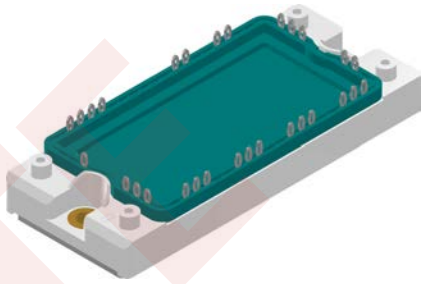
High Voltage Standard Rectifier Module

3~ Rectifier		Brake Chopper	
V_{RRM} =	2200 V	V_{CES} =	1700 V
I_{DAV} =	210 A	I_{C25} =	145 A
I_{FSM} =	1000 A	$V_{CE(sat)}$ =	1,8 V

3~ Rectifier Bridge + Brake Unit + NTC

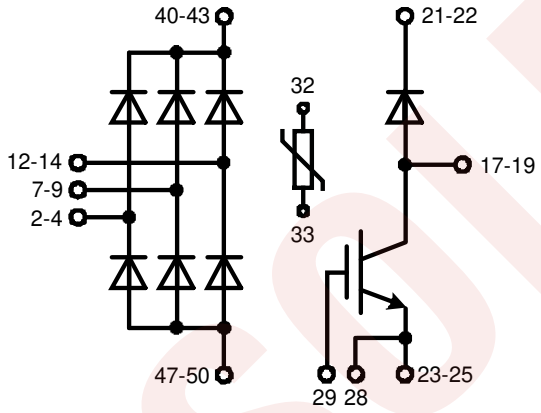
Part number

MDNA210UB2200PTED



Backside: isolated

E72873



Features / Advantages:

- Brake with Infineon IGBT3

Applications:

- 3~ Rectifier with brake unit for drive inverters

Package: E2-Pack

- Isolation Voltage: 4300 V~
- Industry standard outline
- RoHS compliant
- PressFit-Pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Phase Change Material available

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Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.

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Rectifier

Symbol	Definition	Conditions		Ratings min.	typ.	max.	Unit
V_{RSM}	*max. non-repetitive reverse blocking voltage*		T_{VJ} = 25°C			2300	V
V_{RRM}	*max. repetitive reverse blocking voltage*		T_{VJ} = 25°C			2200	V
I_R	*reverse current*	V_R = 2200 V	T_{VJ} = 25°C			100	µA
		V_R = 2200 V	T_{VJ} = 150°C			2	mA
V_F	*forward voltage drop*	I_F = 70 A	T_{VJ} = 25°C			1,23	V
		I_F = 210 A				1,75	V
		I_F = 70 A	T_{VJ} = 125°C			1,19	V
		I_F = 210 A				1,67	V
I_{DAV}	*bridge output current*	T_C = 85°C	T_{VJ} = 150°C			210	A
		rectangular d = ⅓					
V_{F0}	*threshold voltage* } *for power loss calculation only*		T_{VJ} = 150°C			0,82	V
r_F	*slope resistance* }					5,2	mΩ
R_{thJC}	*thermal resistance junction to case*					0,5	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,1		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			250	W
I_{FSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			1,00	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1,08	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			850	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			920	A
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			5,00	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			4,85	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			3,62	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			3,52	kA²s
C_J	*junction capacitance*	V_R = 400 V; f = 1 MHz	T_{VJ} = 25°C		33		pF

