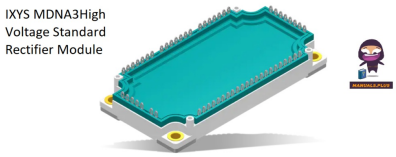
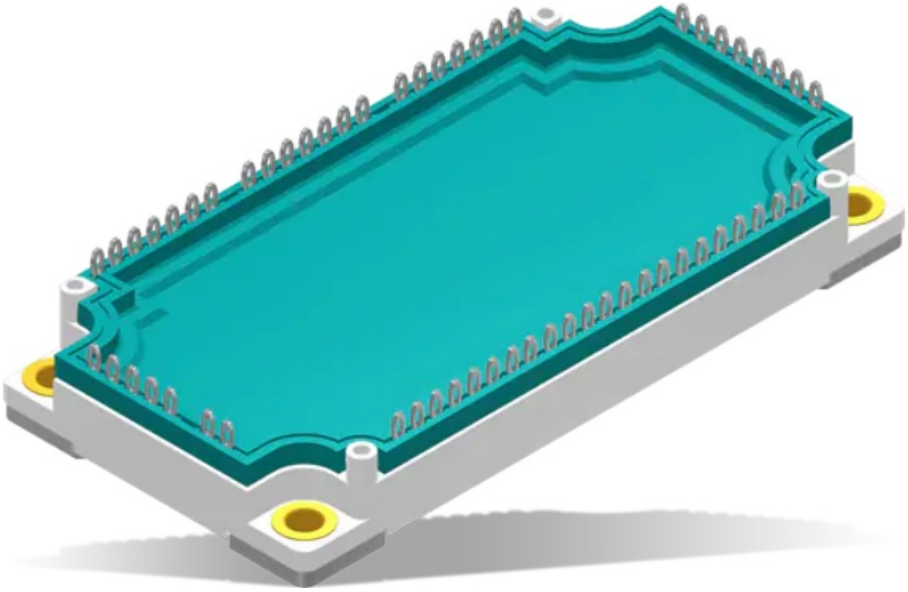


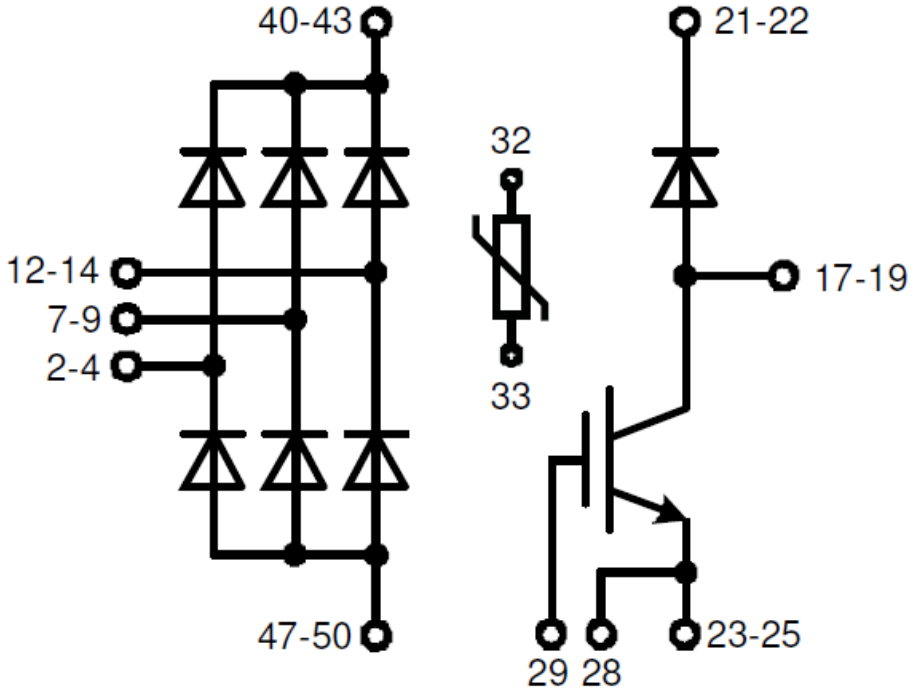
IXYS MDNA3High Voltage Standard Rectifier Module Owner's Manual

Contents

IXYS MDNA3High Voltage Standard Rectifier Module



Part number
MDNA360UB2200PTED



3~ Rectifier	**Brake Chopper**
VRRM = 2200 V	VCES = 1700 V
IDAV = 360 A	IC25 = 200 A
IFSM = 1900 A	VCE(sat) = 2,1 V

