Standard Rectifier Module

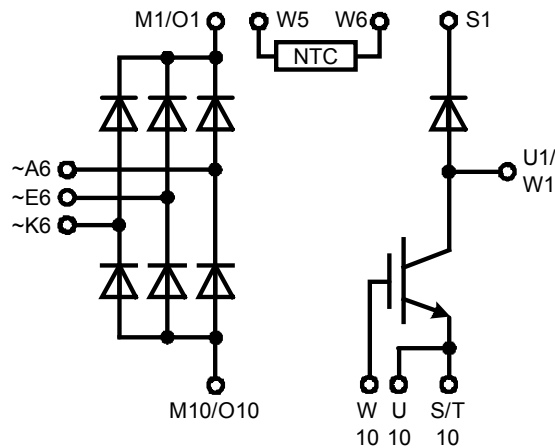| 3~ Rectifier		Brake Chopper	
V_{RRM} =	1600 V	V_{CES} =	1200 V
I_{DAV} =	180 A	I_{C25} =	155 A
I_{FSM} =	1100 A	$V_{CE(sat)}$ =	2.05 V

3~ Rectifier Bridge + Brake Unit + NTC

Part number

VUB120-16NOXT
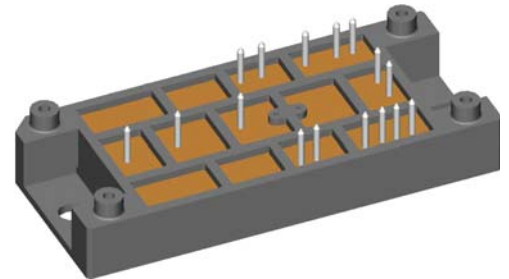
Backside: isolated

UL 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: V2-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

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Rectifier					Ratings		
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
V_{RSM}	max. non-repetitive reverse blocking voltage		$T_{VJ} = 25°C$			1700	V
V_{RRM}	max. repetitive reverse blocking voltage		$T_{VJ} = 25°C$			1600	V
I_R	reverse current	$V_R = 1600$ V	$T_{VJ} = 25°C$			100	µA
		$V_R = 1600$ V	$T_{VJ} = 125°C$			2	mA
V_F	forward voltage drop	$I_F = 60$ A	$T_{VJ} = 25°C$			1.16	V
		$I_F = 180$ A				1.55	V
		$I_F = 60$ A	$T_{VJ} = 125°C$			1.09	V
		$I_F = 180$ A				1.59	V
I_{DAV}	bridge output current	$T_C = 90°C$	$T_{VJ} = 150°C$			180	A
		rectangular d = ⅓					
V_{F0}	threshold voltage } for power loss calculation only		$T_{VJ} = 150°C$			0.81	V
r_F	slope resistance					4.4	mΩ
R_{thJC}	thermal resistance junction to case					0.6	K/W
R_{thCH}	thermal resistance case to heatsink				0.2		K/W
P_{tot}	total power dissipation		$T_C = 25°C$			205	W
I_{FSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			1.10	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			1.19	kA
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150°C$			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	$T_{VJ} = 45°C$			6.05	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			5.89	kA²s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150°C$			4.37	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			4.25	kA²s
C_J	junction capacitance	$V_R = 400$ V; f = 1 MHz	$T_{VJ} = 25°C$		37		pF

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Brake IGBT

Ratings

Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{CES}	collector emitter voltage		T_{VJ} = 25°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°C				155	A
I_{C80}		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
			T_{VJ} = 125°C		2.45		V
$V_{GE(th)}$	gate emitter threshold voltage	I_C = 4 mA; V_{GE} = V_{CE}	T_{VJ} = 25°C	5.4	5.9	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_{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				70		ns
t_r	current rise time				40		ns
$t_{d(off)}$	turn-off delay time	inductive load	T_{VJ} = 125°C		250		ns
t_f	current fall time	V_{CE} = 600 V; I_C = 100 A			100		ns
E_{on}	turn-on energy per pulse	V_{GE} = ±15 V; R_G = 6.8 Ω			8.5		mJ
E_{off}	turn-off energy per pulse				11.5		mJ
RBSOA	reverse bias safe operating area	V_{GE} = ±15 V; R_G = 6.8 Ω	T_{VJ} = 125°C				
I_{CM}		V_{CEK} = 1200 V				300	A
SCSOA	short circuit safe operating area						
t_{SC}	short circuit duration	V_{CE} = 720 V; V_{GE} = ±15 V	T_{VJ} = 125°C			10	µs
I_{SC}	short circuit current	R_G = 6.8 Ω; non-repetitive			400		A
R_{thJC}	thermal resistance junction to case					0.25	K/W
R_{thCH}	thermal resistance case to heatsink				0.10		K/W

