

Six-Pack XPT IGBT

$$V_{CES} = 1200 \text{ V}$$

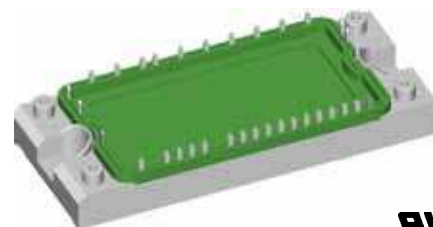
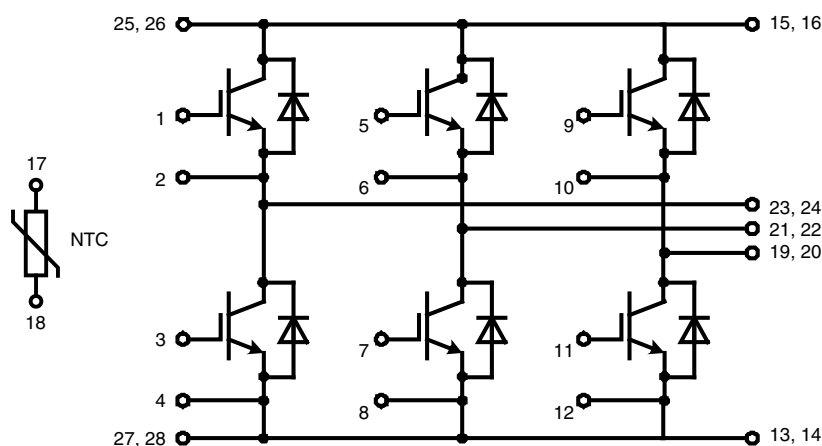
$$I_{C25} = 85 \text{ A}$$

$$V_{CE(sat)} = 1.8 \text{ V}$$

Preliminary data

Part name (Marking on product)

MIXA60W1200TED




E 72873

Pin configuration see outlines.

Features:

- 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 μ sec.
 - very low gate charge
 - square RBSOA @ 3x I_C
 - low EMI
- Thin wafer technology combined with the XPT design results in a competitive low $V_{CE(sat)}$
- SONIC™ diode
 - fast and soft reverse recovery
 - low operating forward voltage

Application:

- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies

Package:

- "E2-Pack" standard outline
- Insulated copper base plate
- Soldering pins for PCB mounting
- Temperature sense included

Output Inverter T1 - T6

Symbol	Definitions	Conditions	min.	Ratings			Unit
				typ.	max.		
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200		V
V_{GES}	max. DC gate voltage	continuous			± 20		V
V_{GEM}	max. transient collector gate voltage	transient			± 30		V
I_{C25}	collector current	$T_C = 25^{\circ}\text{C}$			85		A
I_{C80}		$T_C = 80^{\circ}\text{C}$			60		A
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$			290		W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 55\text{ A}; V_{GE} = 15\text{ V}$		1.8 2.1	2.1		V V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 2\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	5.4	6.0	6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		0.5		mA mA
I_{GES}	gate emitter leakage current	$V_{GE} = \pm 20\text{ V}$			500		nA
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 50\text{ A}$		165			nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 50\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 15\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$	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	$V_{GE} = \pm 15\text{ V}; R_G = 15\ \Omega;$	$T_{VJ} = 125^{\circ}\text{C}$ $V_{CEK} = 1200\text{ V}$		150		A
SCSOA	short circuit safe operating area	$V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V};$	$T_{VJ} = 125^{\circ}\text{C}$		10		μs
t_{SC}	short circuit duration	$R_G = 15\ \Omega;$ non-repetitive		200			A
I_{SC}	short circuit current						
R_{thJC}	thermal resistance junction to case	(per IGBT)			0.43		K/W

Output Inverter D1 - D6

Symbol	Definitions	Conditions	min.	Ratings			Unit
				typ.	max.		
V_{RRM}	max. repetitive reverse voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200		V
I_{F25}	forward current	$T_C = 25^{\circ}\text{C}$			88		A
I_{F80}		$T_C = 80^{\circ}\text{C}$			59		A
V_F	forward voltage	$I_F = 60\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	1.95 1.95	2.2		V V
Q_{rr}	reverse recovery charge	$V_R = 600\text{ V}$ $di_F/dt = -1200\text{ A}/\mu\text{s}$ $I_F = 60\text{ A}; V_{GE} = 0\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$	8			μC
I_{RM}	max. reverse recovery current			60			A
t_{rr}	reverse recovery time			350			ns
E_{rec}	reverse recovery energy			2.5			mJ
R_{thJC}	thermal resistance junction to case	(per diode)			0.6		K/W

