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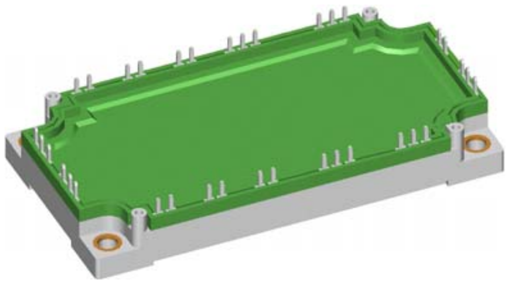
XPT IGBT Module

3~ Rectifier			Brake Chopper			3~ Inverter		
V_{RRM}	=	1600 V	V_{CES}	=	1200 V	V_{CES}	=	1200 V
I_{DAV}	=	290 A	I_{C25}	=	90 A	I_{C25}	=	120 A
I_{FSM}	=	1200 A	$V_{CE(sat)}$	=	1.8 V	$V_{CE(sat)}$	=	1.8 V

6-Pack + 3~ Rectifier Bridge & Brake Unit + NTC

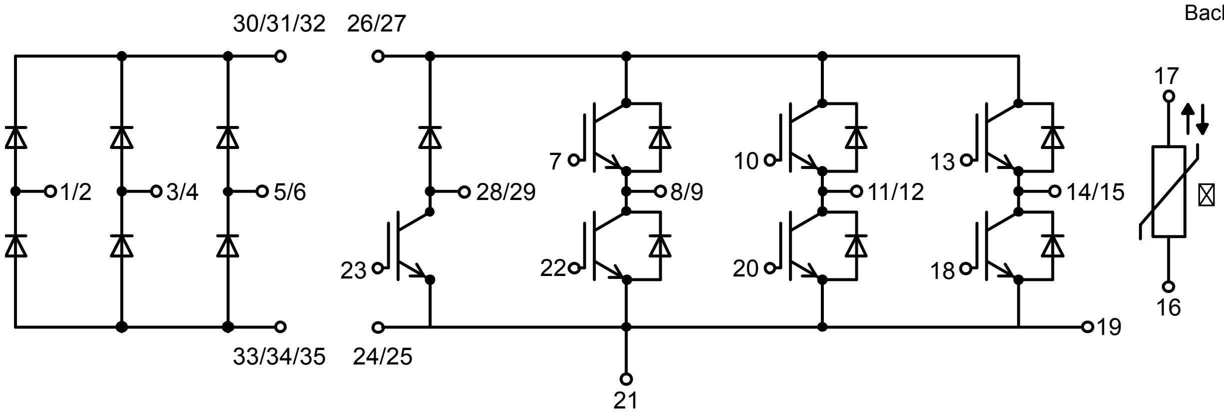
Part number

MIXA81WB1200TEH



Backside: isolated

E72873



Features / Advantages:

- Easy paralleling due to the positive temperature coefficient of the on-state voltage
- Rugged XPT design (Xtreme light Punch Through) results in:
  - short circuit rated for 10 µsec.
  - very low gate charge
  - low EMI
  - square RBSOA @ 3x Ic
- Thin wafer technology combined with the XPT design results in a competitive low VCE(sat)
- SONIC™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

Applications:

- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies
- Inductive heating, cookers
- Pumps, Fans

Package: E3-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

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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, drain current*	V_R = 1600 V	T_{VJ} = 25°C			100	µA
		V_R = 1600 V	T_{VJ} = 125°C			0.5	mA
V_F	*forward voltage drop*	I_F = 120 A	T_{VJ} = 25°C			1.23	V
		I_F = 240 A					V
		I_F = 120 A	T_{VJ} = 125°C			1.19	V
		I_F = 240 A					V
I_{DAV}	*bridge output current*	T_C = 80°C	T_{VJ} = 150°C			290	A
		rectangular d = ⅓					
V_{F0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 150°C			0.85	V
r_F	*slope resistance*					2.7	mΩ
R_{thJC}	*thermal resistance junction to case*					0.45	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.10		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			280	W
I_{FSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			1.20	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1.30	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			1.02	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1.10	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			7.20	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			6.98	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			5.20	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			5.04	kA²s
C_J	*junction capacitance*	V_R = 600 V f = 1 MHz	T_{VJ} = 25°C		26		pF

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Brake IGBT

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 collector gate voltage*					±30	V
I_{C25}	*collector current*		T_C = 25°C			90	A
I_{C80}			T_C = 80°C			60	A
P_{tot}	*total power dissipation*		T_C = 25°C			290	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 55 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.8	2.1	V
			T_{VJ} = 125°C		2.1		V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 2 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 = 55 A			165		nC
$t_{d(on)}$	*turn-on delay time*	inductive load V_{CE} = 600 V; I_C = 55 A V_{GE} = ±15 V; R_G = 15 Ω	T_{VJ} = 125°C		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*				4.5		mJ
E_{off}	*turn-off energy per pulse*				5.5		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 15 Ω	T_{VJ} = 125°C				
I_{CM}		V_{CEK} = 1200 V				150	A
SCSOA	*short circuit safe operating area*						
t_{SC}	*short circuit duration*	V_{CE} = 900 V; V_{GE} = ±15 V	T_{VJ} = 125°C			10	µs
I_{SC}	*short circuit current*	R_G = 15 Ω; non-repetitive			200		A
R_{thJC}	*thermal resistance junction to case*					0.43	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			44	A
I_{F80}			T_C = 80°C			29	A
V_F	*forward voltage*	I_F = 30 A	T_{VJ} = 25°C			2.20	V
			T_{VJ} = 125°C		1.90		V
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C			0.1	mA
			T_{VJ} = 125°C			2	mA
Q_{rr}	*reverse recovery charge*	V_R = 600 V $-di_F/dt$ = 600 A/µs I_F = 30 A	T_{VJ} = 125°C		3.5		µC
I_{RM}	*max. reverse recovery current*				30		A
t_{rr}	*reverse recovery time*				350		ns
E_{rec}	*reverse recovery energy*				0.9		mJ
R_{thJC}	*thermal resistance junction to case*					1.2	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.10		K/W

