

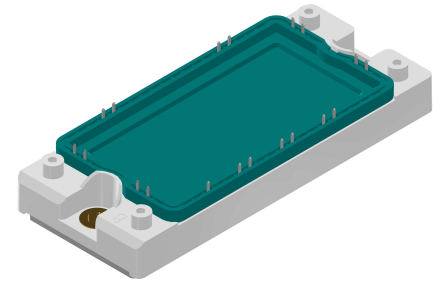
Standard Rectifier Module

3~ Rectifier	Brake Chopper
$V_{RRM} = 1600 \text{ V}$	$V_{CES} = 1200 \text{ V}$
$I_{DAV} = 120 \text{ A}$	$I_{C25} = 120 \text{ A}$
$I_{FSM} = 700 \text{ A}$	$V_{CE(sat)} = 1.8 \text{ V}$

3~ Rectifier Bridge + Brake Unit + NTC

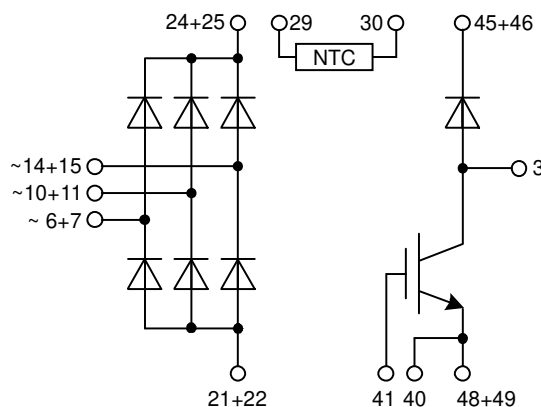
Part number

VUB116-16NOXT



Backside: isolated

 E72873



Features / Advantages:

- Package with DCB ceramic
- 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: E2-Pack

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

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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	$V_R = 1600$ V		$T_{VJ} = 25^\circ\text{C}$		100	μA
		$V_R = 1600$ V		$T_{VJ} = 150^\circ\text{C}$		1.5	mA
V_F	forward voltage drop	$I_F = 40$ A		$T_{VJ} = 25^\circ\text{C}$		1.19	V
		$I_F = 120$ A				1.64	V
		$I_F = 40$ A		$T_{VJ} = 125^\circ\text{C}$		1.12	V
		$I_F = 120$ A				1.70	V
I_{DAV}	bridge output current	$T_C = 105^\circ\text{C}$	rectangular	$T_{VJ} = 150^\circ\text{C}$		120	A
V_{FO}	threshold voltage	} for power loss calculation only		$T_{VJ} = 150^\circ\text{C}$		0.80	V
r_F	slope resistance					7.6	m Ω
R_{thJC}	thermal resistance junction to case					0.65	K/W
R_{thCH}	thermal resistance case to heatsink				0.1		K/W
P_{tot}	total power dissipation			$T_C = 25^\circ\text{C}$		190	W
I_{FSM}	max. forward surge current	$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 45^\circ\text{C}$		700	A
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		755	A
		$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 150^\circ\text{C}$		595	A
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		645	A
I^2t	value for fusing	$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 45^\circ\text{C}$		2.45	kA ² s
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		2.37	kA ² s
		$t = 10$ ms; (50 Hz), sine		$T_{VJ} = 150^\circ\text{C}$		1.77	kA ² s
		$t = 8,3$ ms; (60 Hz), sine		$V_R = 0$ V		1.73	kA ² s
C_J	junction capacitance	$V_R = 400$ V; $f = 1$ MHz		$T_{VJ} = 25^\circ\text{C}$		27	pF