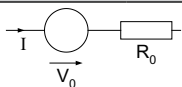
 $T_C = 25^{\circ}\text{C}$ unless otherwise stated

Temperature Sensor NTC

Symbol	Definitions	Conditions	Ratings			
			min.	typ.	max.	Unit
R_{25}	resistance	$T_C = 25^{\circ}\text{C}$	4.75	5.0	5.25	$\text{k}\Omega$
$B_{25/50}$				3375		K

Module

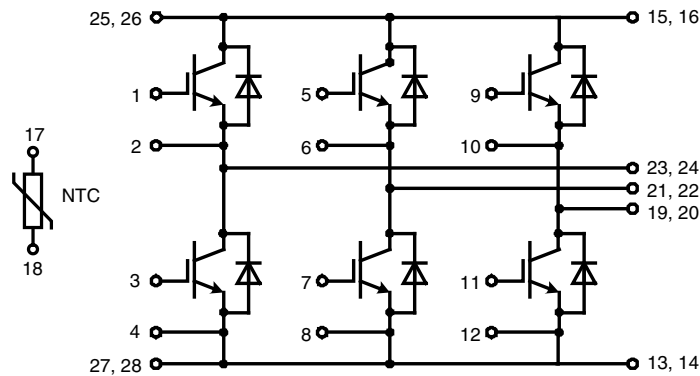
Symbol	Definitions	Conditions	Ratings			
			min.	typ.	max.	Unit
T_{VJ}	operating temperature		-40		125	$^{\circ}\text{C}$
T_{VJM}	max. virtual junction temperature				150	$^{\circ}\text{C}$
T_{stg}	storage temperature		-40		125	$^{\circ}\text{C}$
V_{ISOL}	isolation voltage	$I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}$			3000	V~
CTI	comparative tracking index				-	
M_d	mounting torque (M5)		3		6	Nm
d_s	creep distance on surface		6			mm
d_A	strike distance through air		6			mm
$R_{pin-chip}$	resistance pin to chip			5		$\text{m}\Omega$
R_{thCH}	thermal resistance case to heatsink	with heatsink compound		0.02		K/W
Weight				180		g

Equivalent Circuits for Simulation


Symbol	Definitions	Conditions	Ratings			
			min.	typ.	max.	Unit
V_0	IGBT	T1 - T6	$T_{VJ} = 150^{\circ}\text{C}$	1.1		V
R_0				25.1		$\text{m}\Omega$
V_0	free wheeling diode	D1 - D6	$T_{VJ} = 150^{\circ}\text{C}$	1.22		V
R_0				12.99		$\text{m}\Omega$

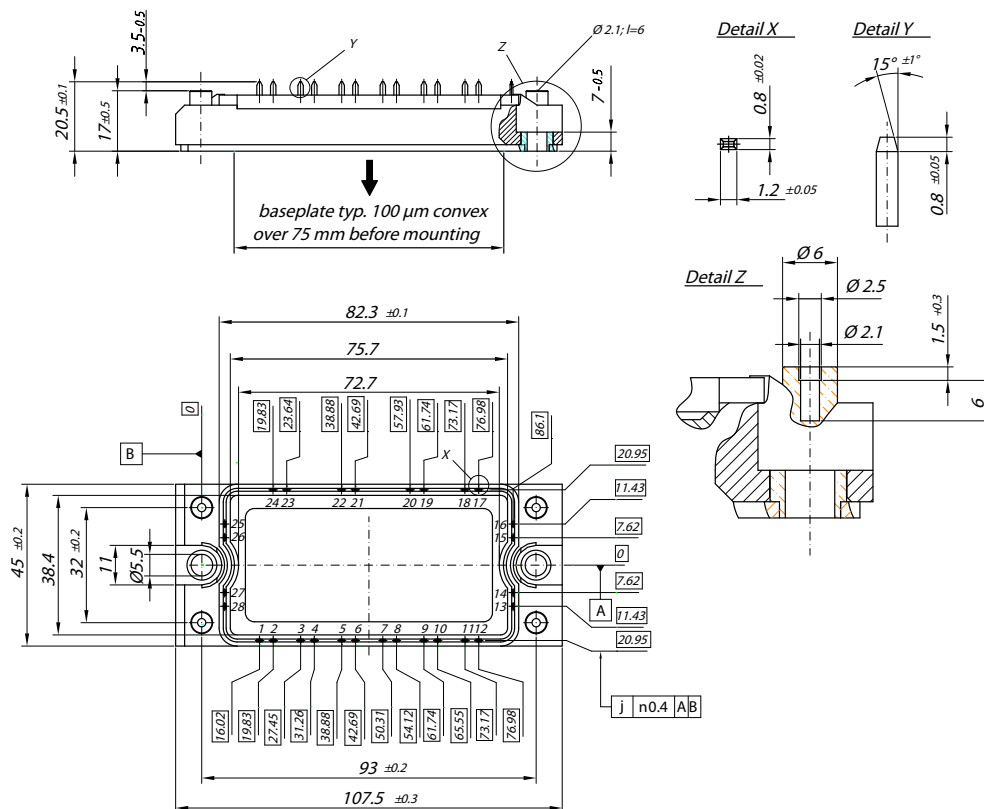
$T_C = 25^{\circ}\text{C}$ unless otherwise stated

