

IGBT Modules

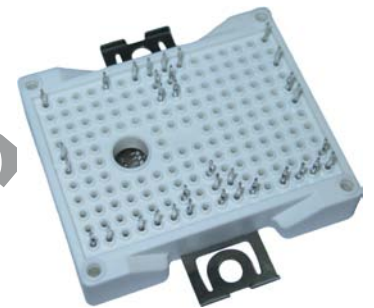
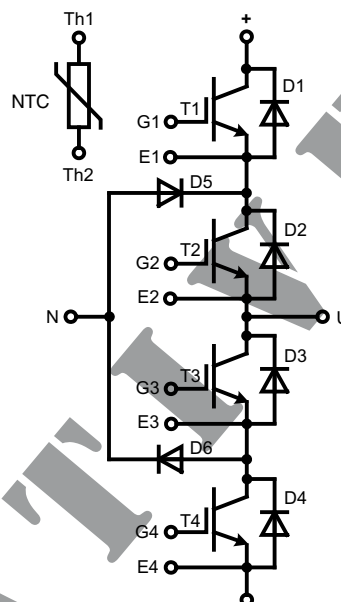
Multi Level

XPT IGBT Technology

$I_{C80} (T1/T4) = 82 \text{ A}$
 $I_{C80} (T2/T3) = 110 \text{ A}$
 $V_{CES} = 650 \text{ V}$
 $V_{CE(sat) \text{ typ.}} = 1.5 \text{ V}$

Part name (Marking on product)

MIXD80PM650TMI



pending

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 @ $2 \times I_c$
 - 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
- Optimized for solar applications
 - T2/T3 re-inforced

Application:

- AC motor control
- AC servo and robot drives
- UPS
- Solar

Package:

- Compatible to EASY2B package
- Pins for pressfit connection
- With DCB base

IGBTs T1 / T4

Symbol	Definitions	Conditions	Ratings				
			min.	typ.	max.	Unit	
V_{CES}	collector emitter voltage		$T_{VJ} = 25^{\circ}\text{C}$		650	V	
V_{GES}	max. DC gate voltage	continuous			± 20	V	
I_{C25}	collector current		$T_C = 25^{\circ}\text{C}$		108	A	
I_{C80}			$T_C = 80^{\circ}\text{C}$		82	A	
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$		275	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 75\text{ A}; V_{GE} = 15\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$	1.5 1.75	1.7	V V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 1.2\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	5.0	5.8	6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		20	250	μA
I_{GES}	gate emitter leakage current	$V_{CE} = 0\text{ V}; V_{GE} = \pm 20\text{ V}$			500	nA	
C_{ies}	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$		tbd		nF	
$Q_{G(on)}$	total gate charge	$V_{GE} = 0 \dots 15\text{ V}$			130	nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 300\text{ V}; I_C = 75\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 10\ \Omega$	$T_{VJ} = 150^{\circ}\text{C}$		25	ns	
t_r	current rise time				45	ns	
$t_{d(off)}$	turn-off delay time				120	ns	
t_f	current fall time				40	ns	
E_{on}	turn-on energy per pulse				0.9	mJ	
E_{off}	turn-off energy per pulse				1.8	mJ	
$E_{rec(off)}$	reverse recovery losses at turn-off				tbd	mJ	
I_{CM}	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 10\ \Omega; L = 100\ \mu\text{H}$			150	A	
V_{CEK}		clamped inductive load;	$T_{VJ} = 150^{\circ}\text{C}$		V_{CES}	V	
t_{sc} (SCSOA)	short circuit safe operating area	$V_{CE} = 360\text{ V}; V_{GE} = \pm 15\text{ V};$ $R_G = 10\ \Omega; \text{non-repetitive}$	$T_{VJ} = 150^{\circ}\text{C}$		10	μs A	
R_{thJC}	thermal resistance junction to case	(per IGBT)			0.55	K/W	
R_{thCH}	thermal resistance case to heatsink	(per IGBT)			0.18	K/W	

Diodes D1 - D4

Symbol	Definitions	Conditions	Maximum Ratings			
			min.	typ.	max.	Unit
V_{RRM}	max. repetitive reverse voltage				650	V
I_{F25}	forward current		$T_C = 25^{\circ}\text{C}$		73	A
I_{F80}			$T_C = 80^{\circ}\text{C}$		53	A
Symbol	Conditions	Characteristic Values				
		min.	typ.	max.	Unit	
V_F	forward voltage	$I_F = 75\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$	1.7 1.8	2.0	V V
Q_{RR}	reverse recovery charge	$V_R = 300\text{ V}; I_F = 75\text{ A}$ $di_F/dt = -1200\text{ A}/\mu\text{s}$	$T_{VJ} = 150^{\circ}\text{C}$		7	μC
I_{RM}	max. reverse recovery current				65	A
t_{rr}	reverse recovery time				150	ns
$E_{rec(off)}$	reverse recovery losses at turn-off				1.5	mJ
R_{thJC}	thermal resistance junction to case	(per diode)			1.0	K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)			0.35	K/W