Brake IGBT				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
V_{CES}	collector emitter voltage				1200	V	
V_{GES}	max. DC gate voltage				±20	V	
V_{GEM}	max. transient gate emitter voltage				±30	V	
I_{C25}	collector current				120	A	
I_{C80}					84	A	
P_{tot}	total power dissipation				390	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 75 \text{ A}; V_{GE} = 15 \text{ V}$			1.8	V	
					2.1	V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 3 \text{ mA}; V_{GE} = V_{CE}$	5.5	6.0	6.5	V	
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}$			0.2	mA	
					0.6	mA	
I_{GES}	gate emitter leakage current	$V_{GE} = \pm 20 \text{ V}$			500	nA	
$Q_{G(on)}$	total gate charge	$V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 75 \text{ A}$		230		nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600 \text{ V}; I_C = 75 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 10 \Omega$		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			6.8		mJ	
E_{off}	turn-off energy per pulse			8.3		mJ	
RBSOA	reverse bias safe operating area	$V_{GE} = \pm 15 \text{ V}; R_G = 10 \Omega$					
I_{CM}		$V_{CEK} = 1200 \text{ V}$			225	A	
SCSOA	short circuit safe operating area	$V_{CEK} = 1200 \text{ V}$					
t_{SC}	short circuit duration	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15$			10	µs	
I_{SC}	short circuit current	$R_G = 10 \Omega$; non-repetitive		300		A	
R_{thJC}	thermal resistance junction to case				0.32	K/W	
R_{thCH}	thermal resistance case to heatsink			0.15		K/W	
Brake Diode							
V_{RRM}	max. repetitive reverse voltage				1200	V	
I_{F25}	forward current				48	A	
I_{F80}					32	A	
V_F	forward voltage	$I_F = 30 \text{ A}$			2.75	V	
					1.99	V	
I_R	reverse current	$V_R = V_{RRM}$			0.25	mA	
					1	mA	
Q_{rr}	reverse recovery charge	$V_R = 600 \text{ V}$ $-di_f/dt = 400 \text{ A}/\mu\text{s}$ $I_F = 30 \text{ A}; V_{GE} = 0 \text{ V}$		1.8		µC	
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	

Package E2-Pack			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			50	A
T_{VJ}	virtual junction temperature		-40		150	°C
T_{op}	operation temperature		-40		125	°C
T_{stg}	storage temperature		-40		125	°C
Weight				176		g
M_D	mounting torque		3		6	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 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3600			V
		t = 1 minute	3000			V



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VUB116-16NOXT	VUB116-16NOXT	Box	6	510755

Temperature Sensor NTC

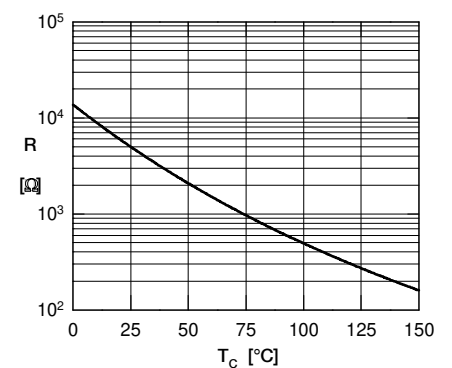
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	resistance	$T_{VJ} = 25^\circ$	4.75	5	5.25	k Ω
$B_{25/50}$	temperature coefficient			3375		K