Brake Diode

Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RRM}	max. repetitive reverse voltage		T_{VJ} = 25°C			1200	V
I_{F25}	forward current	T_C = 25°C				48	A
I_{F80}		T_C = 80°C				32	A
V_F	forward voltage	I_F = 30 A	T_{VJ} = 25°C			2.75	V
			T_{VJ} = 125°C		1.80		V
I_R	reverse current	V_R = V_{RRM}	T_{VJ} = 25°C			0.25	mA
			T_{VJ} = 125°C			1	mA
Q_{rr}	reverse recovery charge	V_R = 600 V			1.8		µC
I_{RM}	max. reverse recovery current	-di$_F$/dt = 400 A/µs	T_{VJ} = 125°C		23		A
t_{rr}	reverse recovery time	I_F = 30 A			150		ns
R_{thJC}	thermal resistance junction to case					0.9	K/W
R_{thCH}	thermal resistance case to heatsink				0.3		K/W

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VUB120-16NOXT

Package	V2-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				76		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	3600			V
		t = 1 minute 50/60 Hz, RMS; I_{ISOL} ≤ 1 mA	3000			V

Logo UL Part name Date code Prod. line
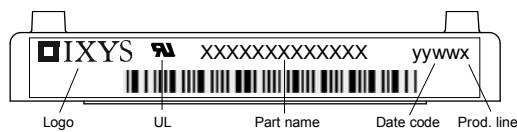
Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB120-16NOXT	VUB120-16NOXT	Box	6	510461

Similar Part	Package	Voltage class
VUB120-16NOX	V2-Pack	1600

Temperature Sensor NTC

Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	resistance	T_{VJ} = 25°	4.75	5	5.25	kΩ
$B_{25/50}$	temperature coefficient			3375		K

Equivalent Circuits for Simulation   * on die level T_{VJ} = 150 °C

		Rectifier	Brake IGBT	Brake Diode	
$V_{0 max}$	threshold voltage	0.81	1.1	1.31	V
$R_{0 max}$	slope resistance *	3.2	13.8	8	mΩ

Typ. NTC resistance vs. temperature

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Outlines   V2-Pack

93

Φ1.5

X   Y

4.5

13

2

65 x 38

17

21.6±0.25

0.25

Detail Y   M 5:1

Φ1.5 (DIN 46 431)

0.5±0.2

$1.5^{+0.6}_{-0.3}$

80±0.3

64.05 ±0.3

42.65 ±0.3

12.4 ±0.3

4 ±0.3

22.85 ±0.3

9.4 ±0.3

10.45 ±0.3

0.6 ±0.3

4 ±0.3

5.5

40.4

32

23.8

Φ5.5

30.8 ±0.3

A B C D E F G H I K L M N O P R S T U V W

1 2 3 4 5 6 7 8 9 10

1 2 3 4 5 6 7 8 9 10

Marking

0.5

4 ±0.3

42.65 ±0.3

4 ±0.3

56.05 ±0.3

4 ±0.3

64.05 ±0.3

78.5±0.3

Detail X   M 2:1

Φ6.1

Φ2.5

1.5

(4)