Features / Advantages:
Brake with Infineon IGBT³

Applications
3~ Rectifier with brake unit for drive inverters

Package: E2-Pack

- Isolation Voltage: 4 3 0 0 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

Rectifier				**Ratings**			
Symbol	**Definition**	**Conditions**		**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			3	mA
V_F	*forward voltage drop*	I_F = 120 A	T_{VJ} = 25°C			1,25	V
		I_F = 360 A				1,80	V
		I_F = 120 A	T_{VJ} = 125°C			1,23	V
		I_F = 360 A				1,98	V
I DAV	*bridge output current* rectangular	T_C = 85°C d = ⅓	TVJ = 150°C			360	A
V_{F0}	*threshold voltage for power loss calculation only*		TVJ = 150°C			0,82	V
r_F	*slope resistance*					3,4	mΩ

RthJC	*thermal resistance junction to case*					0,25	K/W
RthCH	*thermal resistance case to heatsink*				0,1		K/W
Ptot	*total power dissipation*	T_C = 25°C				500	W
IFSM *max. forward surge current*	t = 10 ms; (50 Hz), sine T_{VJ} = 45°C					1,90	kA
	t = 8,3 ms; (60 Hz), sine V_R = 0 V					2,05	kA
	t = 10 ms; (50 Hz), sine TVJ = 150°C					1,62	kA
	t = 8,3 ms; (60 Hz), sine V_R = 0 V					1,75	kA
I²t *value for fusing*	t = 10 ms; (50 Hz), sine T_{VJ} = 45°C					18,1	kA²s
	t = 8,3 ms; (60 Hz), sine V_R = 0 V					17,5	kA²s
	t = 10 ms; (50 Hz), sine T_{VJ} = 150°C					13,0	kA²s
	t = 8,3 ms; (60 Hz), sine V_R = 0 V					12,7	kA²s
C_J	*junction capacitance*	VR = 400 V; f = 1 MHz	T_{VJ} = 25°C		73		pF

Brake IGBT + Diode					**Ratings**			
Symbol	**Definition**	**Conditions**			**min.**	**typ.**	**max.**	**Unit**
VCES	*collector emitter voltage*		TVJ	= 25°C			1700	V
VGES	*max. DC gate voltage*						±20	V
VGEM	*max. transient gate emitter voltage*						±30	V
IC25	*collector current*		T_C	= 25°C			200	A
IC100			T_C	= 100°C			135	A
Ptot	*total power dissipation*		T_C	= 25°C			935	W

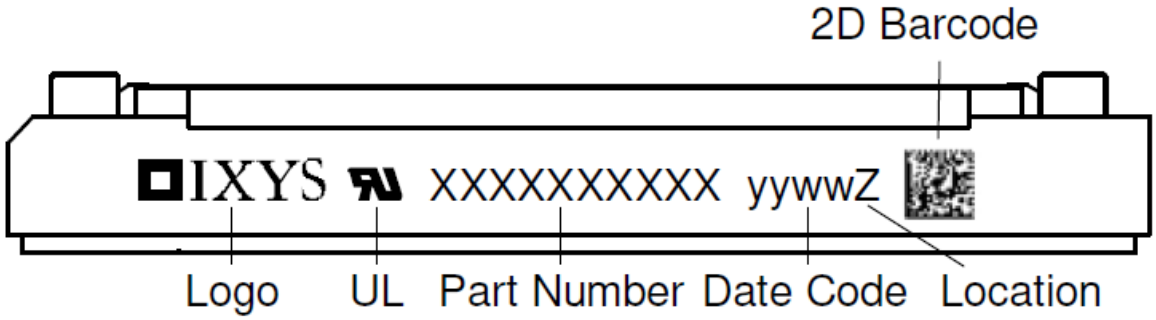
VCE(sat)	*collector emitter saturation voltage*	I_C = 150 A; V_{GE} = 15 V	T VJ	= 25°C		2,1	2,8	V
			T VJ	= 125°C		3,2		V
VGE(th)	*gate emitter threshold voltage*	I_C = 4 mA; V_{GE} = V_{CE}	T VJ	= 25°C	5,5	6,0	6,5	V
ICES	*collector emitter leakage current*	V_{CE} = V_{CES}; V_{GE} = 0 V	T VJ T VJ	= 25°C = 125°C		2,3	0,12	mA mA
IGES	*gate emitter leakage current*	V_{GE} = ±20 V					500	nA
QG(on)	*total gate charge*	V_{CE} = 900 V; V_{GE} = 15 V; I_C = 150 A				310		nC
td(on) **t_r** **td(off)** **t_f** **Eon** **Eoff**	*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} 900 V; I_C = 150 A V_{GE} = ±15 V; R_G = 10 Ω	T VJ	= 125°C		120 80 400 150 45 50		ns ns ns ns mJ mJ
RBSOA **I CM**	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 10 Ω V_{CEK} = 1700 V	T VJ	= 125°C			280	A
SCSOA	*short circuit safe operating area*	V_{CEK} = 1700 V						
tSC	*short circuit duration*	V_{CE} = 1300 V; V_{GE} = ±15	T VJ	= 125°C			10	µs
ISC	*short circuit current*	R_G = 10 Ω; non-repetitive				400		A
RthJC	*thermal resistance junction to case*						0,16	K/W
RthCH	*thermal resistance case to heatsink*					0,25		K/W
Brake Diode								
VRRM	*max. repetitive reverse voltage*		T VJ	= 25°C			1700	V