IGBTs T2 / T3

Symbol	Definitions	Conditions	Ratings			Unit	
			min.	typ.	max.		
V_{CES}	collector emitter voltage		$T_{VJ} = 25^{\circ}\text{C}$		650	V	
V_{GES}	max. DC gate voltage	continuous			± 20	V	
I_{C25}	collector current		$T_C = 25^{\circ}\text{C}$		147	A	
I_{C80}			$T_C = 80^{\circ}\text{C}$		110	A	
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$		375	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 100\text{ A}; V_{GE} = 15\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$	1.5 1.75	1.7	V V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 1.6\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	5.0	5.8	6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		20	250	μA
I_{GES}	gate emitter leakage current	$V_{CE} = 0\text{ V}; V_{GE} = \pm 20\text{ V}$			500	nA	
C_{ies}	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$		tbd		nF	
$Q_{G(on)}$	total gate charge	$V_{GE} = 0 \dots 15\text{ V}$			180	nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 300\text{ V}; I_C = 100\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 8.2\ \Omega$	$T_{VJ} = 150^{\circ}\text{C}$		25	ns	
t_r	current rise time				45	ns	
$t_{d(off)}$	turn-off delay time				120	ns	
t_f	current fall time				40	ns	
E_{on}	turn-on energy per pulse				2	mJ	
E_{off}	turn-off energy per pulse				2.4	mJ	
$E_{rec(off)}$	reverse recovery losses at turn-off		tbd	mJ			
I_{CM}	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 8.2\ \Omega; L = 100\ \mu\text{H}$			200	A	
V_{CEK}		clamped inductive load;	$T_{VJ} = 150^{\circ}\text{C}$		V_{CES}	V	
t_{sc} (SCSOA)	short circuit safe operating area	$V_{CE} = 360\text{ V}; V_{GE} = \pm 15\text{ V};$ $R_G = 8.2\ \Omega; \text{non-repetitive}$	$T_{VJ} = 150^{\circ}\text{C}$		10	μs	
				400		A	
R_{thJC}	thermal resistance junction to case	(per IGBT)			0.40	K/W	
R_{thCH}	thermal resistance case to heatsink	(per IGBT)			0.13	K/W	

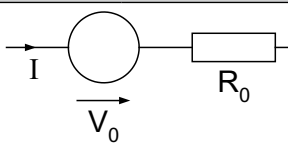
Diodes D5 / D6

Symbol	Definitions	Conditions	Maximum Ratings			Unit
			min.	typ.	max.	
V_{RRM}	max. repetitive reverse voltage				650	V
I_{F25}	forward current		$T_C = 25^{\circ}\text{C}$		114	A
I_{F80}			$T_C = 80^{\circ}\text{C}$		83	A
Symbol	Conditions	Characteristic Values				Unit
		min.	typ.	max.		
V_F	forward voltage	$I_F = 100\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 150^{\circ}\text{C}$	1.7 1.8	2.0	V V
I_R	leakage current	$V_R = 650\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$	20	200	μA
Q_{RR}	reverse recovery charge	$V_R = 300\text{ V}; I_F = 100\text{ A}$ $di_F/dt = -1500\text{ A}/\mu\text{s}$	$T_{VJ} = 150^{\circ}\text{C}$		9.5	μC
I_{RM}	max. reverse recovery current				95	A
t_{rr}	reverse recovery time				150	ns
$E_{rec(off)}$	reverse recovery losses at turn-off				2.5	mJ
R_{thJC}	thermal resistance junction to case	(per diode)			0.6	K/W
R_{thCH}	thermal resistance case to heatsink	(per diode)			0.2	K/W

Module

Symbol	Definitions	Conditions	Ratings			Unit
			min.	typ.	max.	
T_{VJ}	operating temperature		-40		150	°C
T_{VJM}	max. virtual junction temperature				175	°C
T_{stg}	storage temperature		-40		125	°C
V_{ISOL}	isolation voltage	$I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}$			2500	V~
M_d	mounting torque	(M4)	2.0		2.2	Nm
d_S	creep distance on surface		11.5			mm
d_A	strike distance through air		10.0			mm
Weight				40		g
$R_{pin-chip}$	resistance pin to chip	$V = V_{CEsat} + 2 \cdot R \cdot I_C$ resp. $V = V_F + 2 \cdot R \cdot I_F$		6		mΩ

Equivalent Circuits for Simulation

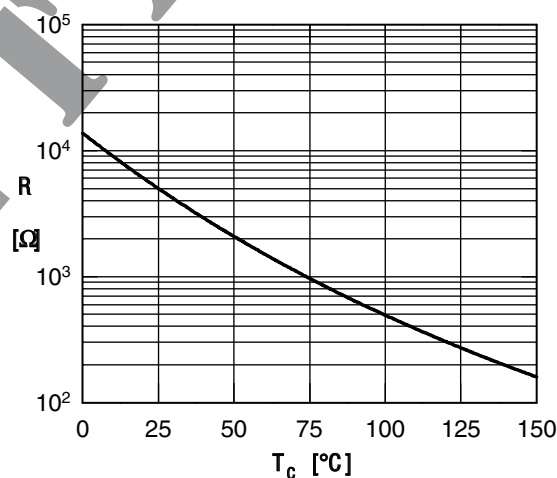


Ratings

Symbol	Definitions	Conditions	Ratings			Unit
			min.	typ.	max.	
V_0 R_0	IGBT T1/T4	$T_{VJ} = 175^\circ\text{C}$		0.8 16		V mΩ
V_0 R_0	IGBT T2/T3	$T_{VJ} = 175^\circ\text{C}$		0.8 12		V mΩ
V_0 R_0	Diode D1/D4	$T_{VJ} = 175^\circ\text{C}$		1.2 12		V mΩ
V_0 R_0	Diode D5/D6	$T_{VJ} = 175^\circ\text{C}$		1.2 9		V mΩ