Circuit Diagram



Outline Drawing

Dimensions in mm (1 mm = 0.0394")



Product Marking



Part number

M = Module
I = IGBT
X = XPT
A = standard
60 = Current Rating [A]
W = Six-Pack
1200 = Reverse Voltage [V]
T = NTC
ED = E2-Pack

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MIXA60W1200 TED	MIXA60W1200TED	Box	6	507660

Inverter T1 - T6

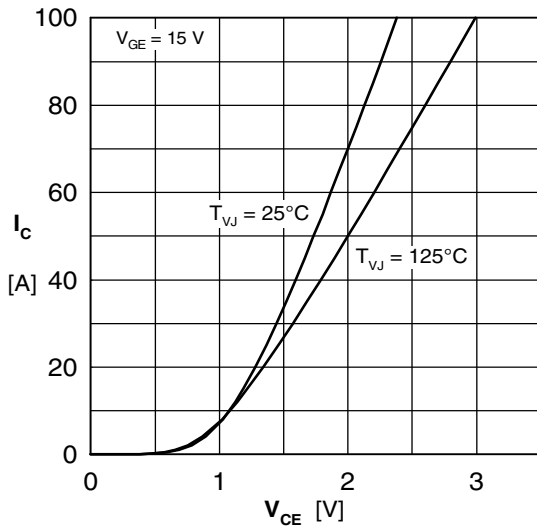


Fig. 1 Typ. output characteristics

