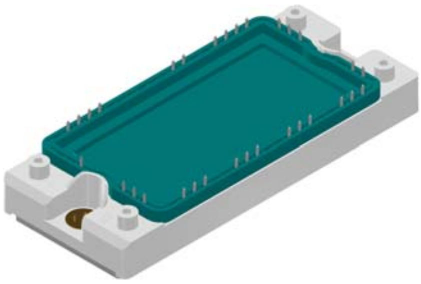
Standard Rectifier Module

3~ Rectifier		
V_{RRM}	=	1600 V
I_{DAV}	=	360 A
I_{FSM}	=	1900 A

3~ Rectifier Bridge + Softstart-Thyristor

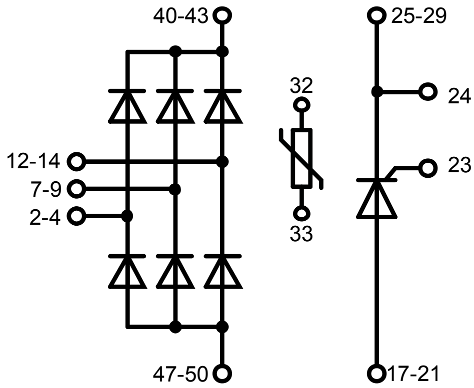
Part number

MDMA360UC1600TED



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

Applications:

- Diode for main rectification plus Softstart-Thyristor
- For three phase bridge configurations
- Supplies for DC power equipment
- Input rectifiers for PWM inverter
- Battery DC power supplies
- Field supply for DC motors

Package: E2-Pack

- Isolation Voltage: 3600 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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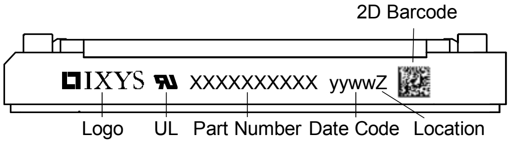
Rectifier

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} = 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*	T_C = 85°C	T_{VJ} = 150°C			360	A
		rectangular d = ⅓					
V_{F0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 150°C			0.82	V
r_F	*slope resistance*	*for power loss calculation only*				3.4	mΩ
R_{thJC}	*thermal resistance junction to case*					0.25	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.1		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			500	W
I_{FSM}	*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	T_{VJ} = 150°C			1.62	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1.75	kA
I^2t	*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*	V_R = 400 V; f = 1 MHz	T_{VJ} = 25°C		10		pF

Softstart-Thyristor				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1700	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1600	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1600 V	T_{VJ} = 25°C			100	µA
		$V_{R/D}$ = 1600 V	T_{VJ} = 150°C			15	mA
V_T	*forward voltage drop*	I_T = 150 A	T_{VJ} = 25°C			1.34	V
		I_T = 300 A				1.73	V
		I_T = 150 A	T_{VJ} = 125°C			1.31	V
		I_T = 300 A				1.77	V
I_{TAV}	*average forward current*	T_C = 90°C 180° sine	T_{VJ} = 150°C			150	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 150°C			0.84	V
r_T	*slope resistance*					3.1	mΩ
R_{thJC}	*thermal resistance junction to case*					0.17	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.080		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			735	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			2.40	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			2.59	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			2.04	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			2.21	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			28.8	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			27.9	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			20.8	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			20.2	kA²s
C_J	*junction capacitance*	V_R = 400 V f = 1 MHz	T_{VJ} = 25°C		119		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 150°C			10	W
		t_P = 300 µs				5	W
P_{GAV}	*average gate power dissipation*					0.5	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 150°C; f = 50 Hz	repetitive, I_T = 450 A			150	A/µs
		t_P = 200 µs; di_G/dt = 0.45 A/µs; I_G = 0.45 A; V = ⅔ V_{DRM}	non-repet., I_T = 150 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V = ⅔ V_{DRM} R_{GK} = ∞; method 1 (linear voltage rise)	T_{VJ} = 150°C			1000	V/µs
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			1.5	V
			T_{VJ} = -40°C			1.6	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			150	mA
			T_{VJ} = -40°C			200	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 150°C			0.2	V
I_{GD}	*gate non-trigger current*					10	mA
I_L	*latching current*	t_p = 10 µs I_G = 0.45 A; di_G/dt = 0.45 A/µs	T_{VJ} = 25°C			200	mA
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			200	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM} I_G = 0.45 A; di_G/dt = 0.45 A/µs	T_{VJ} = 25°C			2	µs
t_q	*turn-off time*	V_R = 100 V; I_T = 150 A; V = ⅔ V_{DRM} di/dt = 10 A/µs dv/dt = 20 V/µs t_p = 200 µs	T_{VJ} = 125 °C		185		µs