Temperature Sensor NTC

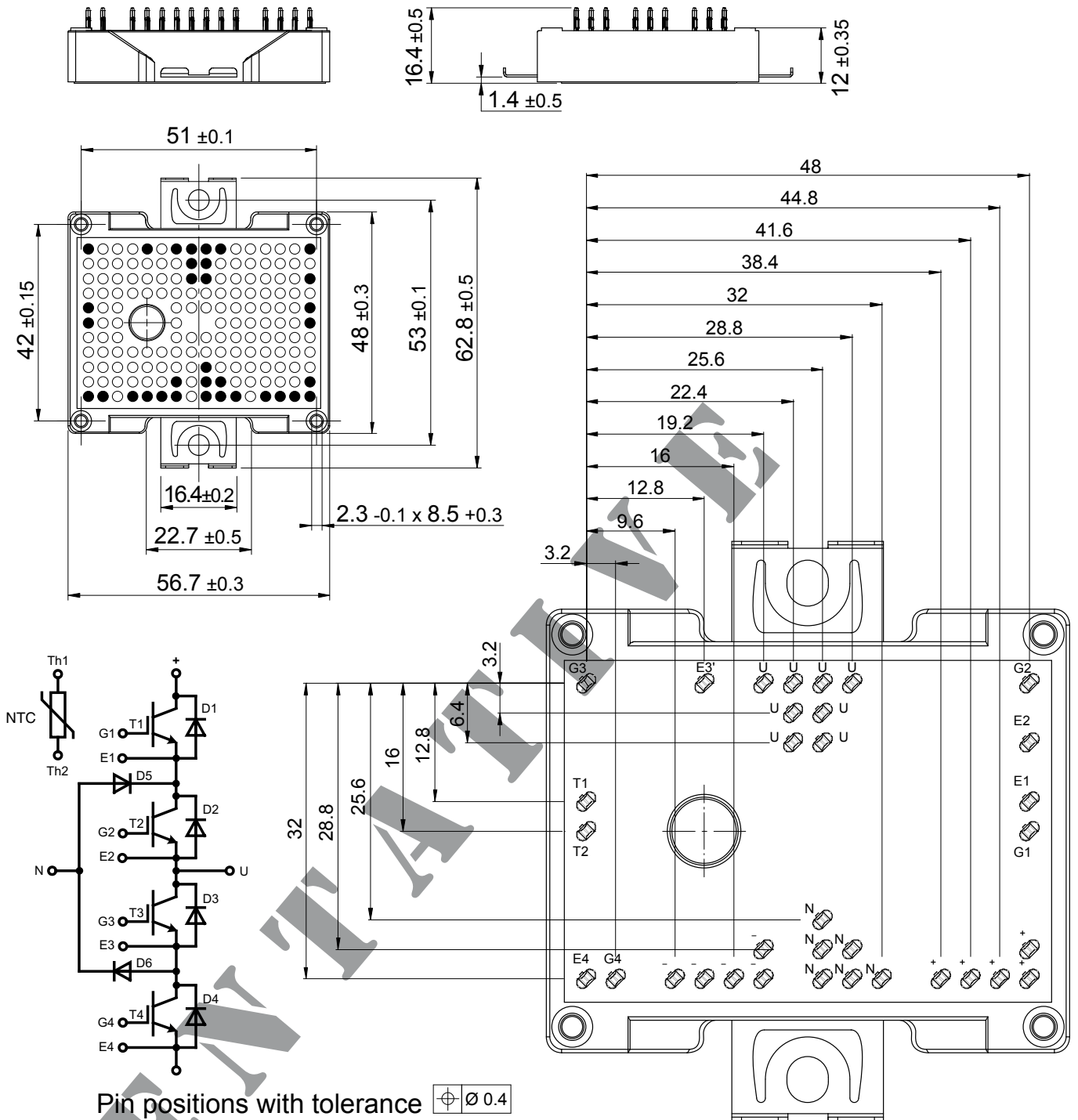
Symbol	Definitions	Conditions	Ratings			Unit
			min.	typ.	max.	
R_{25} $B_{25/50}$	resistance	$T_C = 25^\circ\text{C}$	4.75	5.0 3375	5.25	kΩ K



Typ. NTC resistance vs. temperature

Outline Drawing

Dimensions in mm (1 mm = 0.0394")



Product Marking

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MIXD80PM650TMI	MIXD80PM650TMI	Blister	20	514219