6.0

Φ2.1

M1/O1   W5   W6   S1

NTC

~A6

~E6

~K6

U1/W1

M10/O10

W U S/T
10 10 10

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Rectifier

Fig. 1 Forward current vs.
voltage drop per diode
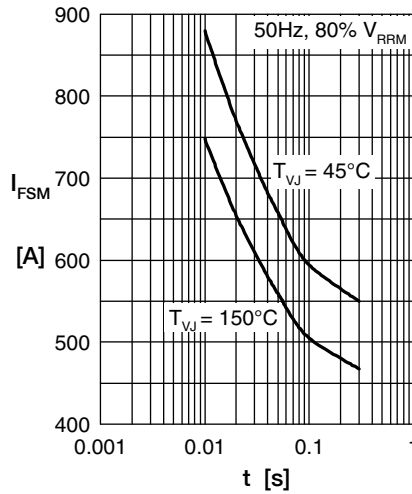
Fig. 2 Surge overload current
vs. time per diode
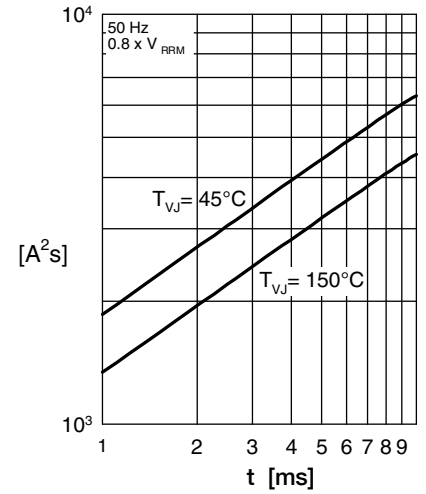
Fig. 3 I^2t vs. time per diode
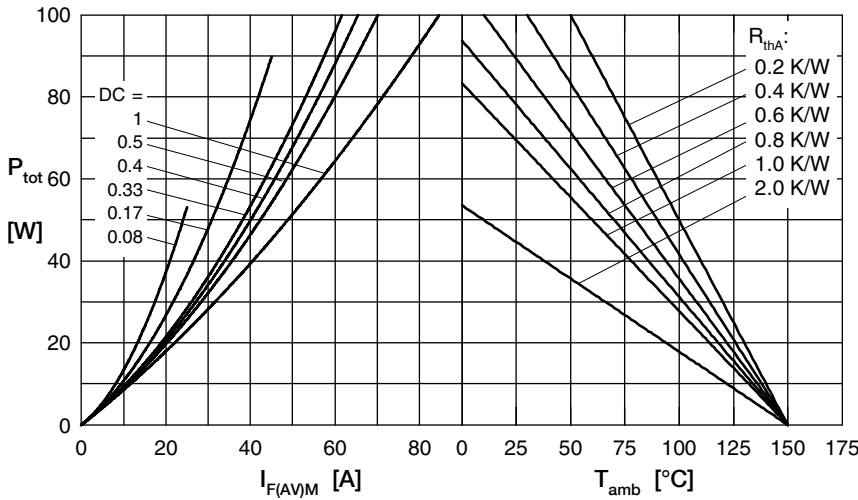
Fig. 4 Power dissipation vs. forward current
and ambient temperature per diode
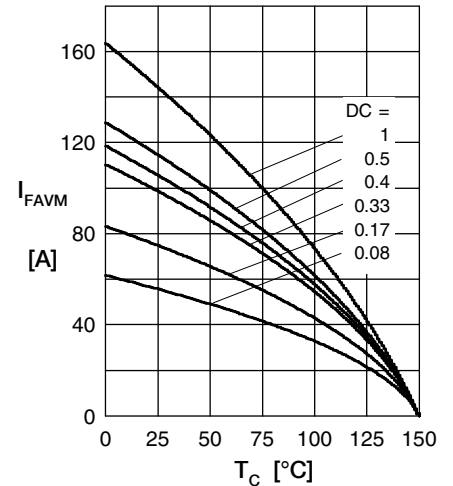
Fig. 5 Max. forward current vs.
case temperature per diode
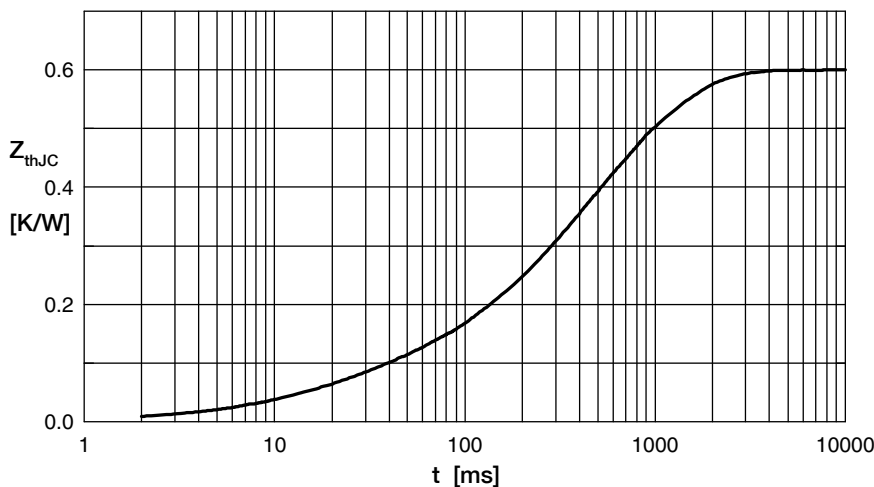
Fig. 6 Transient thermal impedance junction to case vs. time per diode