Package E2-Pack

Symbol	Definition	Conditions		Ratings 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} ≤ 1 mA	3600			V
		t = 1 minute		3000			V



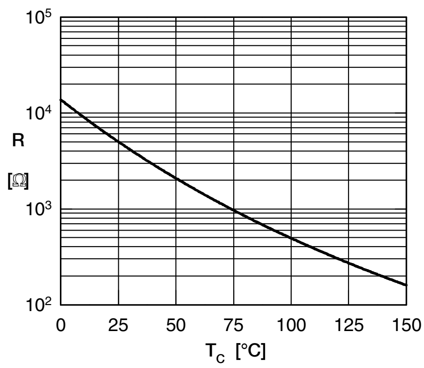
Part description

M = Module
D = Diode
M = Standard Rectifier
A = (up to 1800V)
360 = Current Rating [A]
UC = 3~ Rectifier Bridge + Softstart-Thyristor
1600 = Reverse Voltage [V]
T = Thermistor \ Temperature sensor
ED = E2-Pack

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MDMA360UC1600TED	MDMA360UC1600TED	Box	6	524541

Temperature Sensor NTC

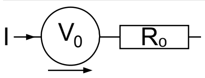
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	*resistance*	T_{VJ} = 25°	4.85	5	5.15	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K



Typ. NTC resistance vs. temperature

Equivalent Circuits for Simulation

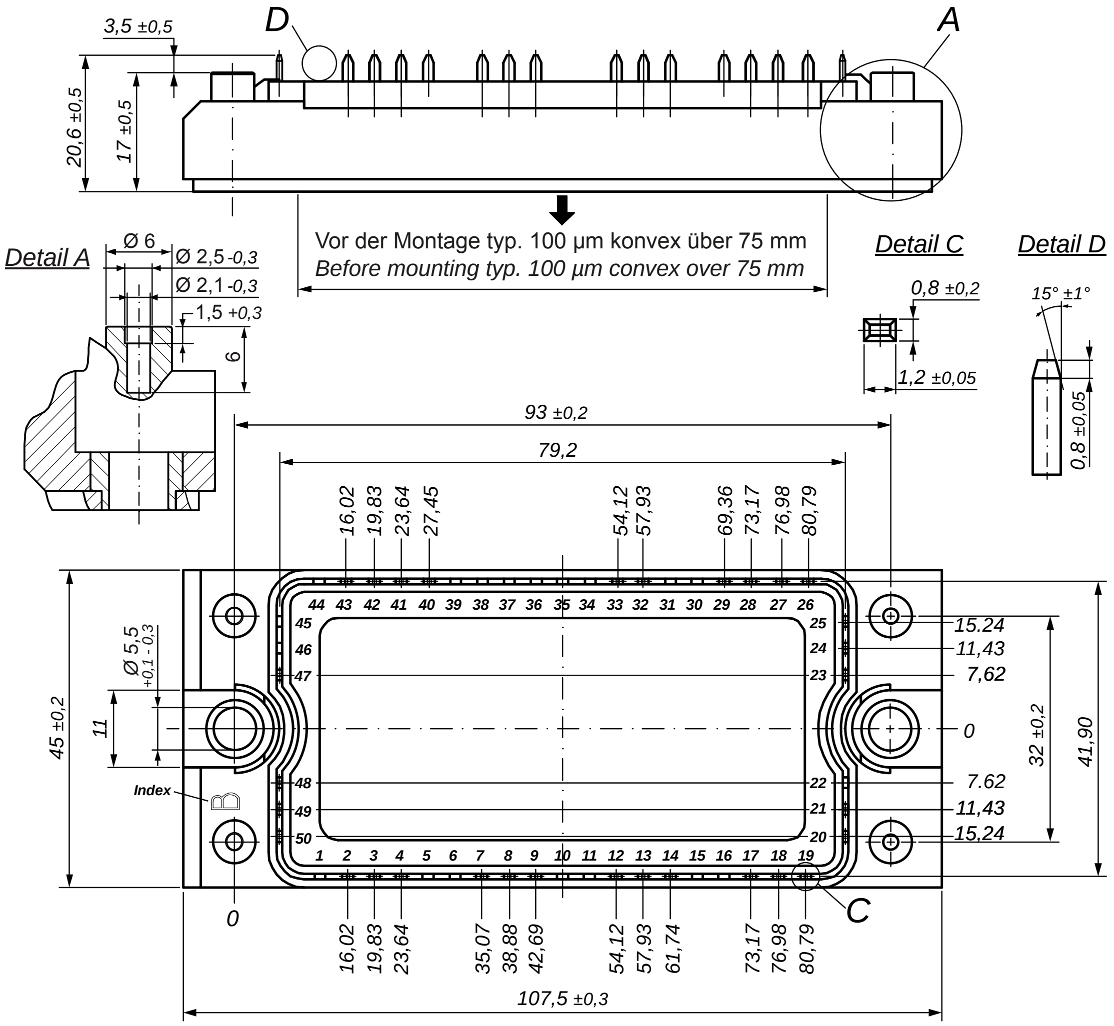
* *on die level* T_{VJ} = 150°C



Rectifier

$V_{0\,max}$	*threshold voltage*	0.82	V
$R_{0\,max}$	*slope resistance **	10.2	mΩ

Outlines E2-Pack

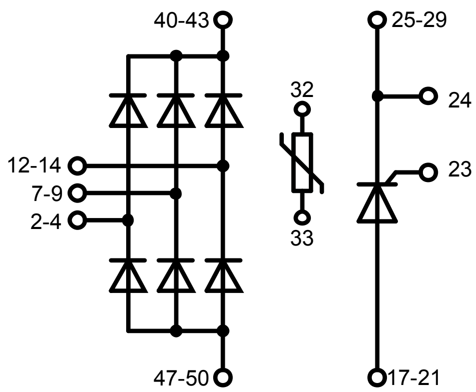


Bemerkung / *Note:*

- Nichttolerierte 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**
- 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**