IF25	*forward current*		T_C	= 25°C			145	A
IF100			T C	= 100° C			90	A
V_F	*forward voltage*	I_F = 100 A	T VJ T VJ	= 25°C = 125° C		2,00	2,20	V V
IR	*reverse current*	VR = VRRM	T VJ T VJ	= 25°C = 125° C			tbd tbd	mA mA
Qrr	*reverse recovery charge*	V_R = 900 V				30		µC
IRM	*max. reverse recovery current*	-di$_F$ /dt = 2500A/µs	T VJ	= 125° C		60		A
trr	*reverse recovery time*	I_F = 100 A; V_{GE} = 0 V				200		ns
Erec	*reverse recovery energy*					11		mJ
RthJC	*thermal resistance junction to case*						0,39	K/W
RthCH	*thermal resistance case to heatsink*					0,62		K/W

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
Top	*operation temperature*		-40		125	°C
T_{stg}	*storage temperature*		-40		125	°C
Weight				176		g
MD	*mounting torque*		3		6	Nm
dSpp/App *creepage distance on surface | striking distance through air* **dSpb/Apb**		*terminal to terminal* *terminal to backside*	6,0 12,0			mm mm
V **ISOL** IISOL ≤ 1 mA t = 1 minute	*isolation voltage*	t = 1 second 50/60 Hz, RMS;	4300 3600			V V

Part description

M = Module
D = Diode
N = High Voltage Standard Rectifier
A = (>= 2000V)
360 = 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

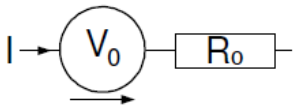


Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDNA360UB2200PTED	MDNA360UB2200PTED	Blister	28	515682
Alternative	MDNA360UB2200PTED-PC	MDNA360UB2200PTED	Blister	28	514541