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Inverter IGBT

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 collector gate voltage*					±30	V
I_{C25}	*collector current*		T_C = 25°C			120	A
I_{C80}			T_C = 80°C			84	A
P_{tot}	*total power dissipation*		T_C = 25°C			390	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 75 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.8	2.1	V
			T_{VJ} = 125°C		2.1		V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 3 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			0.2	mA
			T_{VJ} = 125°C		0.6		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 = 75 A			230		nC
$t_{d(on)}$	*turn-on delay time*	inductive load	T_{VJ} = 125°C		70		ns
t_r	*current rise time*	V_{CE} = 600 V; I_C = 75 A			40		ns
$t_{d(off)}$	*turn-off delay time*	V_{GE} = ±15 V; R_G = 10 Ω			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} = ±15 V; R_G = 10 Ω	T_{VJ} = 125°C				
I_{CM}		V_{CEmax} = 1200 V				225	A
SCSOA	*short circuit safe operating area*	V_{CEmax} = 1200 V					
t_{SC}	*short circuit duration*	V_{CE} = 900 V; V_{GE} = ±15 V	T_{VJ} = 125°C			10	µs
I_{SC}	*short circuit current*	R_G = 10 Ω; non-repetitive			300		A
R_{thJC}	*thermal resistance junction to case*					0.32	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.10		K/W

Inverter 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			135	A
I_{F80}			T_C = 80°C			90	A
V_F	*forward voltage*	I_F = 100 A	T_{VJ} = 25°C			2.20	V
			T_{VJ} = 125°C		1.90		V
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C			*	mA
	* not applicable, see Ices value above		T_{VJ} = 125°C		*		mA
Q_{rr}	*reverse recovery charge*	V_R = 600 V			12.5		µC
I_{RM}	*max. reverse recovery current*	$-di_F/dt$ = 1600 A/µs	T_{VJ} = 125°C		100		A
t_{rr}	*reverse recovery time*	I_F = 100 A; V_{GE} = 0 V			350		ns
E_{rec}	*reverse recovery energy*				4		mJ
R_{thJC}	*thermal resistance junction to case*					0.4	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.10		K/W

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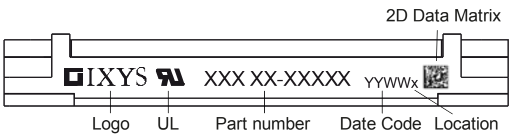
Package E3-Pack			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	*RMS current*	per terminal			300	A
T_{stg}	*storage temperature*		-40		125	°C
T_{VJ}	*virtual junction temperature*		-40		150	°C
Weight				270		g
M_D	*mounting torque*		3		6	Nm
V_{ISOL}	*isolation voltage*	t = 1 second; 50/60 Hz, RMS; $I_{ISOL} \le 1$ mA	3600			V
		t = 1 minute; 50/60 Hz, RMS; $I_{ISOL} \le 1$ mA	3000			V
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*	*terminal to terminal*	6.0			mm
$d_{Spb/Apb}$	*creepage distance on surface | striking distance through air*	*terminal to backside*	12.0			mm
$R_{pin-chip}$	*resistance pin to chip*			5		mΩ



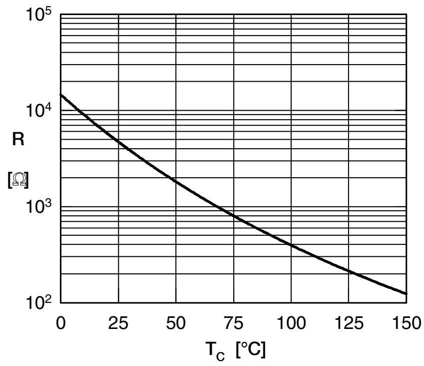
Part number

M = Module
I = IGBT
X = XPT IGBT
A = Gen 1 / std
81 = Current Rating [A]
WB = 6-Pack + 3~ Rectifier Bridge & Brake Unit
1200 = Reverse Voltage [V]
T = Thermistor \ Temperature sensor
EH = E3-Pack

Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MIXA81WB1200TEH	MIXA81WB1200TEH	Box	5	512760