R_i	t_i
0.060	0.020
0.003	0.010
0.150	0.225
0.243	0.800
0.144	0.580

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Brake IGBT
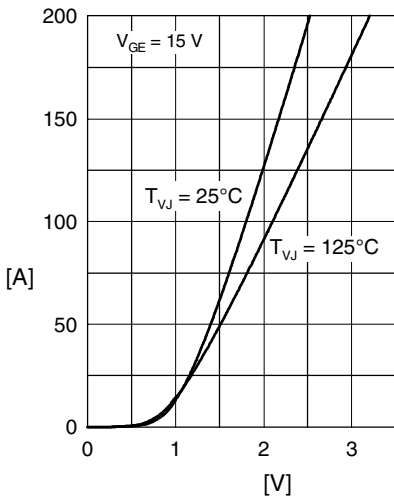
Fig. 1 Typ. output characteristics
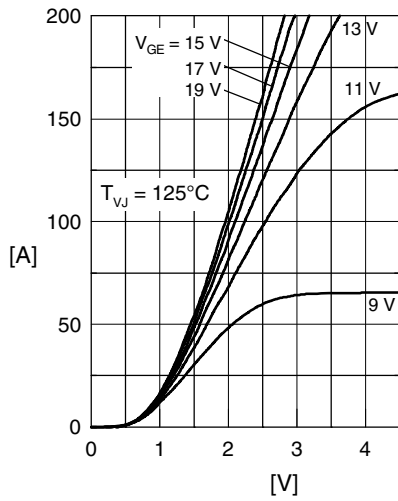
Fig. 2 Typ. output characteristics
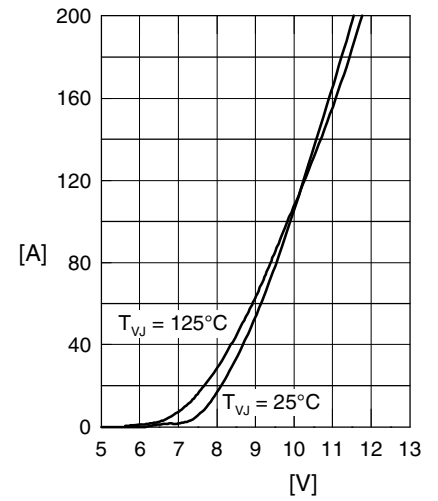
Fig. 3 Typ. transfer characteristics
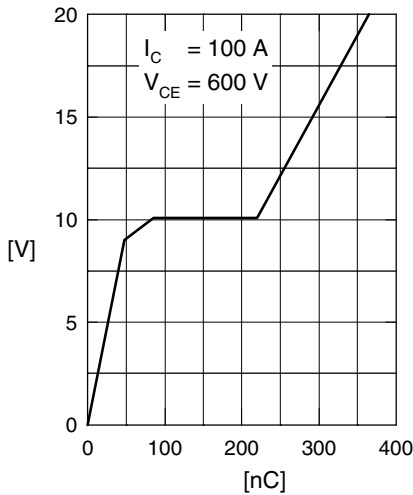
Fig. 4 Typ. turn-on gate charge
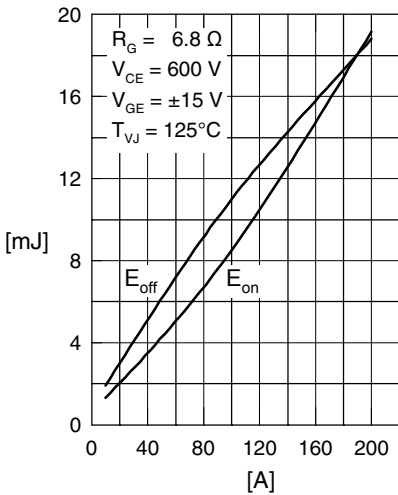
Fig. 5 Typ. switching energy versus collector current