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 150^\circ\text{C}$

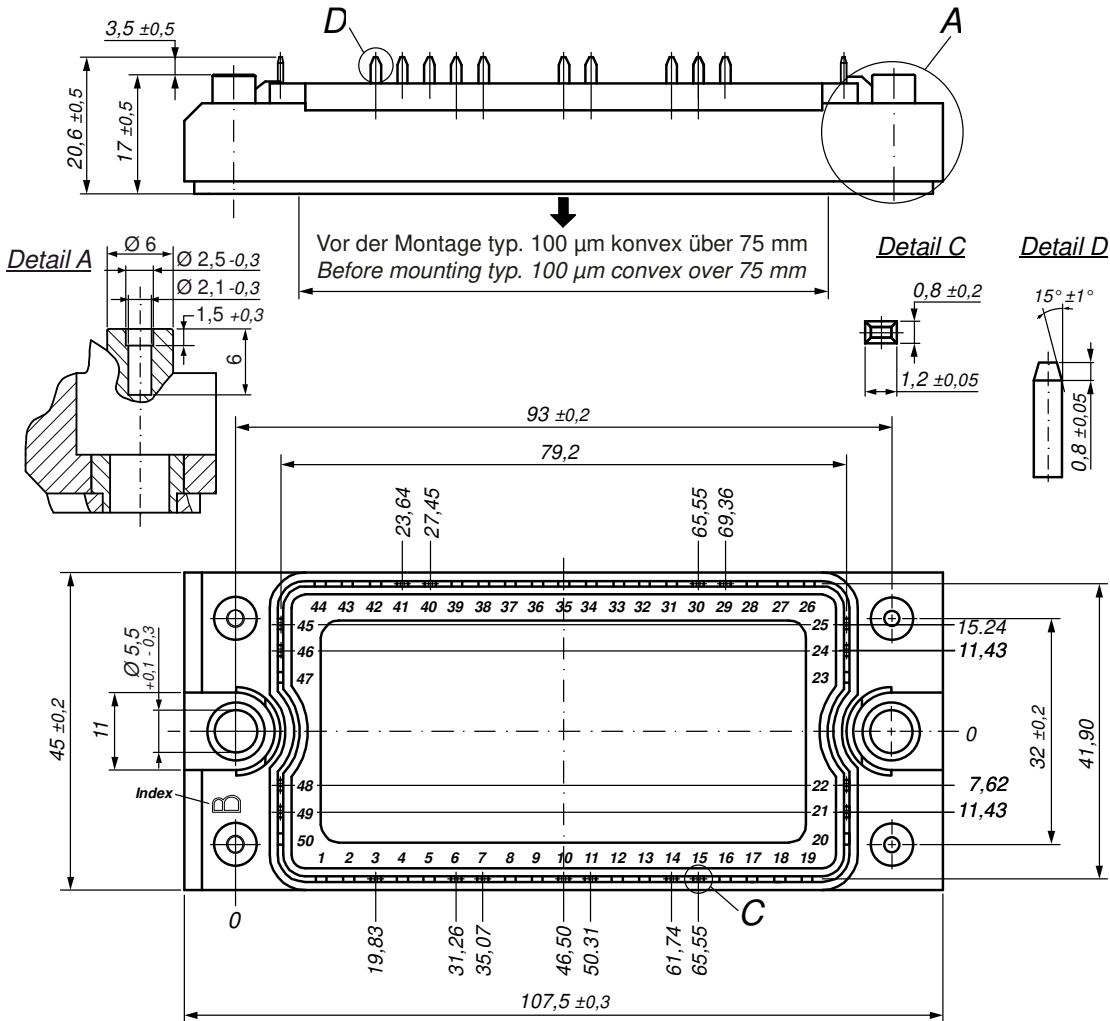
	Rectifier	Brake IGBT	Brake Diode	
V_0	0.8	1.1	1.31	V
R_0	4.5	17.9	8	m Ω



Typ. NTC resistance vs. temperature



Outlines E2-Pack

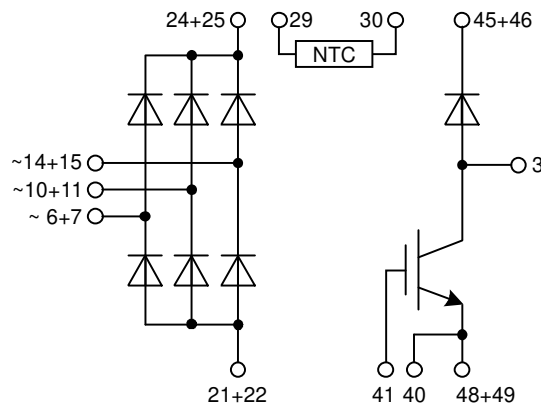


Bemerkung / Note:

- Nichttolerierete Maße nach / Measure without tolerances according DIN ISO 2768-T1-m
- PCB-Lochmuster / PCB hole pattern: **see pin position**
- Toleranz Pin-Position und PCB-Lochmuster / Tolerance of pin position and PCB hole pattern: $\oplus 0.1$
- Montageanleitung / Mounting instruction: www.ixys.com **Application note IXAN0024**

Detail A: PCB-Montage / Mounting on PCB ^L

- Empfohlene, selbstschneidende Schraube / Recommended, self-tapping screw: **EJOT PT®** (Größe / size: **K25**) ^L
- Max. Schraubenlänge / Max. screw length: **PCB-Dicke / thickness + 6 mm** (max. Lochtiefe / hole depth) ^L
- Empfohlenes Drehmoment / Recommended mounting torque: **1.5 Nm**