Rectifier

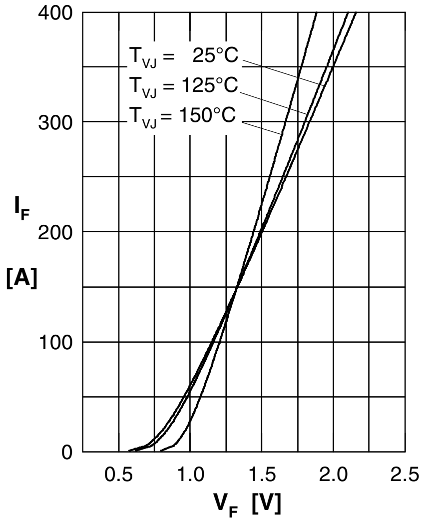


Fig. 1 Forward current versus voltage drop per diode

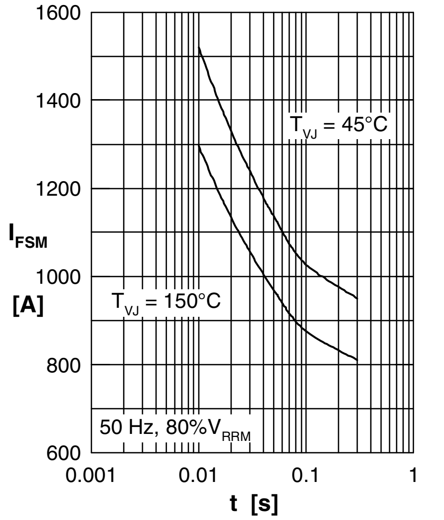


Fig. 2 Surge overload current vs. time per diode

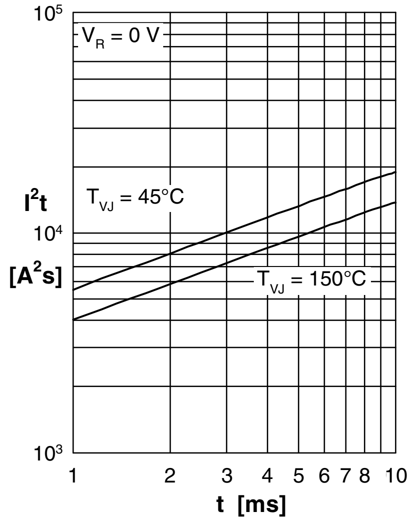


Fig. 3 I^2t versus time per diode

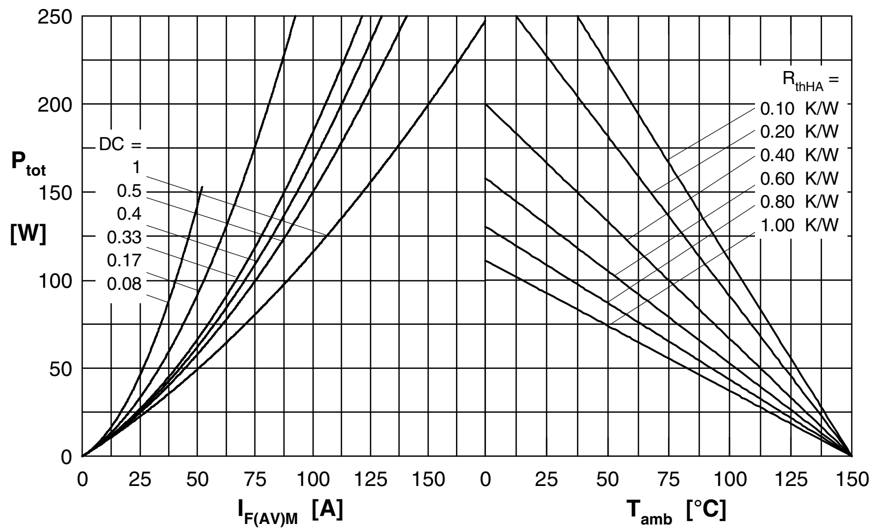


Fig. 4 Power dissipation vs. forward current and ambient temperature per diode

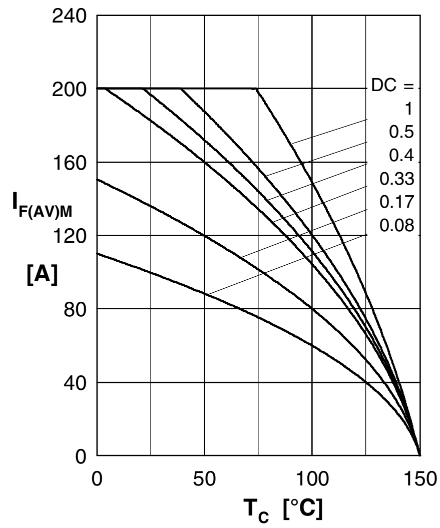


Fig. 5 Max. forward current vs. case temperature per diode