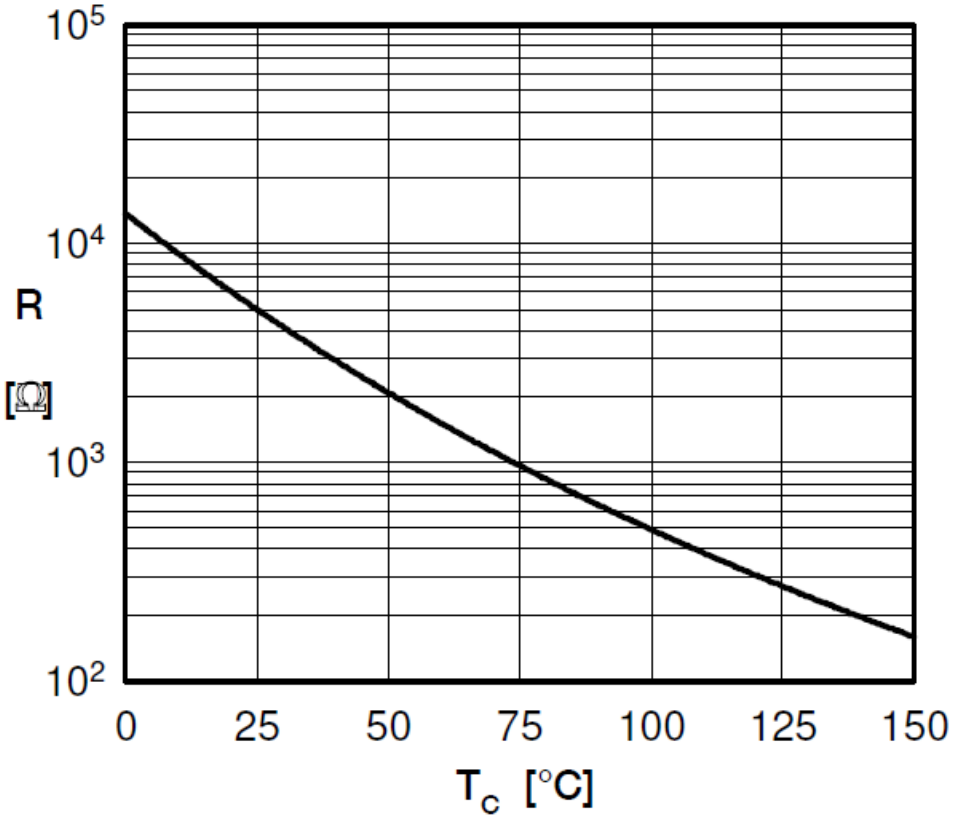
Temperature Sensor NTC

Symbol	Definition	Conditions	min.	typ.	max.	Unit
R25 B25/50	*resistance* *temperature coefficient*	T_{VJ} = 25°	4,85	5 3375	5,15	kΩ K