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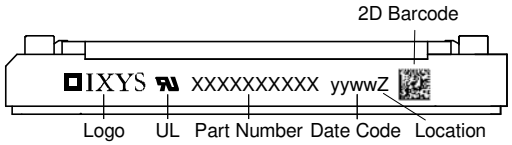
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Brake IGBT + Diode				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
V_{CES}	*collector emitter voltage*		T_{VJ} = 25°C			1700	V
V_{GES}	*max. DC gate voltage*					±20	V
V_{GEM}	*max. transient gate emitter voltage*					±30	V
I_{C25}	*collector current*		T_C = 25°C			145	A
I_{C80}			T_C = 80°C			100	A
P_{tot}	*total power dissipation*		T_C = 25°C			540	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 75 A; V_{GE} = 15 V	T_{VJ} = 25°C		1,8	2,16	V
			T_{VJ} = 125°C		2,1		V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 4 mA; V_{GE} = V_{CE}	T_{VJ} = 25°C	5,2	5,8	6,4	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		0,7		mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				500	nA
$Q_{G(on)}$	*total gate charge*	V_{CE} = 900 V; V_{GE} = 15 V; I_C = 75 A			1200		nC
$t_{d(on)}$	*turn-on delay time*	inductive load V_{CE} = 900 V; I_C = 75 A V_{GE} = ±15 V; R_G = 3,9 Ω	T_{VJ} = 125°C		320		ns
t_r	*current rise time*				50		ns
$t_{d(off)}$	*turn-off delay time*				550		ns
t_f	*current fall time*				400		ns
E_{on}	*turn-on energy per pulse*				15		mJ
E_{off}	*turn-off energy per pulse*				18		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 3,9 Ω	T_{VJ} = 125°C				
I_{CM}		V_{CEK} = 1700 V				200	A
SCSOA	*short circuit safe operating area*	V_{CEK} = 1700 V					
t_{SC}	*short circuit duration*	V_{CE} = 900 V; V_{GE} = ±15	T_{VJ} = 125°C			10	µs
I_{SC}	*short circuit current*	R_G = 3,9 Ω; non-repetitive			400		A
R_{thJC}	*thermal resistance junction to case*					0,23	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,08		K/W
Brake Diode							
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 25°C			1700	V
I_{F25}	*forward current*		T_C = 25°C			81	A
I_{F80}			T_C = 80°C			54	A
V_F	*forward voltage*	I_F = 60 A	T_{VJ} = 25°C			2,20	V
			T_{VJ} = 125°C		2,00		V
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C			0,1	mA
			T_{VJ} = 125°C			1,2	mA
Q_{rr}	*reverse recovery charge*	V_R = 900 V $-di_F/dt$ = 1600 A/µs I_F = 60 A; V_{GE} = 0 V	T_{VJ} = 125°C		15		µC
I_{RM}	*max. reverse recovery current*				100		A
t_{rr}	*reverse recovery time*				550		ns
E_{rec}	*reverse recovery energy*				6,5		mJ
R_{thJC}	*thermal resistance junction to case*					0,6	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,2		K/W

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Package E2-Pack				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal				30	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} ≤ 1 mA	4300			V
		t = 1 minute		3600			V



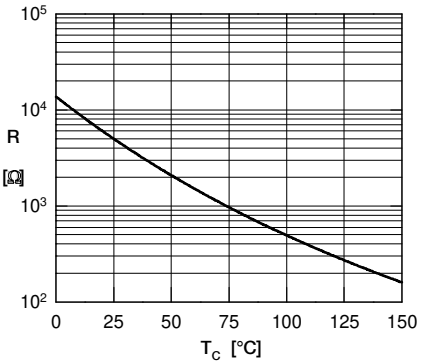
Part description

M = Module
D = Diode
N = High Voltage Standard Rectifier
A = (>= 2000V)
210 = Current Rating [A]
UB = 3~ Rectifier Bridge + Brake Unit
2200 = Reverse Voltage [V]
PT = PressFit-Pin, Thermistor
ED = E2-Pack
- = Hyphen
PC = Phase Change Material

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDNA210UB2200PTED	MDNA210UB2200PTED	Blister	28	515668
Alternative	MDNA210UB2200PTED-PC	MDNA210UB2200PTED	Blister	28	515430

Temperature Sensor NTC

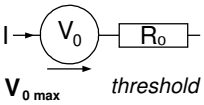
Symbol	**Definition**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
R_{25}	*resistance*	T_{VJ} = 25°	4,85	5	5,15	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K



