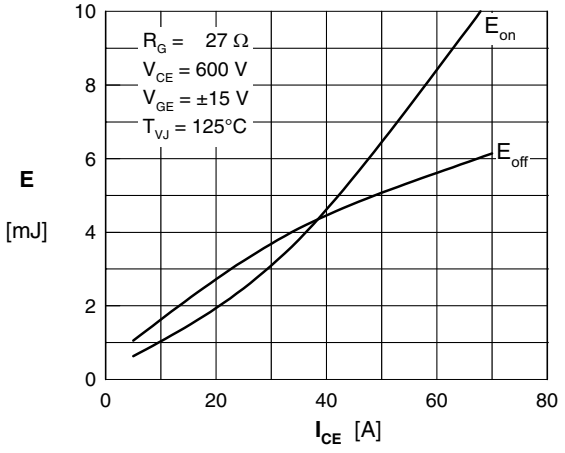


Fig. 8 IGBT, typ. switching energy versus collector current

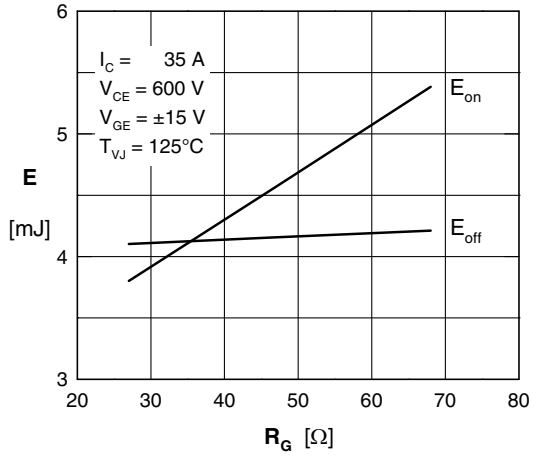


Fig. 9 IGBT, typ. switching energy versusgate resistance

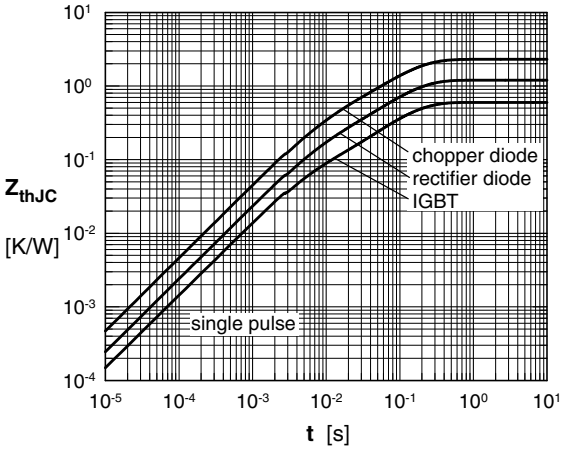


Fig. 10 Typ. transient thermal impedance

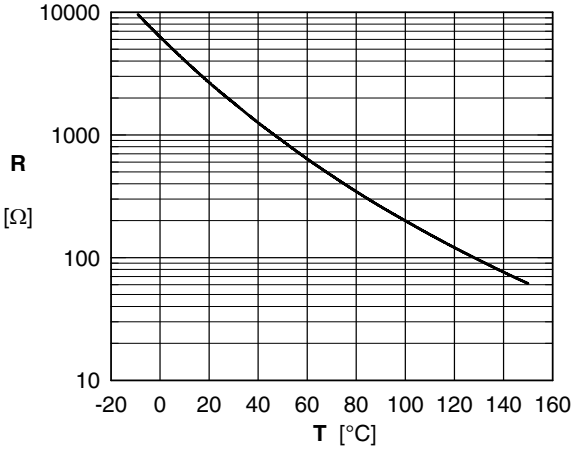


Fig. 11 Typ. thermistor resistace vs. temperature

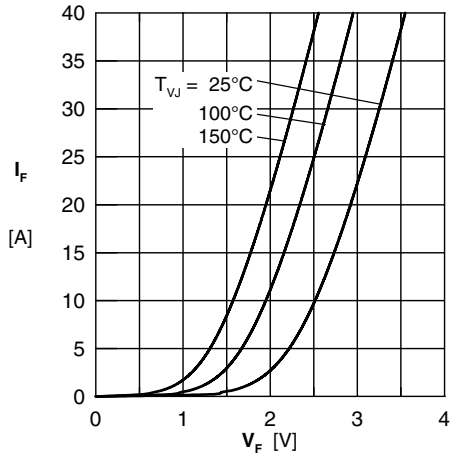


Fig. 12 Forward current I_F versus V_F

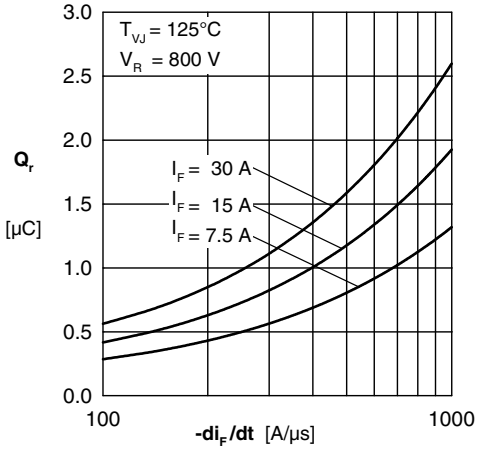