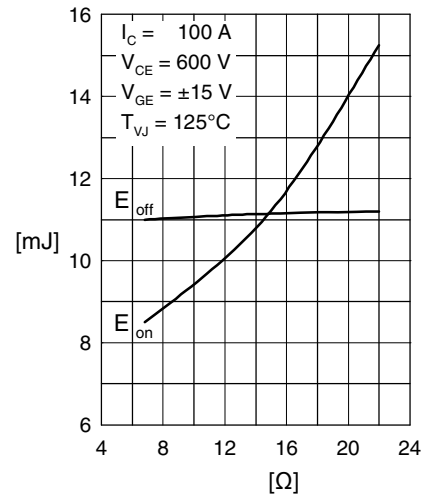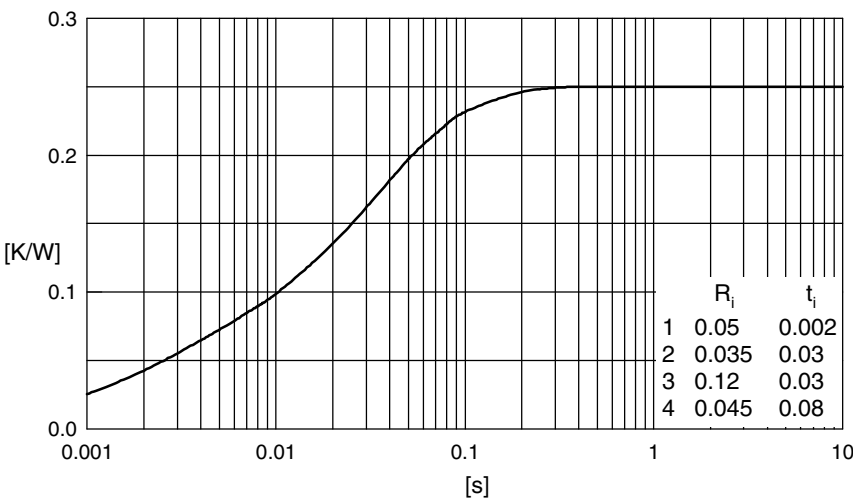Fig. 6 Typ. switching energy versus gate resistance

	R_i	t_i
1	0.05	0.002
2	0.035	0.03
3	0.12	0.03
4	0.045	0.08

Fig. 7 Transient thermal impedance junction to case
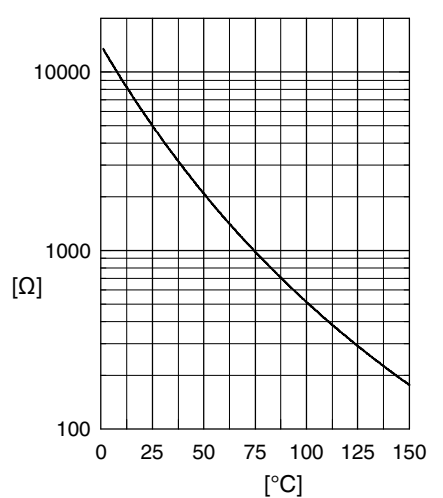
Fig. 8 Typ. thermistor resistance versus temperature

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Brake Diode
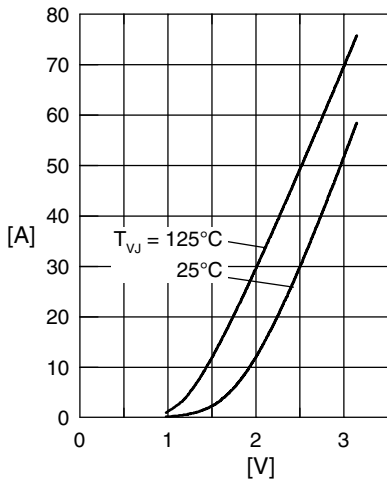
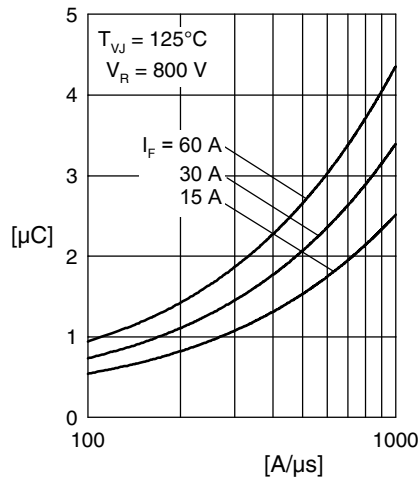Fig. 1 Typ. forward current I_F vs. V_F

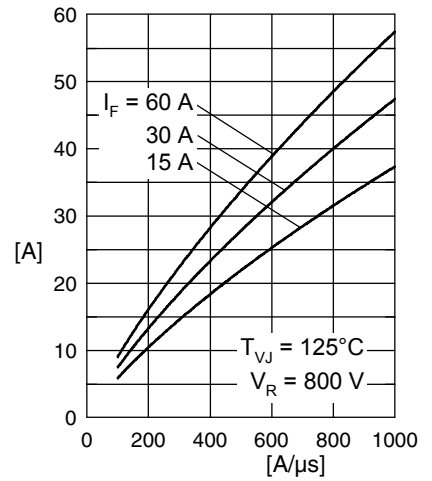Fig. 2 Typ. reverse recovery charge Q_r versus $-di_F/dt$