Rectifier

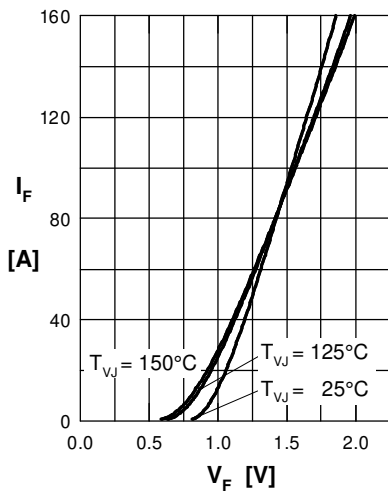


Fig. 1 Forward current versus voltage drop per diode

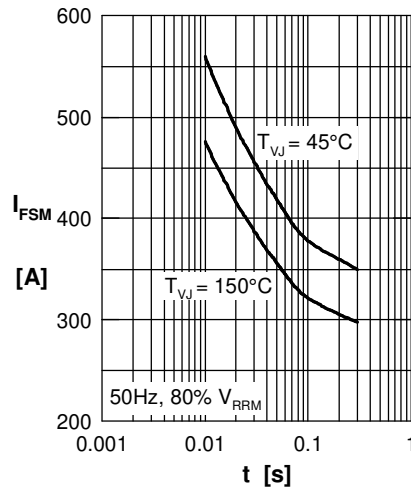


Fig. 2 Surge overload current vs. time per diode

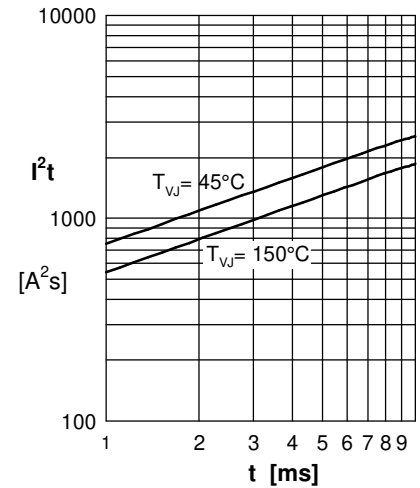


Fig. 3 I^2t versus time per diode

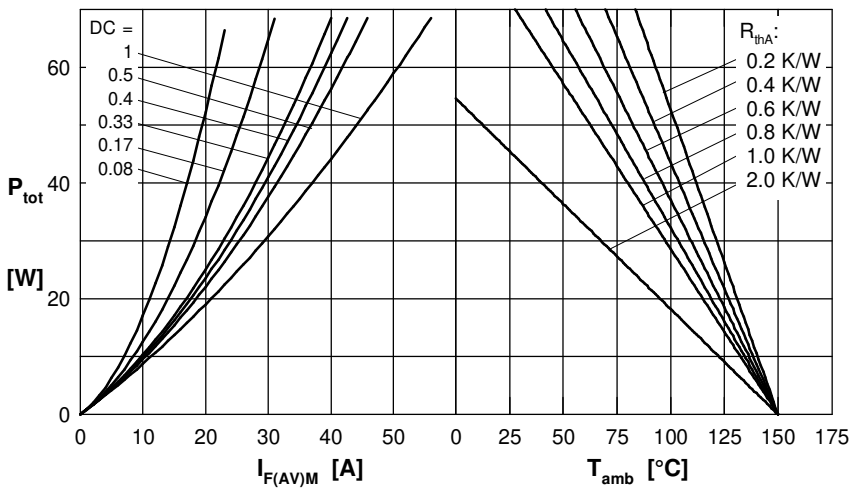


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

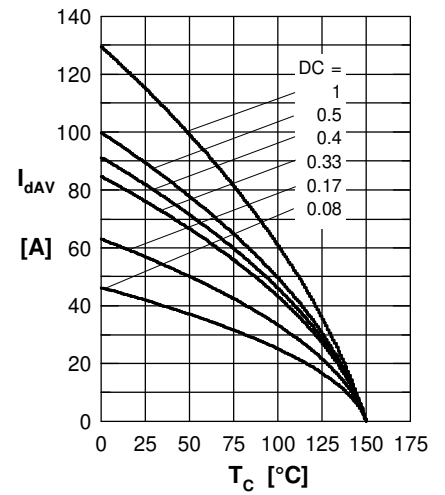


Fig. 5 Max. forward current vs. case temperature per diode