Fig. 13 Typ. reverse recovery charge Q_r versus $-di_F/dt$

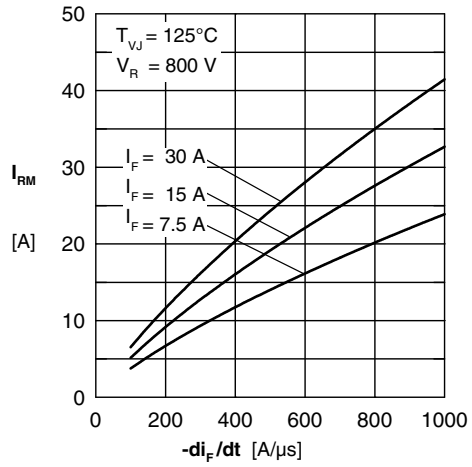


Fig. 14 Typ. peak reverse current I_{RM} versus $-di_F/dt$

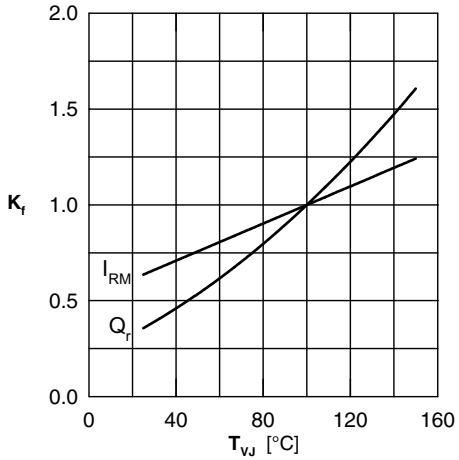


Fig. 15 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

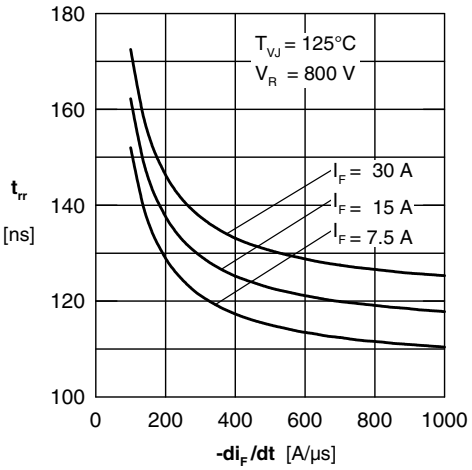


Fig. 16 Typ. recovery time t_{rr} versus $-di_F/dt$

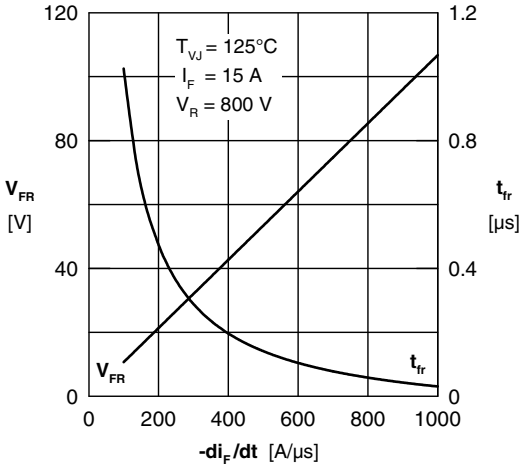


Fig. 17 Typ. peak forward voltage V_{FR} and t_{fr} versus di_F/dt