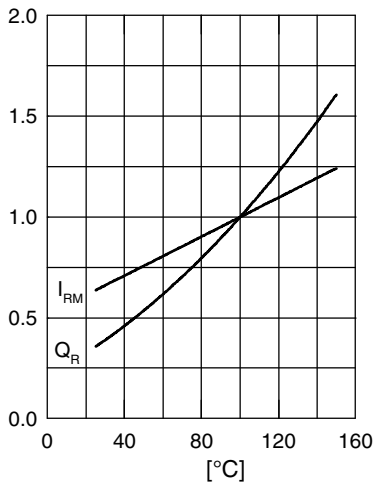Fig. 3 Typ. peak reverse current I_{RM} versus $-di_F/dt$

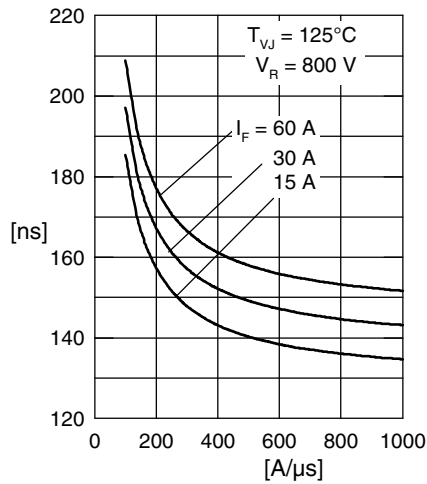Fig. 4 Typ. dynamic parameters Q_r, I_{RM}, versus T_{VJ}
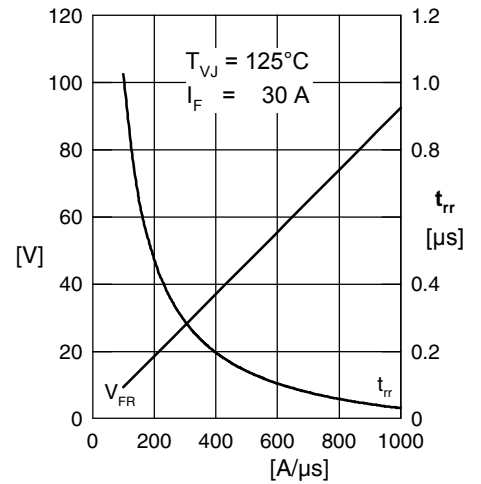
Fig. 5 Typ. recovery time t_{rr} vs. $-di_F/dt$

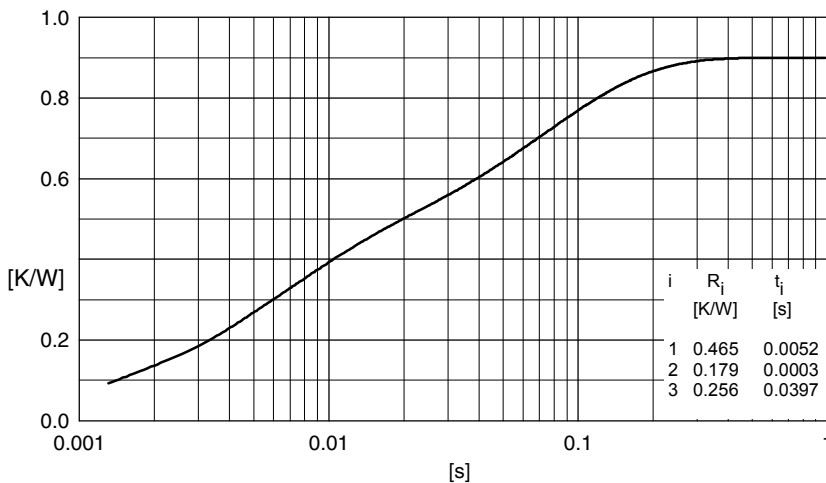Fig. 6 Typ. peak forward voltage V_{FR} and t_{fr} versus di_F/dt

i	R_i [K/W]	t_i [s]
1	0.465	0.0052
2	0.179	0.0003
3	0.256	0.0397

Fig. 7 Typ. transient thermal impedance junction to case

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