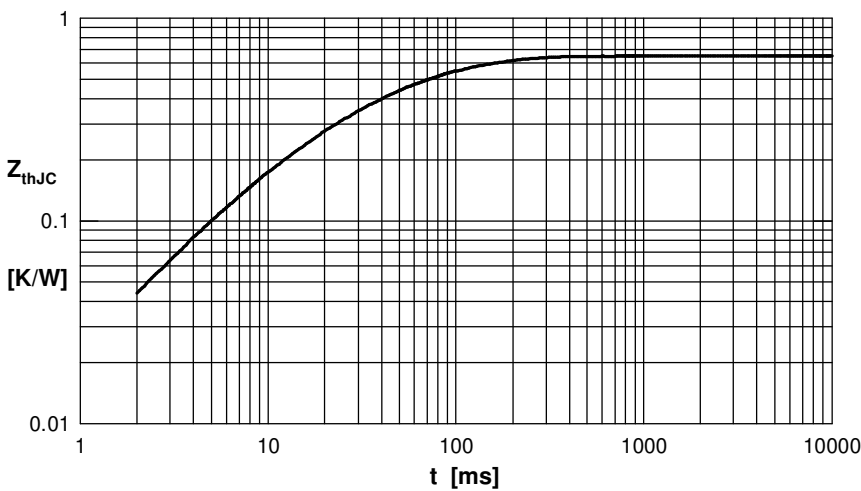


Fig. 6 Transient thermal impedance junction to case vs. time per diode

R_i	t_i
0.085	0.012
0.041	0.007
0.309	0.036
0.215	0.102

Brake IGBT

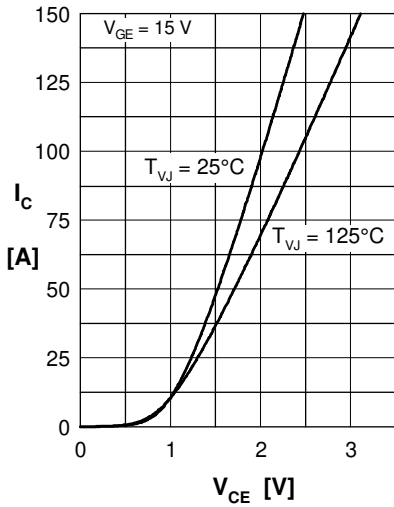


Fig. 1 Typ. output characteristics

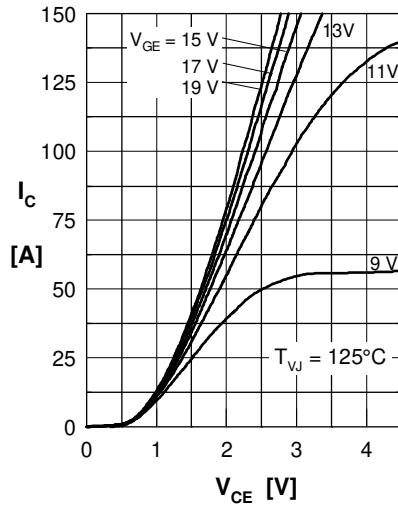


Fig. 2 Typ. output characteristics

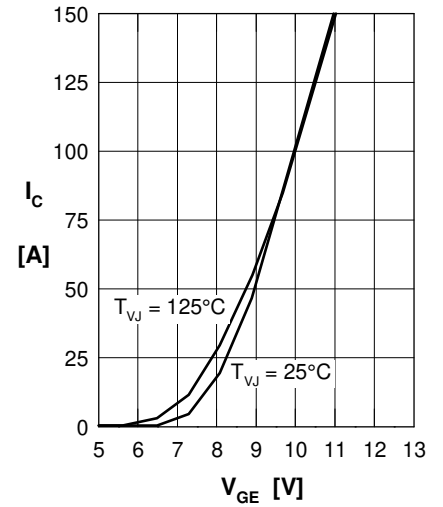


Fig. 3 Typ. transfer characteristics