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

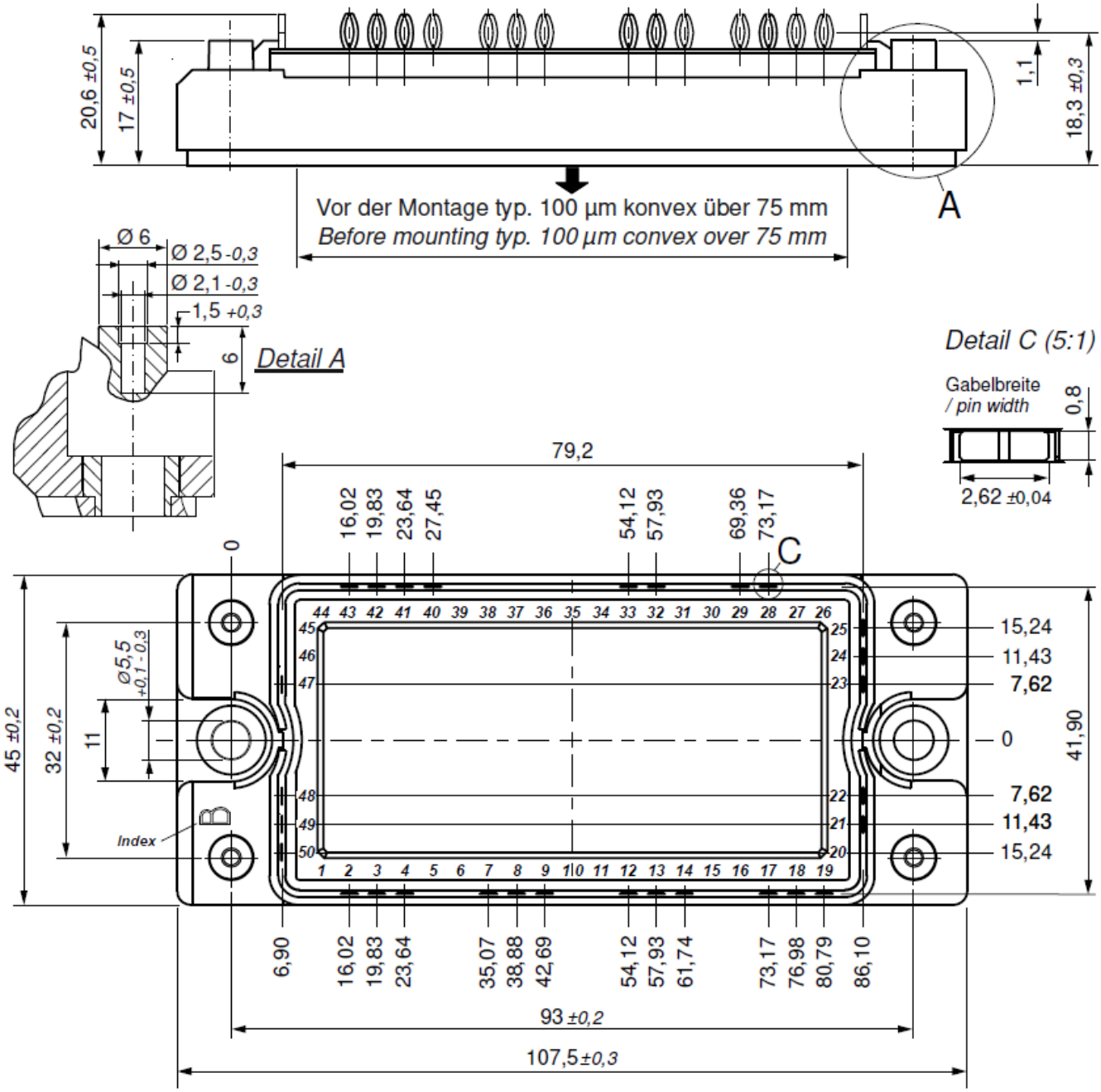


		Rectifier	Brake IGBT +	Brake Diode	
$V_{0\,max}$	*threshold voltage*	0,82	1,1	1,25	V
$R_{0\,max}$	*slope resistance* *	1,5	9,2	8,5	mΩ



Typ. NTC resistance vs. temperature

Outlines E2-Pack



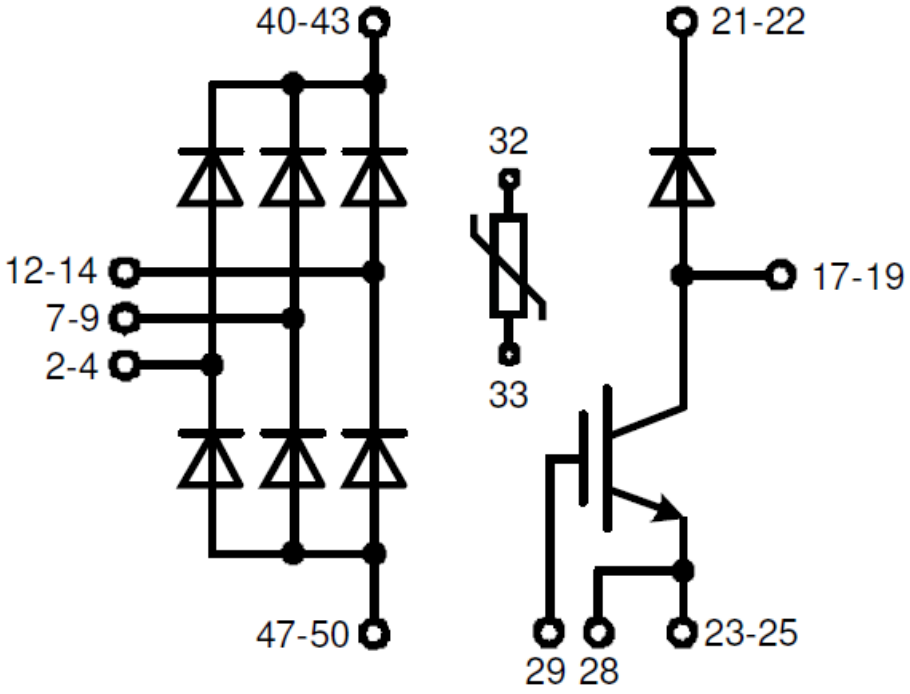
Bemerkung / Note:

- Measure without tolerances according DIN ISO 2768-T1-m
- PCB hole pattern: see pin position
- Tolerance of pin position and PCB hole pattern: 0.1
- Diameter of drill: Ø 2.35 mm
- Diameter of plated holes:Ø 2.14 – 2.29 mm (Cu thickness in via typ. 50 µm)
- Plating: chem. Sn max. 15 µm
- Insert Force: per terminal with a typ. insert speed of 7 mm/s: typ. 90 N
- Further information: **www.ixys.com** Application note IXAN0077
- Mounting instruction: **www.ixys.com** Application note IXAN0024

Detail A: Mounting on PCB

- Recommended, self-tapping screw: EJOT PT® (size: K25)

- Max. screw length: PCB-Dicke / thickness + 6 mm (hole depth)
- Recommended mounting torque:1.5 Nm