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



Typ. NTC resistance vs. temperature

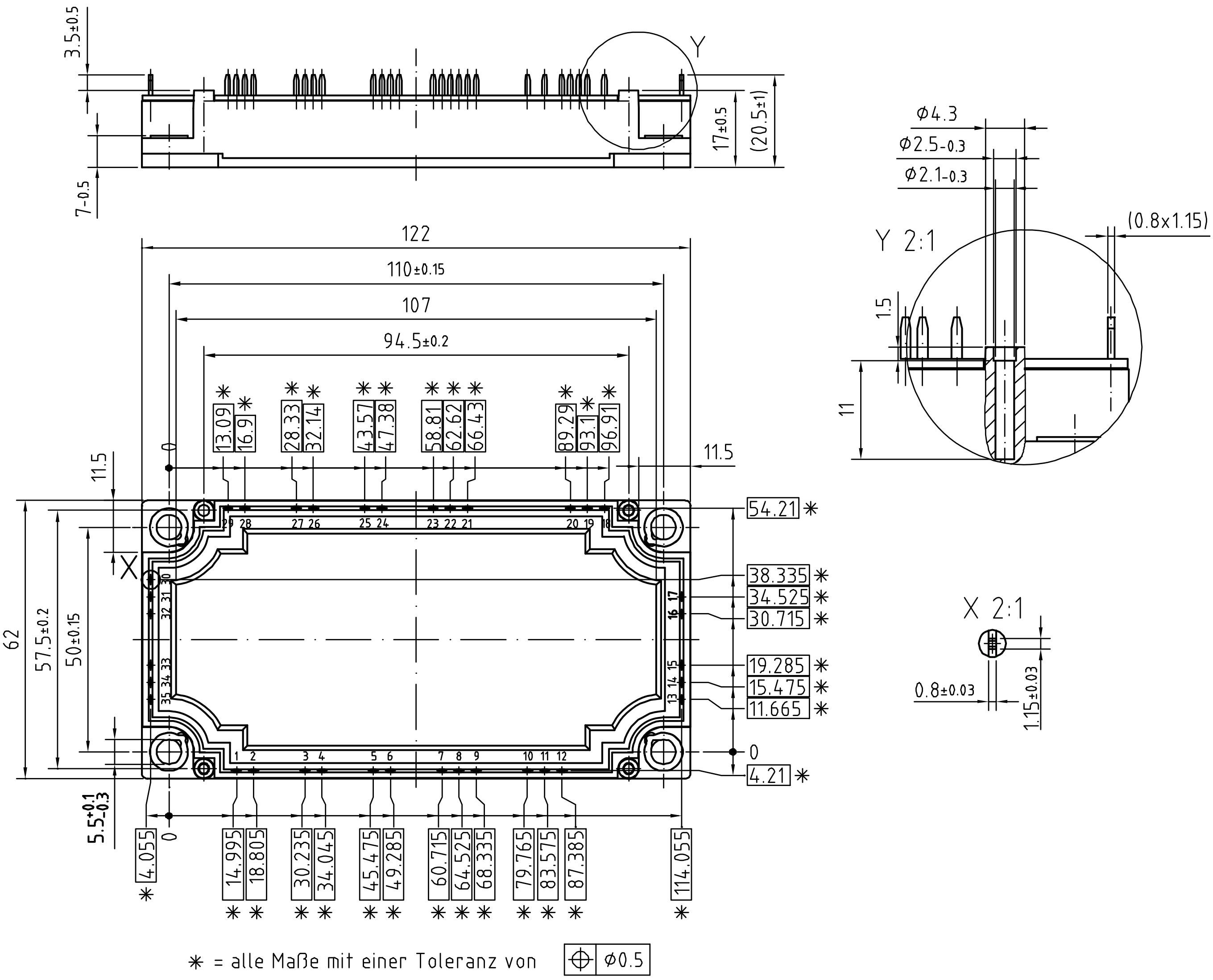
Equivalent Circuits for Simulation

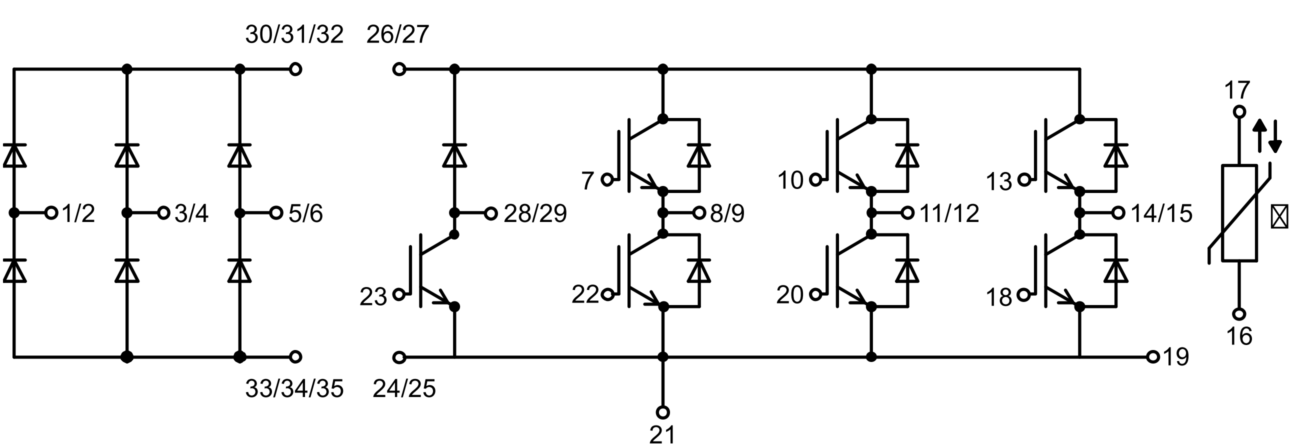
** on die level* T_{VJ} = 150°C

I → V_0 — R_0

		Rectifier	Brake IGBT	Brake Diode	Inverter IGBT	Inverter Diode	
$V_{0\,max}$	*threshold voltage*	0.85	1.1	1.2	1.1	1.35	V
$R_{0\,max}$	*slope resistance **	2.7	25	27	17.9	8.5	mΩ