Typ. NTC resistance vs. temperature

Equivalent Circuits for Simulation

** on die level* T_{VJ} = 150°C

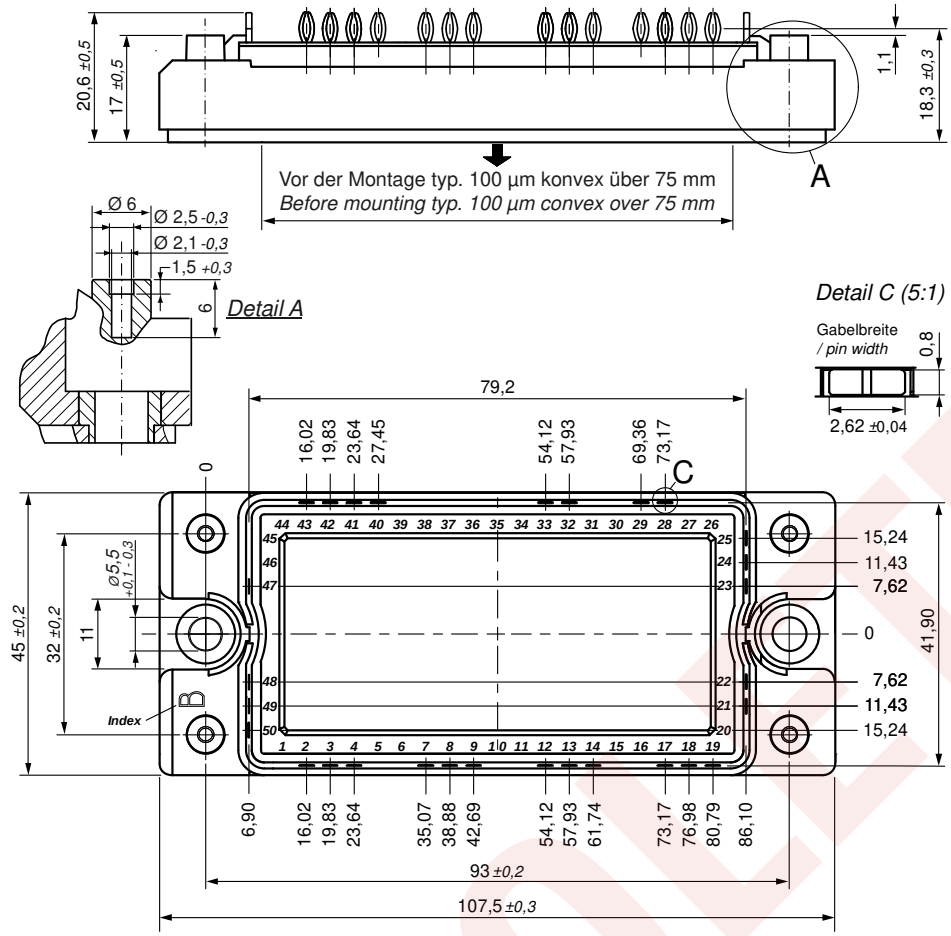


		Rectifier	**Brake IGBT +**	**Brake Diode**	
$V_{0\ max}$	*threshold voltage*	0,82	1,1	1,22	V
$R_{0\ max}$	*slope resistance **	3,1	17,9	13	mΩ

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Outlines E2-Pack

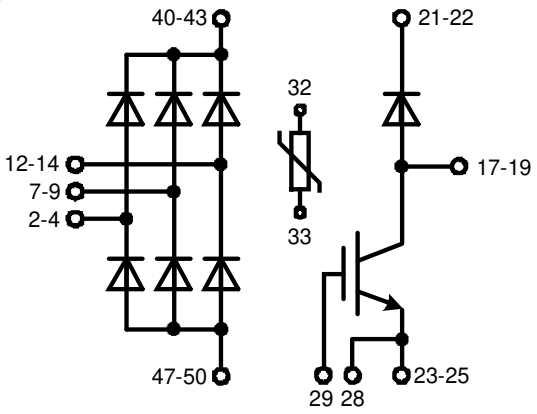


Bemerkung / ***Note:***

- Nicht tolerierte 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:* ⌖ **0.1**
- Bohrlochdurchmesser / *Diameter of drill:* **Ø 2.35 mm**
- Endlochdurchmesser / *Diameter of plated holes:* **Ø 2.14 - 2.29 mm** (Cu thickness in via typ. 50 µm)
- Beschichtung / *Plating:* **chem. Sn max. 15 µm**
- Einpresskraft / *Insert Force:* per terminal with a typ. insert speed of 7 mm/s: **typ. 90 N**
- Weitere Angaben / *Further information:* www.ixys.com **Application note IXAN0077**
- Montageanleitung / *Mounting instruction:* www.ixys.com **Application note IXAN0024**