Rectifier

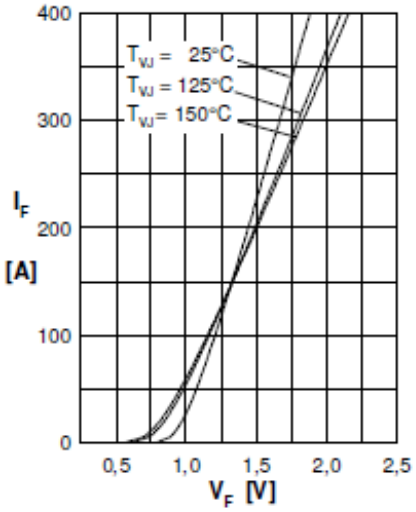


Fig. 1 Forward current versus voltage drop per diode

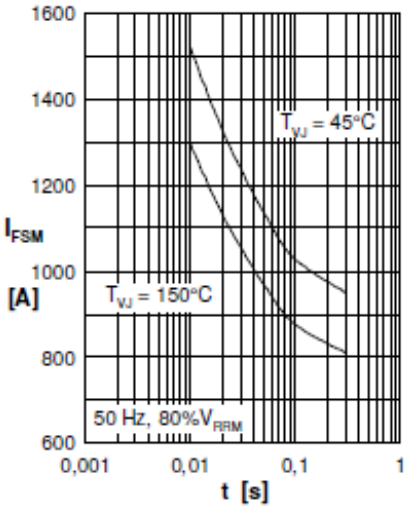


Fig. 2 Surge overload current vs. time per diode

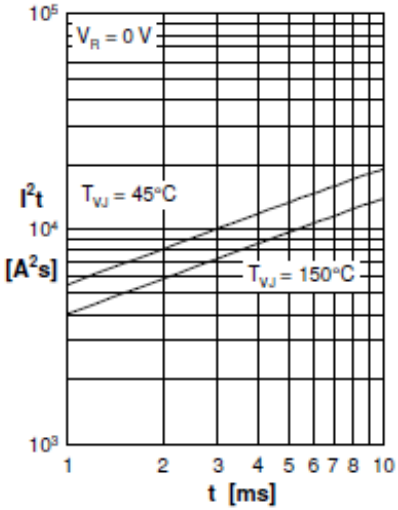


Fig. 3 I^2t versus time per diode

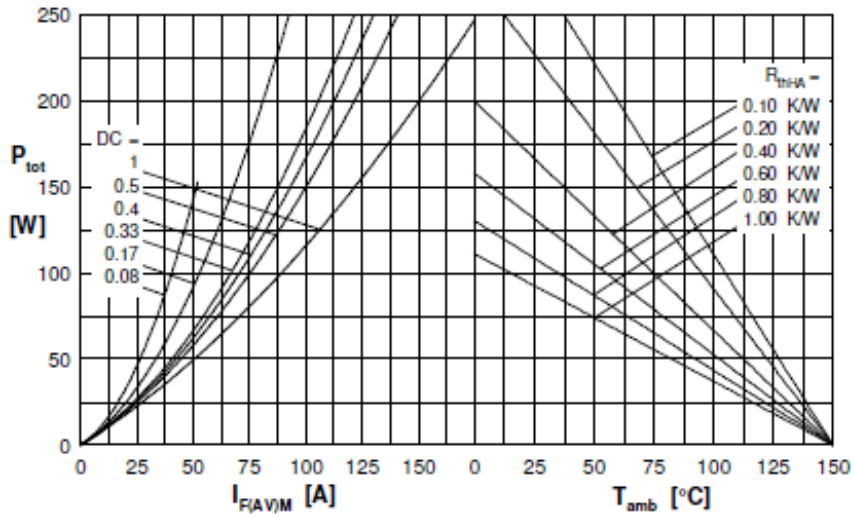


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

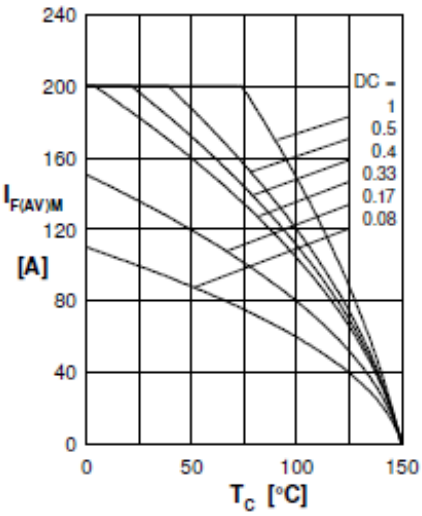


Fig. 5 Max. forward current vs. case temperature per diode

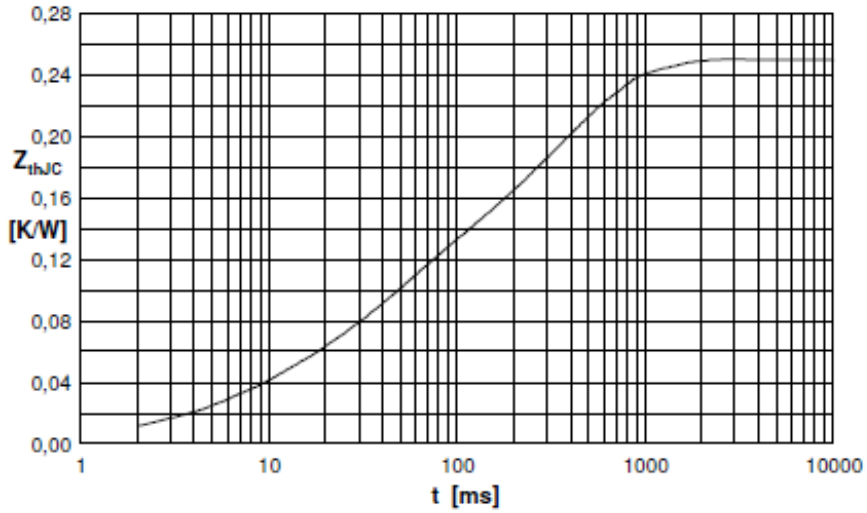


Fig. 6 Transient thermal impedance junction to case vs. time per diode

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.020	0.006
2	0.003	0.007
3	0.080	0.037
4	0.147	0.360