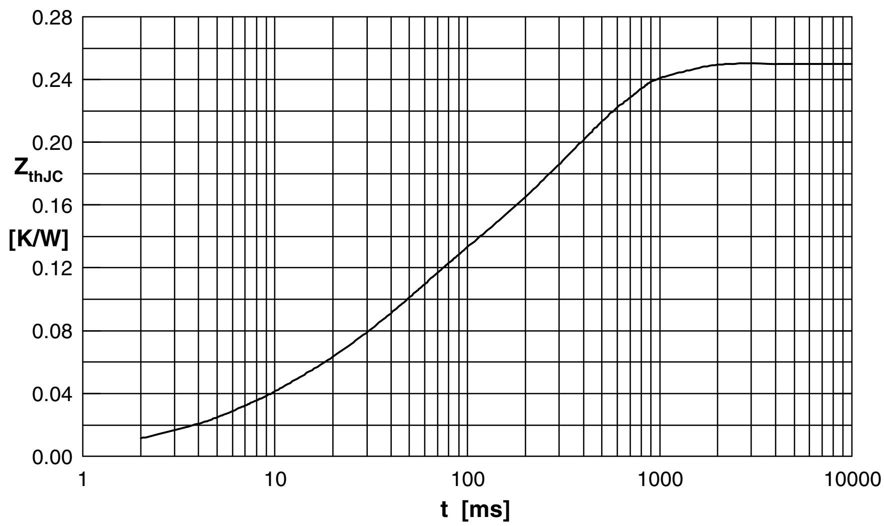


Fig. 6 Transient thermal impedance junction to case vs. time per diode

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

Softstart Thyristor

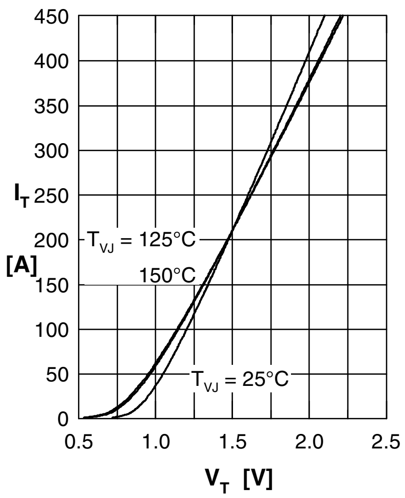


Fig. 1 Forward characteristics

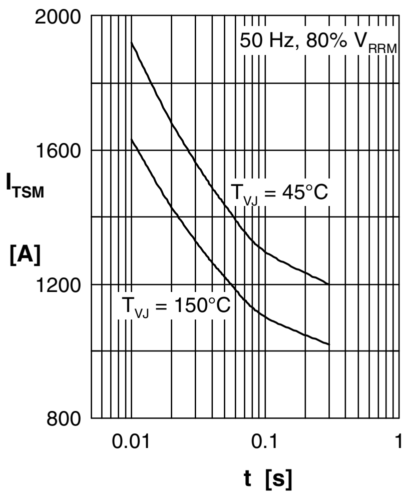


Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration

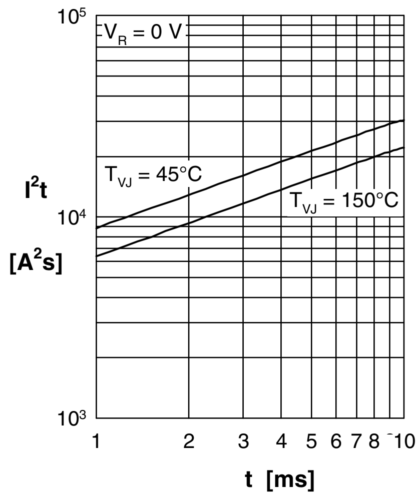


Fig. 3 I^2t versus time (1-10 s)