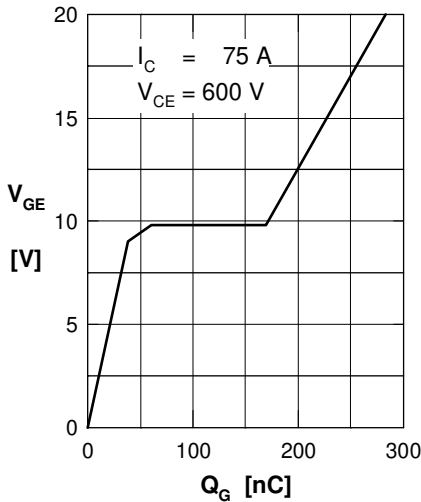


Fig. 4 Typ. turn-on gate charge

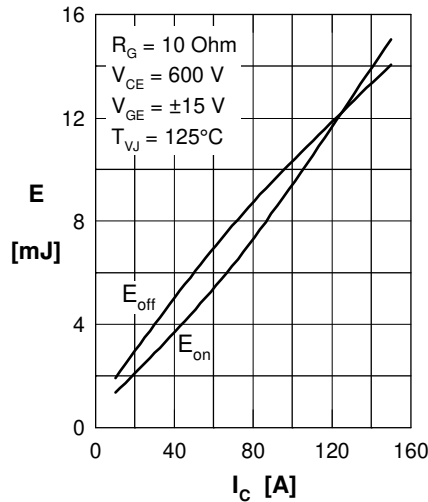


Fig. 5 Typ. switching energy versus collector current

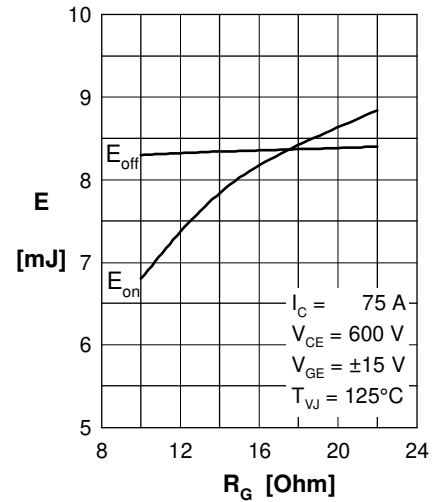


Fig. 6 Typ. switching energy versus gate resistance

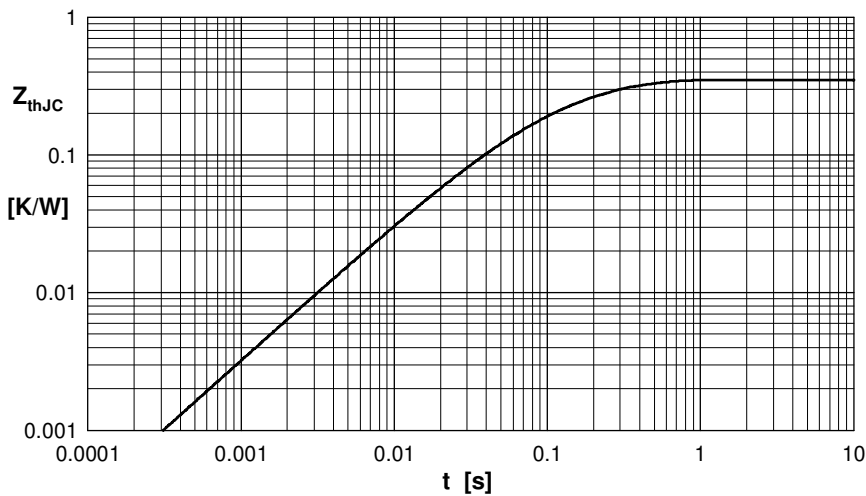


Fig. 7 Typ. transient thermal impedance junction to case

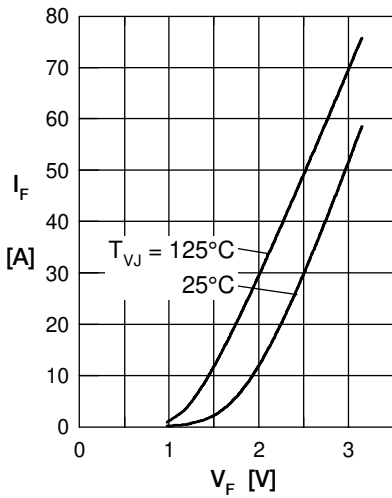
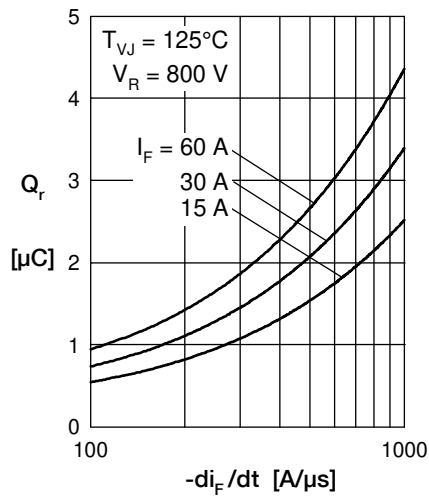
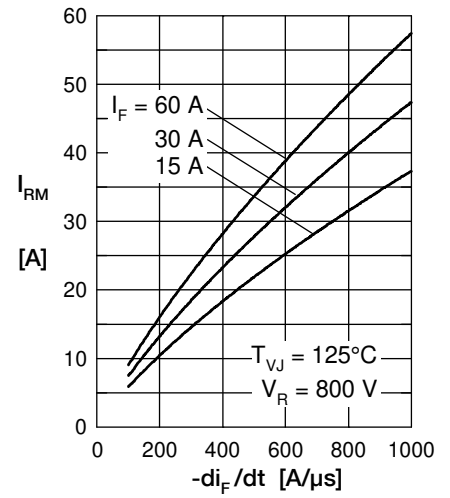