Brake IGBT + Diode

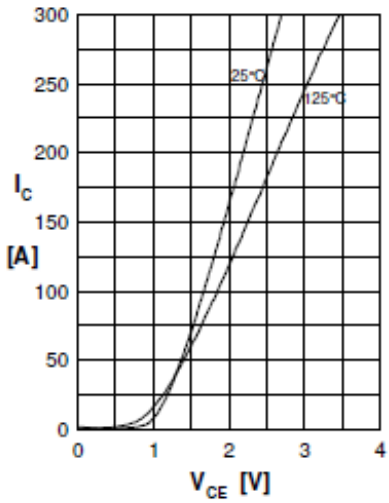


Fig.1 Typ. output characteristics IGBT

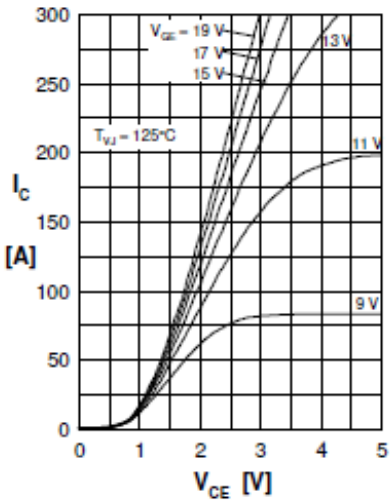


Fig.2 Typ. output characteristics IGBT

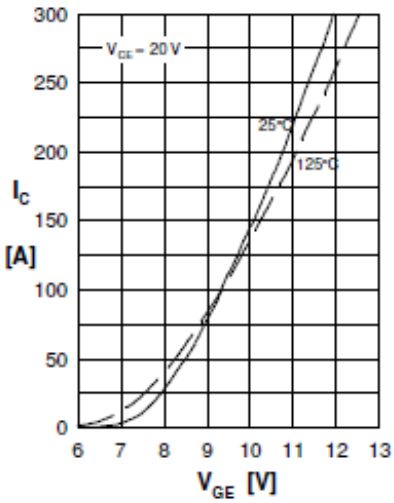


Fig. 3 Typ. transfer charact. IGBT

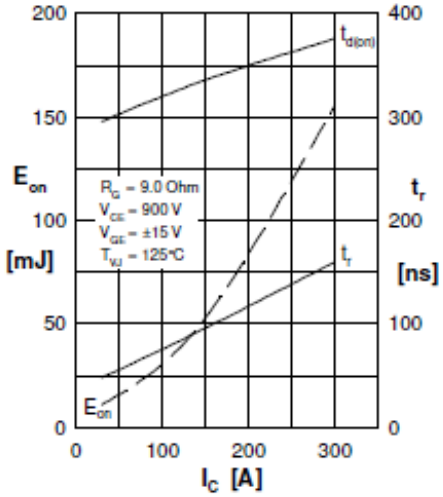


Fig. 4 Typ. turn-on energy & switch. times vs. collector current

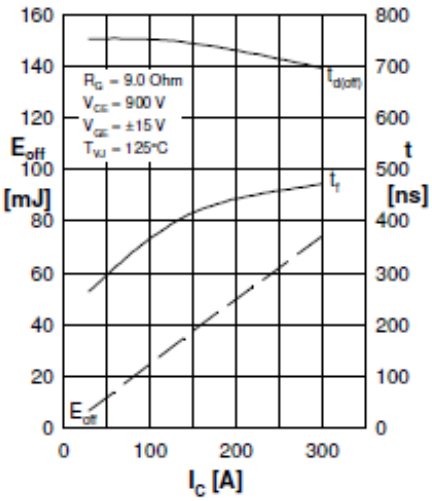


Fig. 5 Typ. turn-off energy & switch. times vs. collector current

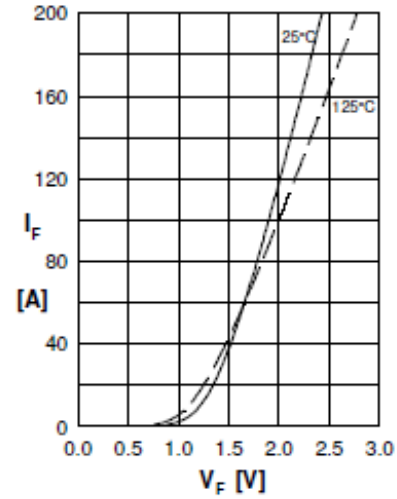


Fig. 6 Typ. forward characteristics Diode

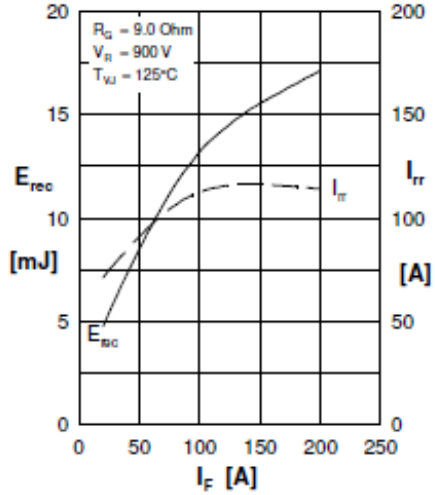