Outlines E3-Pack





Rectifier

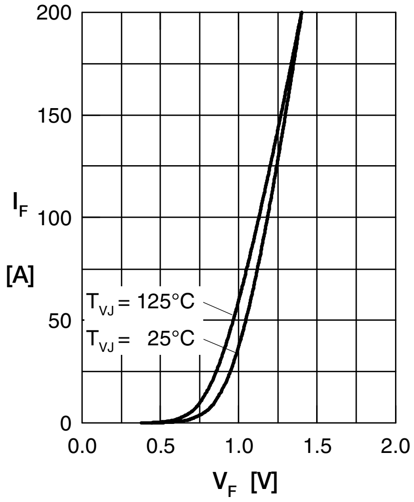


Fig. 1 Forward current versus voltage drop per diode

Fig. 2 Surge overload current

Fig. 3 I^2t versus time per diode

Fig. 4 Power dissipation versus direct output current and ambient temperature, sine 180°

Fig. 5 Max. forward current versus case temperature

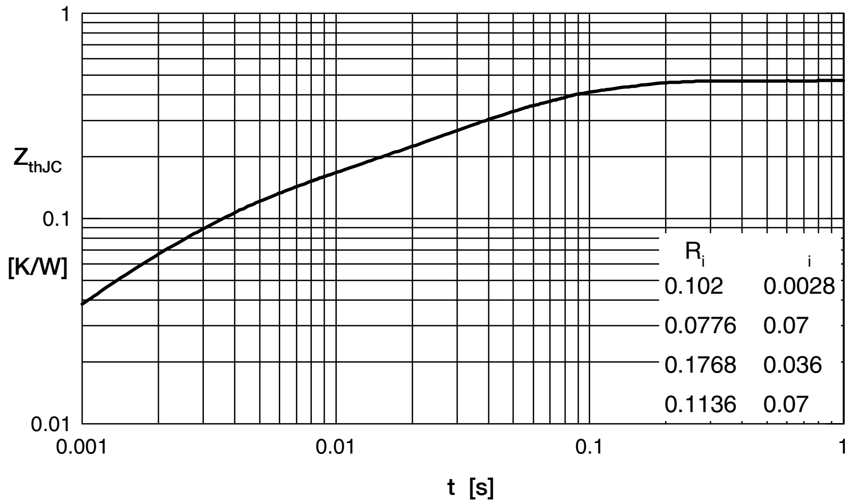


Fig. 6 Transient thermal impedance junction to case

Brake IGBT

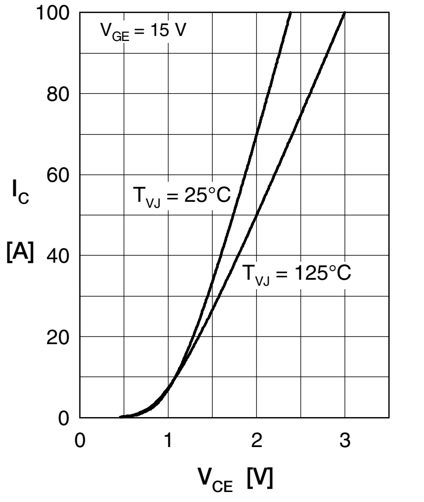


Fig. 1 Typ. output characteristics

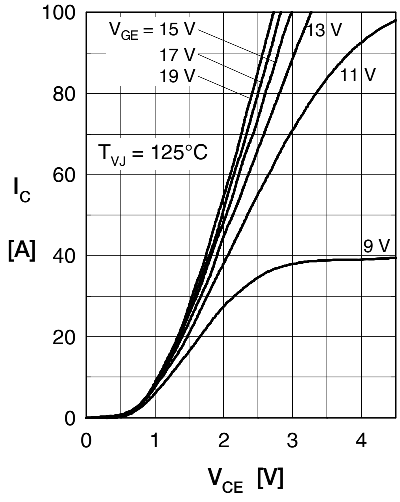


Fig. 2 Typ. output characteristics