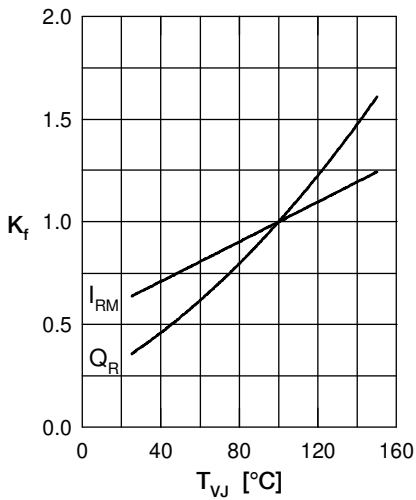
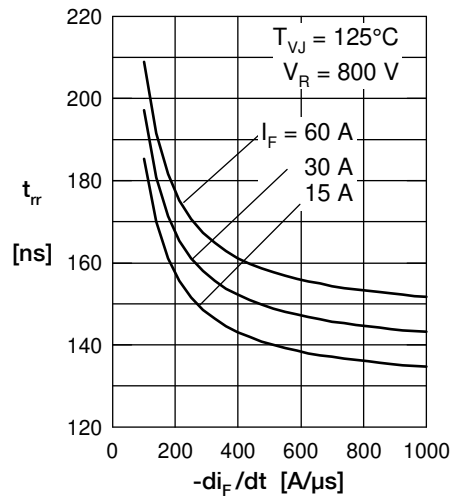
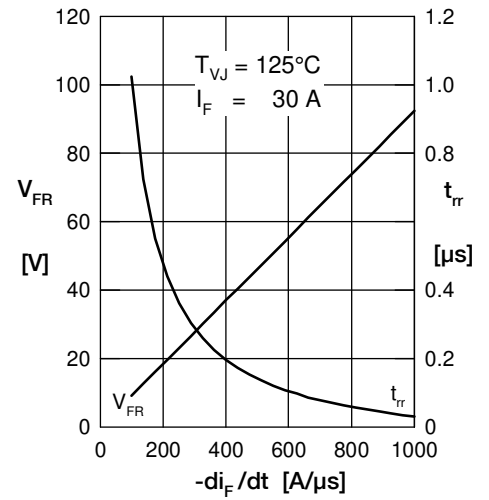
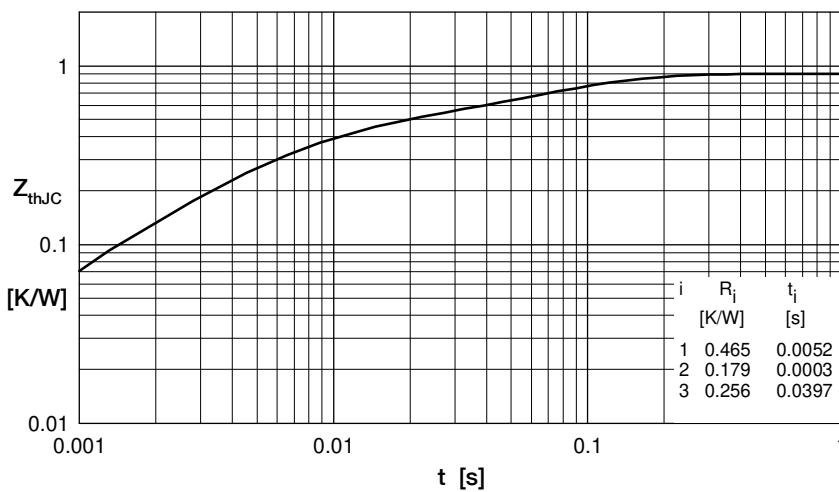
Brake Diode

 Fig. 1 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 Dynamic parameters Q_r , I_{RM} versus T_{VJ}

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

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


Fig. 7 Transient thermal impedance junction to case