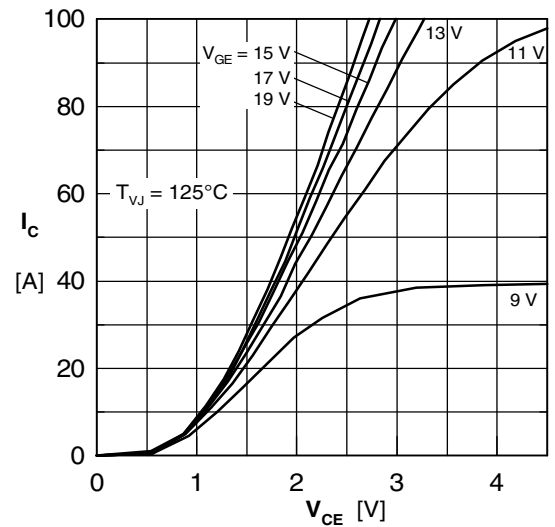


Fig. 2 Typ. output characteristics

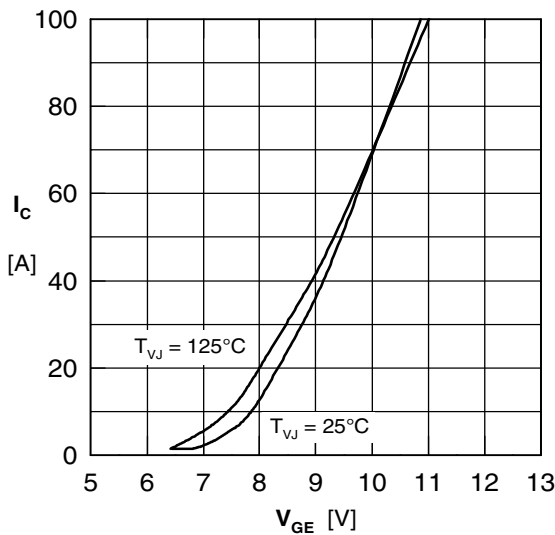


Fig. 3 Typ. transfer characteristics

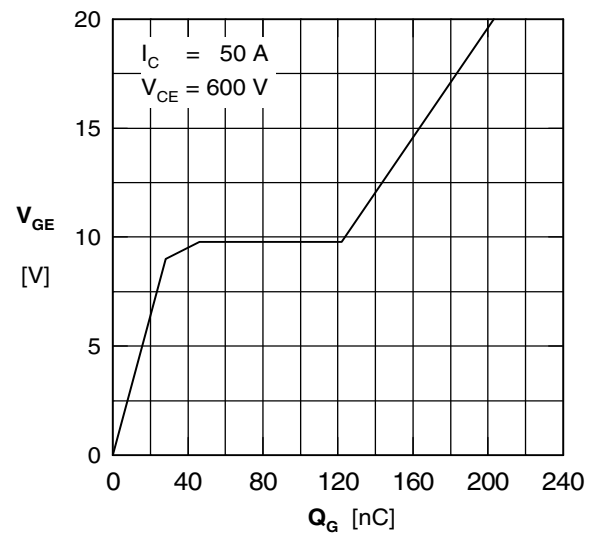


Fig. 4 Typ. turn-on gate charge

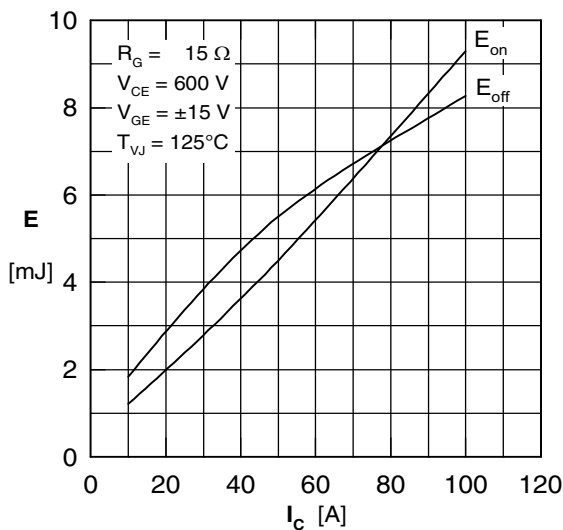


Fig. 5 Typ. switching energy vs. collector current

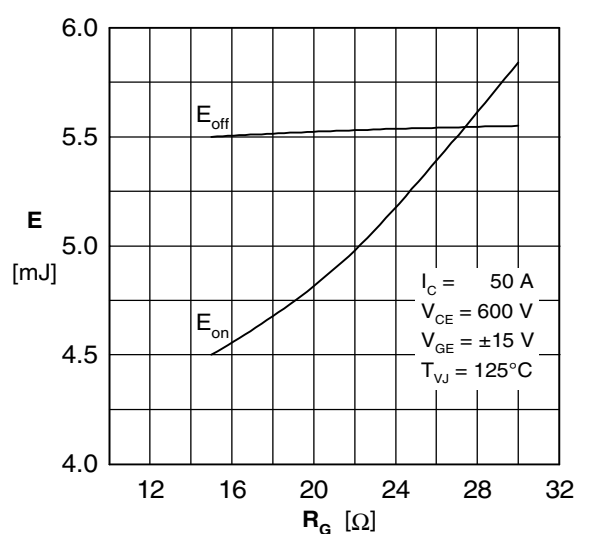


Fig. 6 Typ. switching energy vs. gate resistance

Inverter D1 - D6

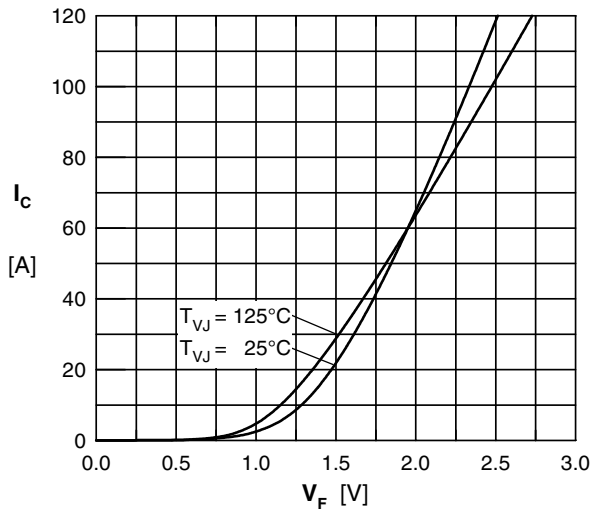