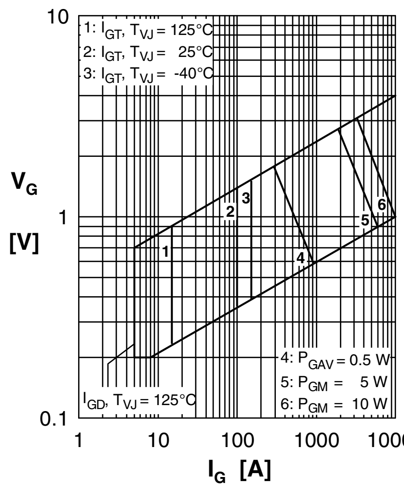


Fig. 4 Gate voltage & gate current

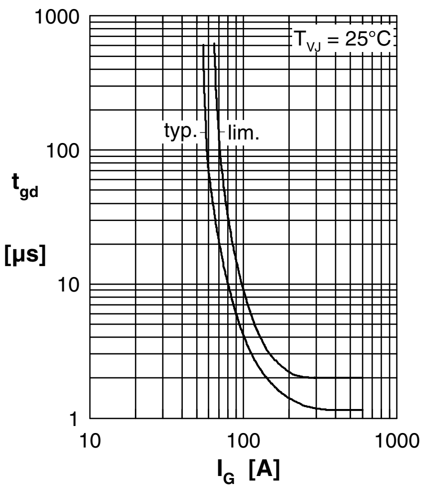


Fig. 5 Gate controlled delay time t_{gd}

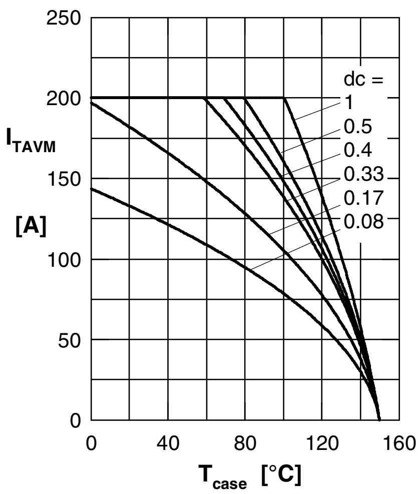


Fig. 6 Max. forward current at case temperature

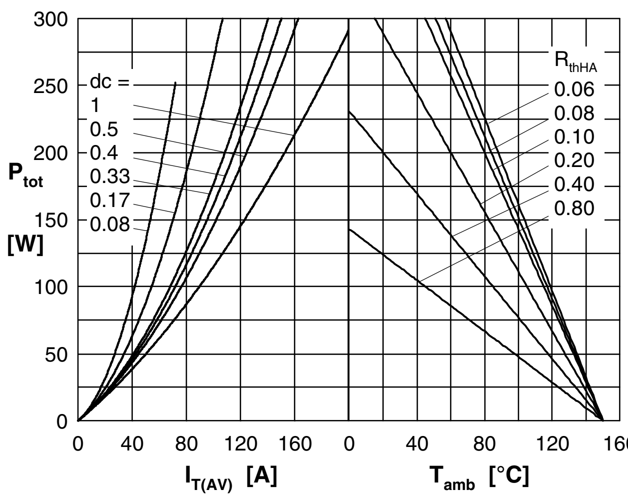
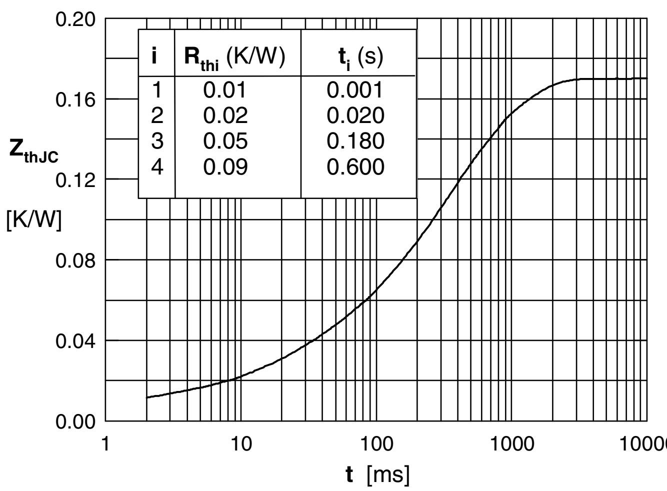


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



i	R_{thi} (K/W)	t_i (s)
1	0.01	0.001
2	0.02	0.020
3	0.05	0.180
4	0.09	0.600

Fig. 8 Transient thermal impedance junction to case