***Detail A*:** PCB-Montage / *Mounting on PCB*

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



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Rectifier

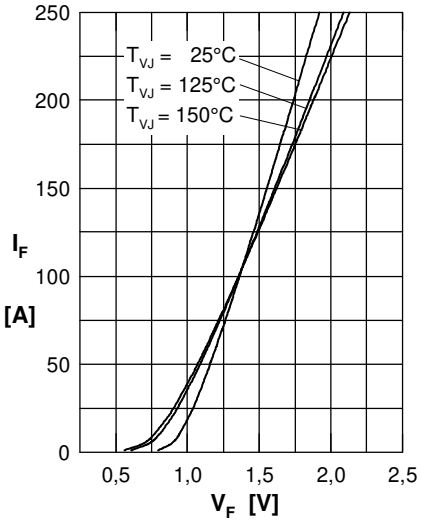


Fig. 1 Forward current versus voltage drop per diode

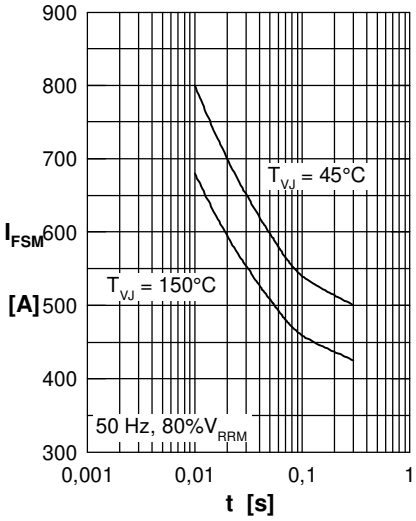


Fig. 2 Surge overload current vs. time per diode

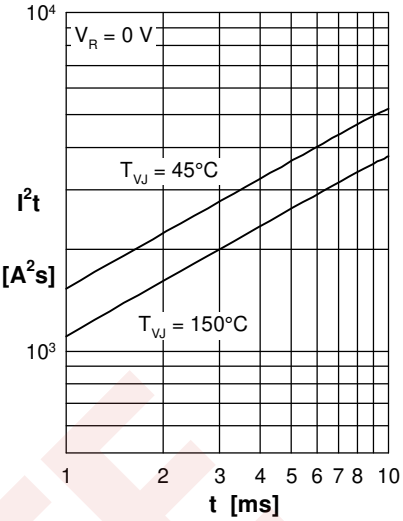


Fig. 3 I^2t versus time per diode

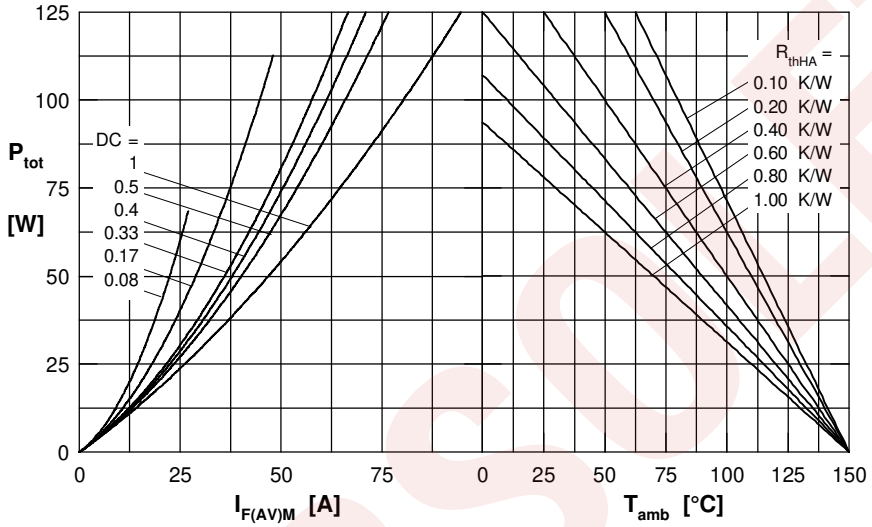


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

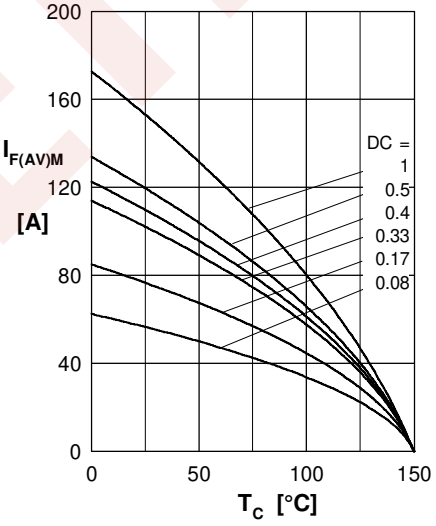


Fig. 5 Max. forward current vs. case temperature per diode

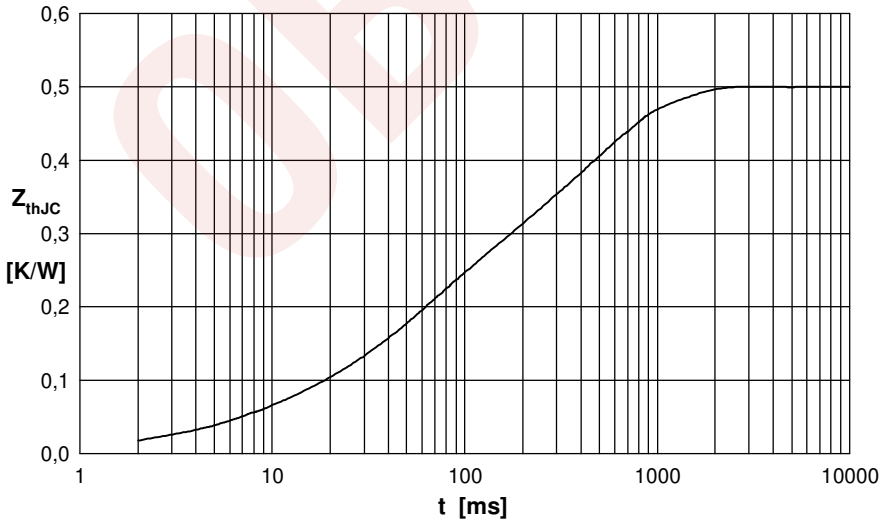


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.030	0.006
2	0.003	0.007
3	0.182	0.045
4	0.285	0.450