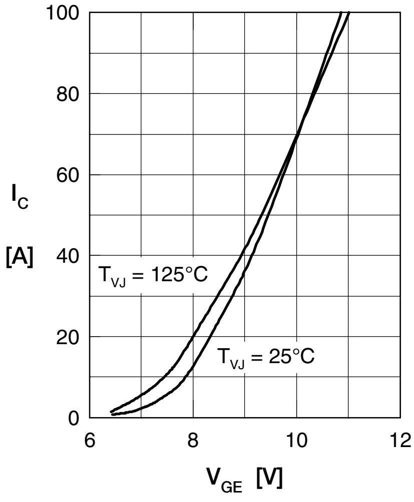


Fig. 3 Typ. tranfer characteristics

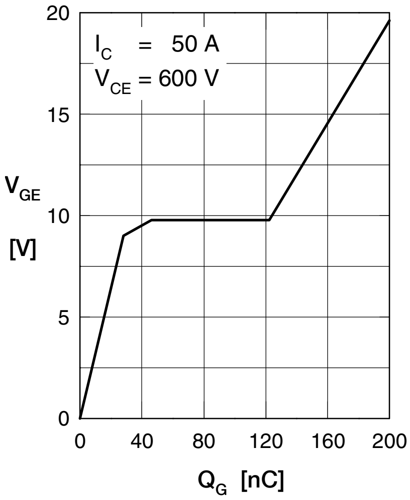


Fig. 4 Typ. turn-on gate charge

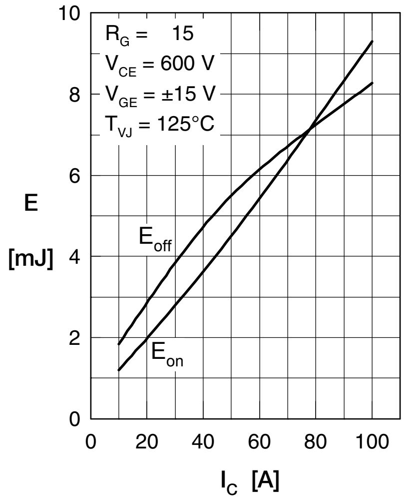


Fig. 5 Typ. switching energy versus collector current

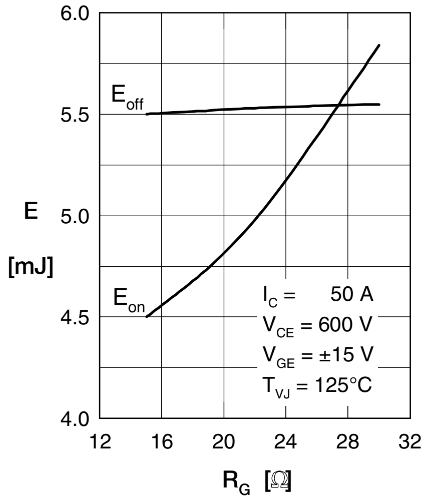


Fig. 6 Typ. switching energy versus gate resistance

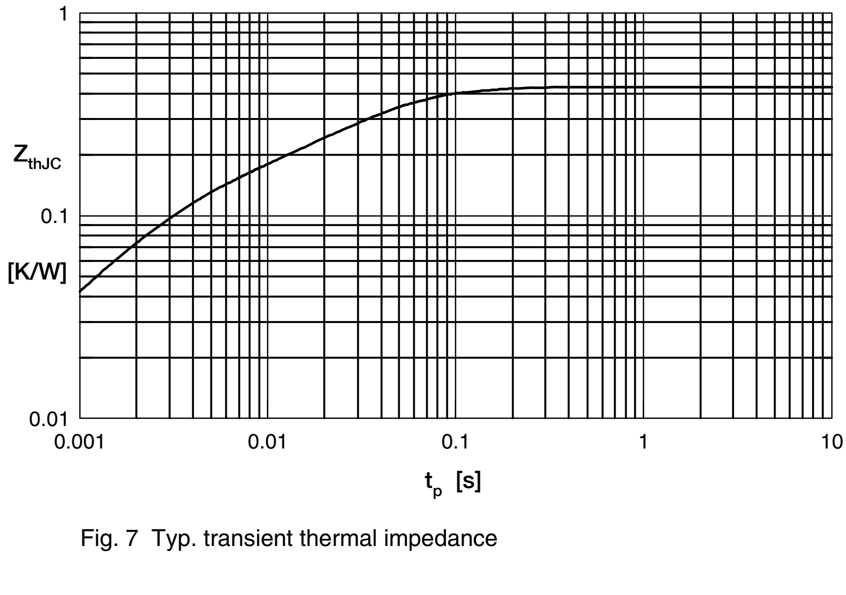


Fig. 7 Typ. transient thermal impedance

Brake Diode

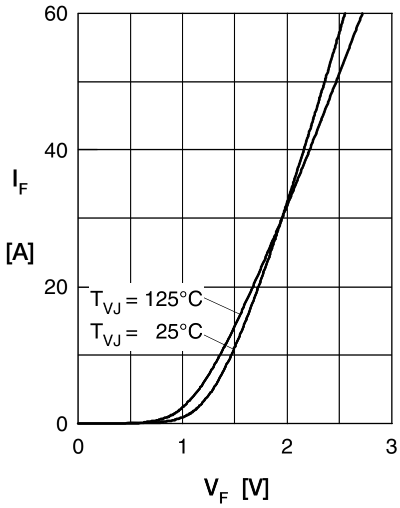


Fig. 1 Typ. Forward current I_F versus V_F

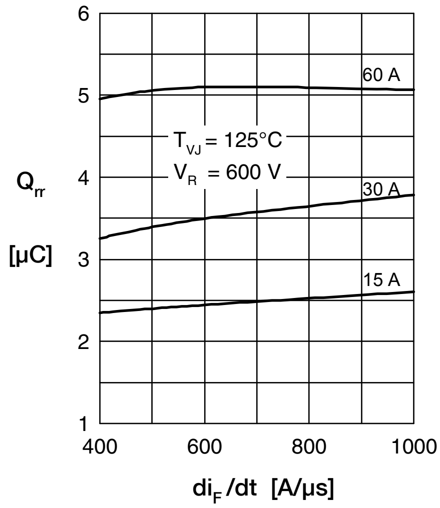