Fig. 7 Typ. Forward current versus V_F

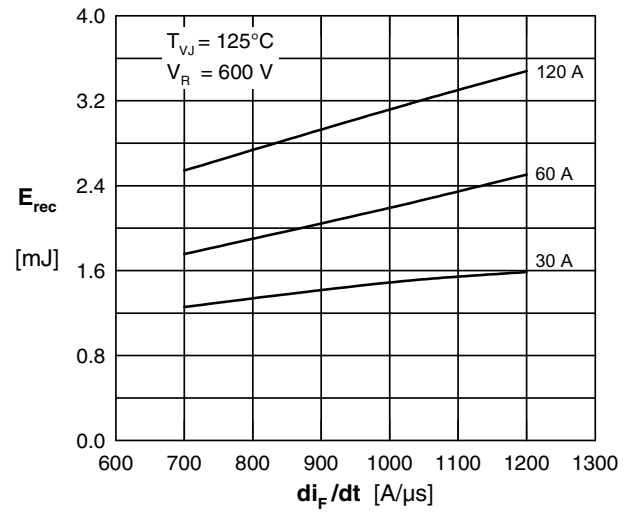


Fig. 8 Typ. recovery energy E_{rec} versus di/dt

NTC

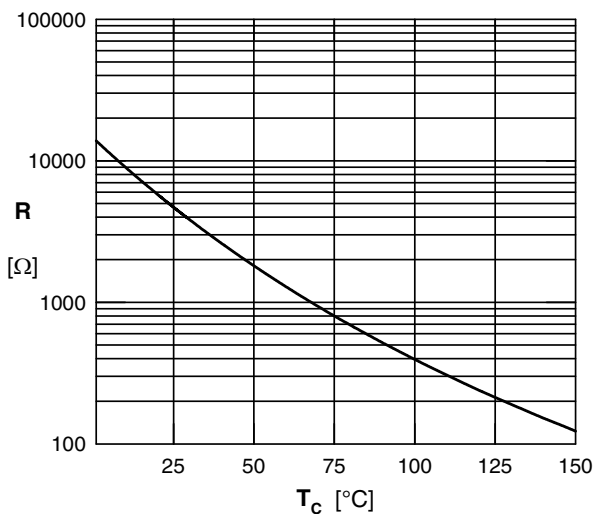


Fig. 9 Typ. NTC resistance versus temperature

	IGBT		FRD	
	R_i	τ_i	R_i	τ_i
1	0.1	0.0025	0.137	0.0025
2	0.05	0.03	0.1	0.03
3	0.21	0.03	0.233	0.03
4	0.07	0.08	0.13	0.08

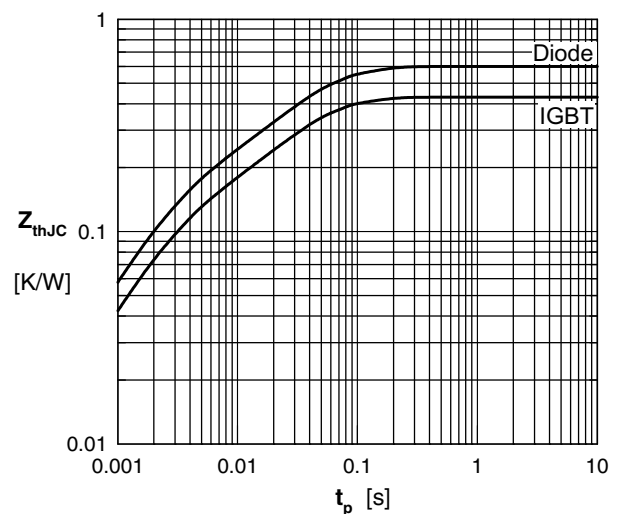


Fig. 10 Typ. transient thermal impedance