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Brake IGBT + Diode

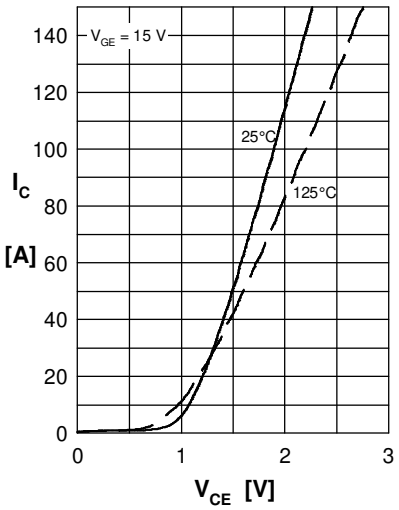


Fig.1 Output characteristics IGBT

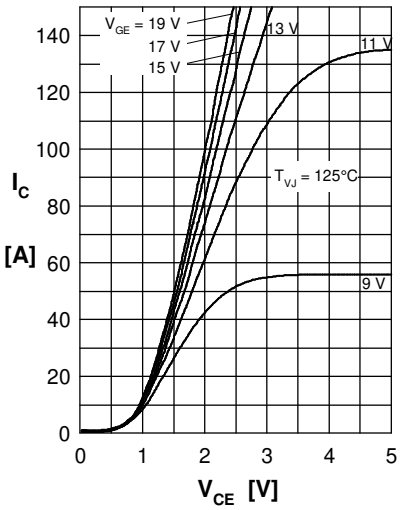


Fig.2 Typ. output characteristics IGBT

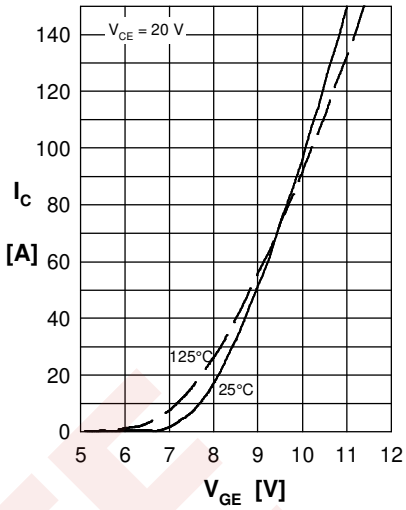


Fig. 3 Typ. transfer charact. IGBT

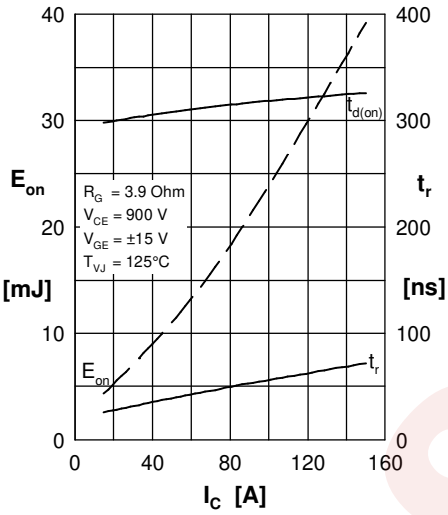


Fig. 4 Typ. turn-on energy & switch. times vs. collector current

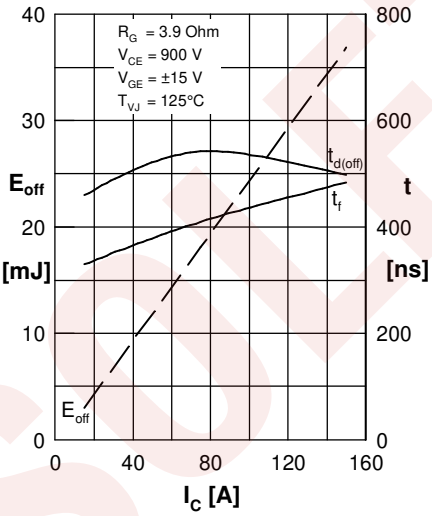