Fig. 2 Typ. reverse recov. charge Q_{rr} versus di/dt

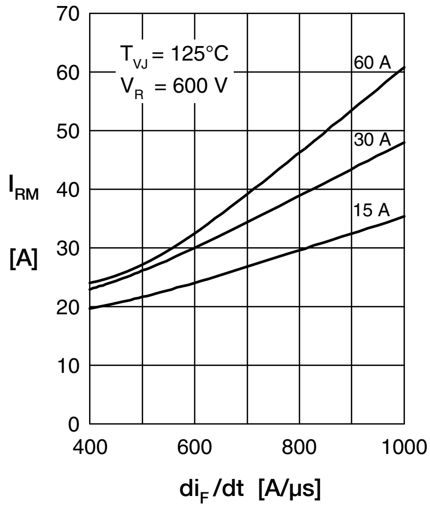


Fig.3 Typ. peak reverse current I_{RM} versus di/dt

Fig. 4 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

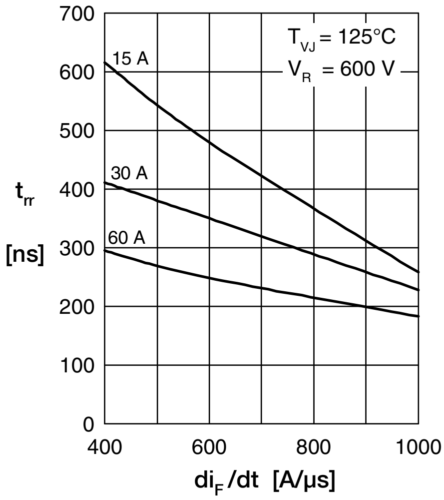


Fig. 5 Typ. recovery time t_{rr} versus di/dt

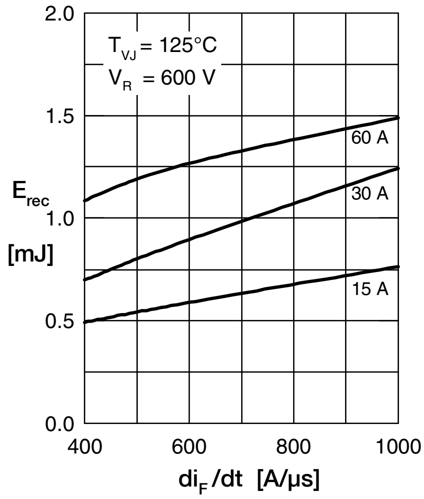


Fig. 6 Typ. recovery energy E_{rec} versus di/dt

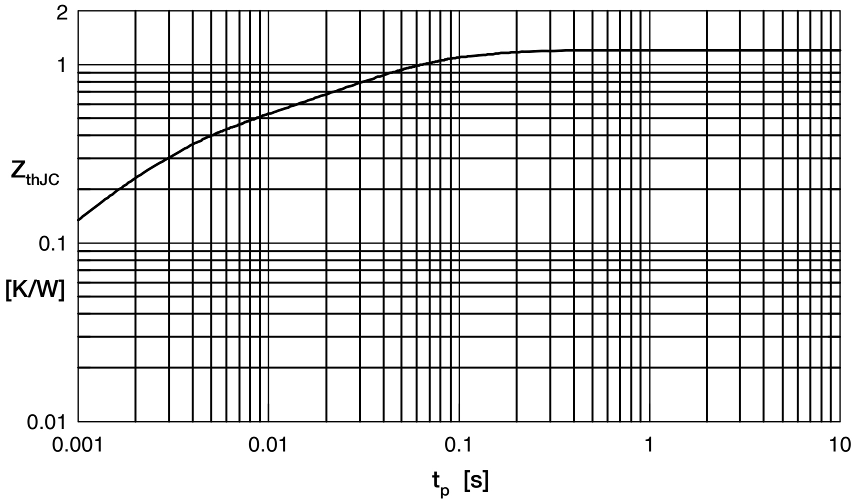


Fig. 7 Typ. transient thermal impedance

Inverter IGBT

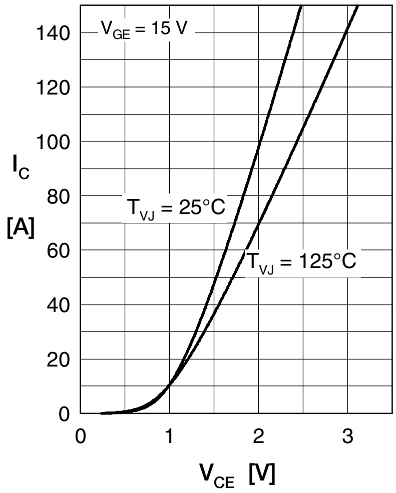


Fig. 1 Typ. output characteristics