Fig. 7 Typ. reverse recovery characteristics Diode

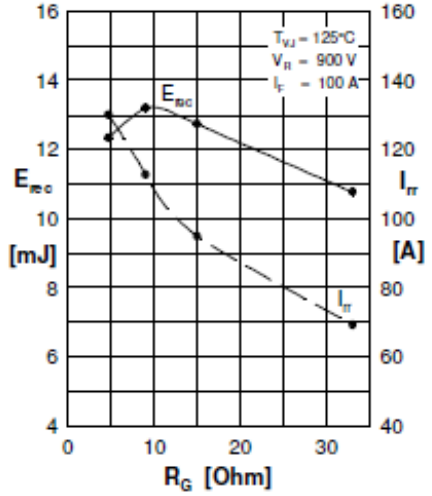


Fig. 8 Typ. reverse recovery characteristics Diode

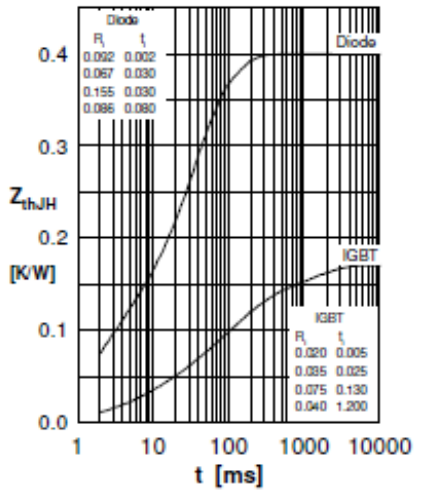
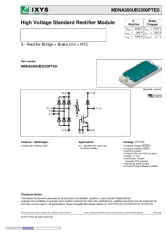


Fig. 9 Typ. transient thermal resistance juntion to heatsink

Documents / Resources

	IXYS MDNA3High Voltage Standard Rectifier Module [pdf] Owner's Manual MDNA360UB2200PTED, MDNA3 High Voltage Standard Rectifier Module, MDNA3, High Voltage Standard Rectifier Module, Voltage Standard Rectifier Module, Standard Rectifier Module, Rectifier Module

References

- IXYS
- Product Disclaimer - Littelfuse
- User Manual