Fig. 5 Typ. turn-off energy & switch. times vs. collector current

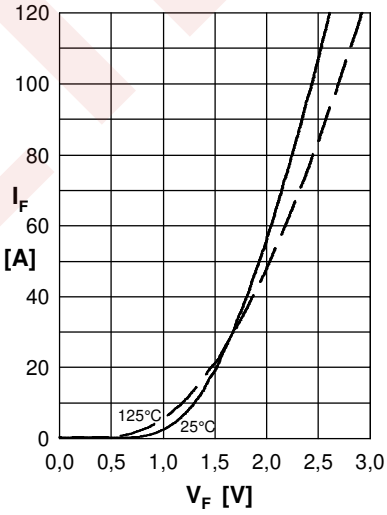


Fig. 6 Typ. forward characteristics Diode

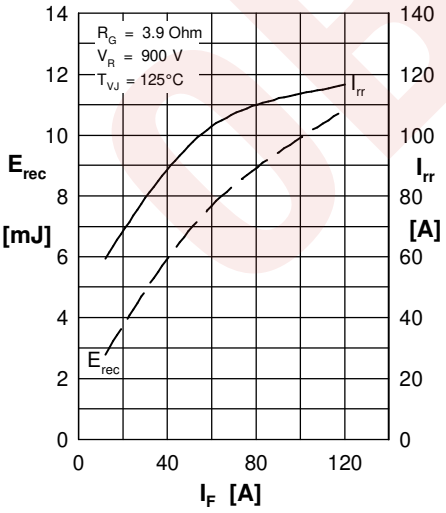


Fig. 7 Typ. reverse recovery characteristics Diode

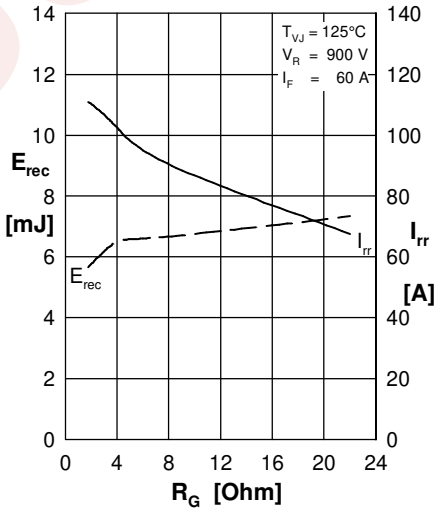


Fig. 8 Typ. reverse recovery characteristics Diode

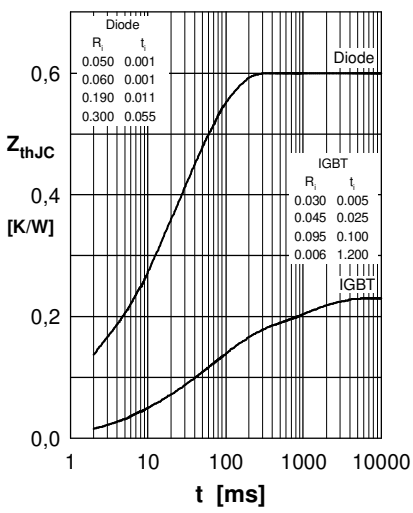


Fig. 9 Transient thermal resistance junction to case

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