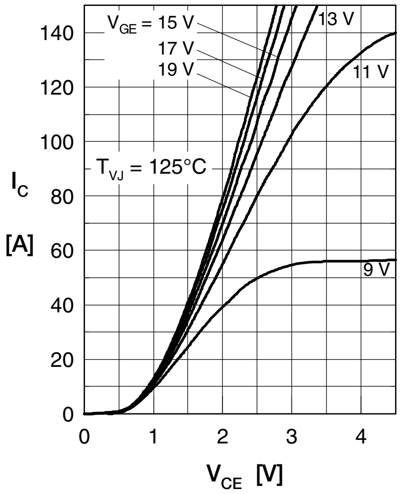


Fig. 2 Typ. output characteristics

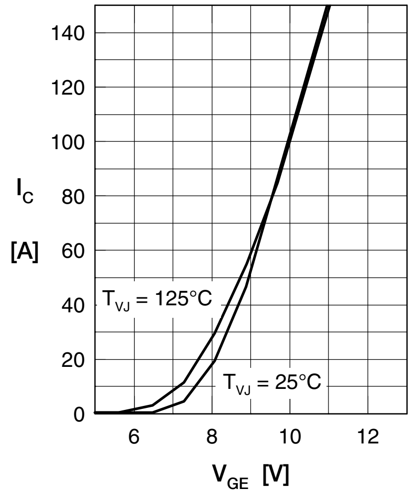


Fig. 3 Typ. tranfer characteristics

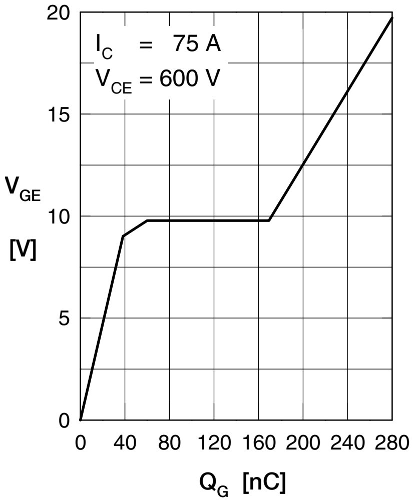


Fig. 4 Typ. turn-on gate charge

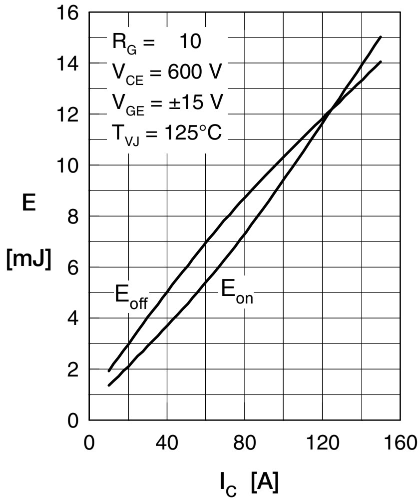


Fig. 5 Typ. switching energy versus collector current

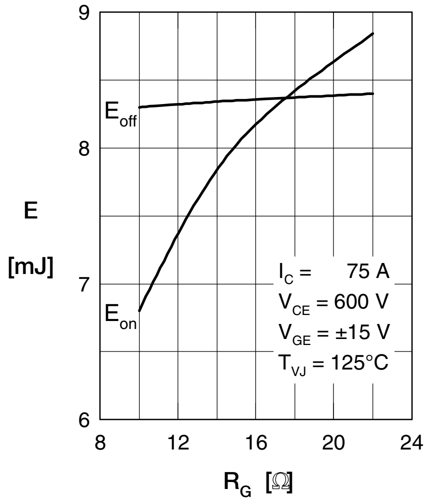


Fig. 6 Typ. switching energy versus gate resistance

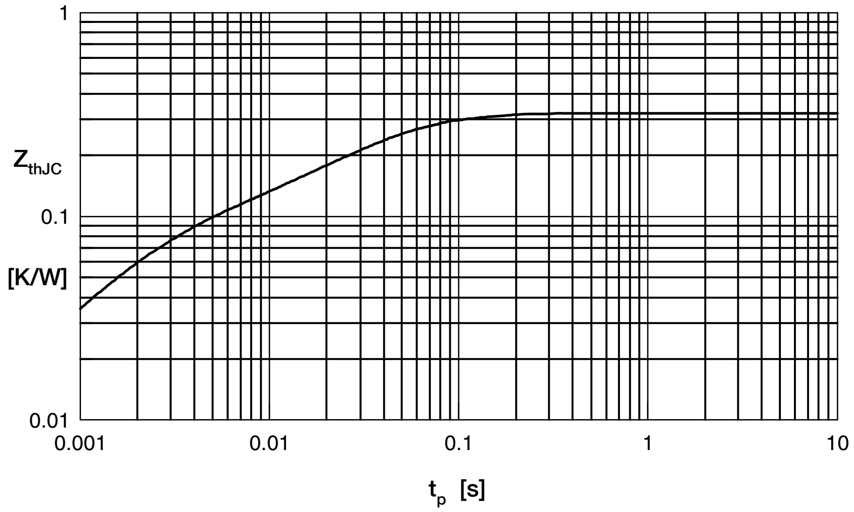


Fig. 7 Typ. transient thermal impedance

Inverter Diode

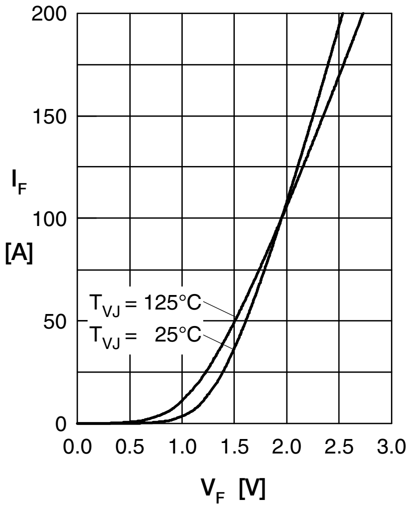


Fig. 1 Typ. Forward current I_F versus V_F

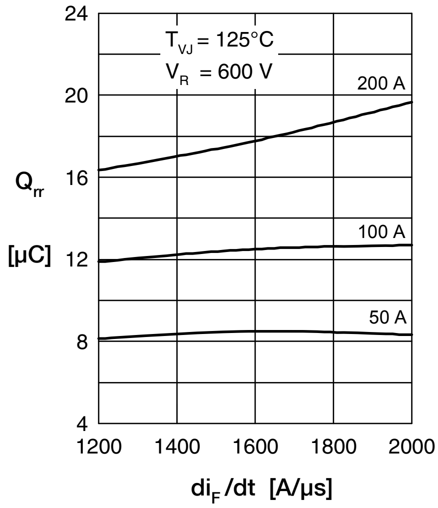


Fig. 2 Typ. reverse recov. charge Q_{rr} versus di/dt

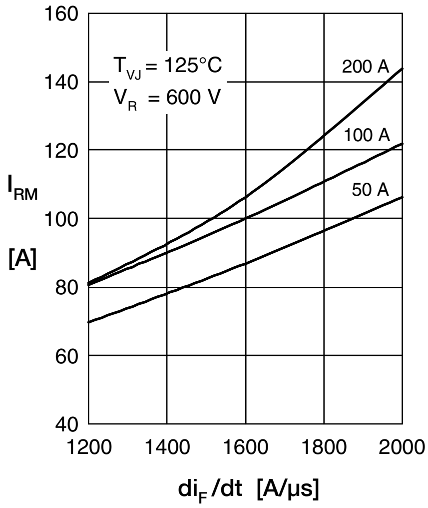


Fig.3 Typ. peak reverse current I_{RM} versus di/dt

Fig. 4 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

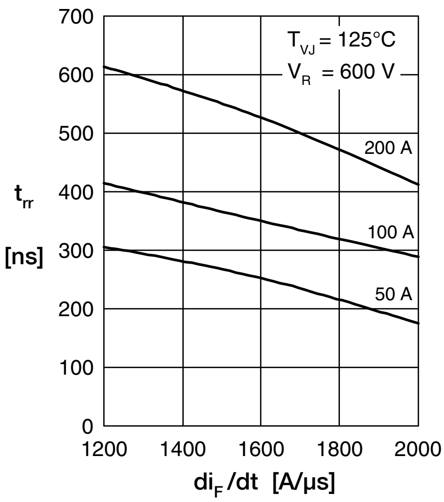


Fig. 5 Typ. recovery time t_{rr} versus di/dt

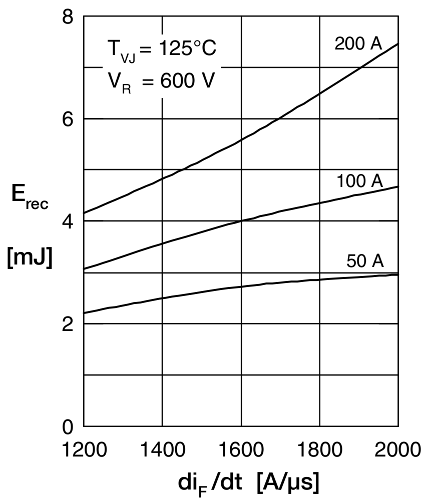


Fig. 6 Typ. recovery energy E_{rec} versus di/dt

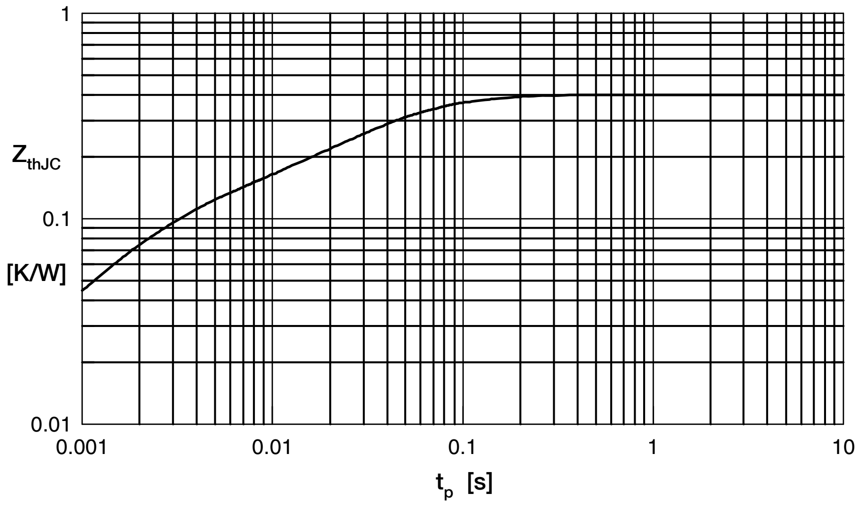


Fig. 7 Typ. transient thermal impedance

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