

# IGBT Module

## Sixpack

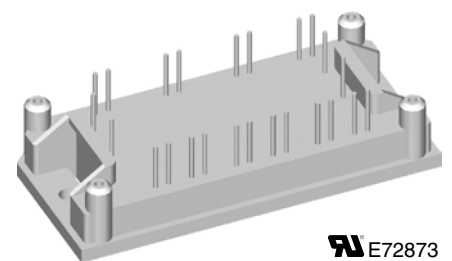
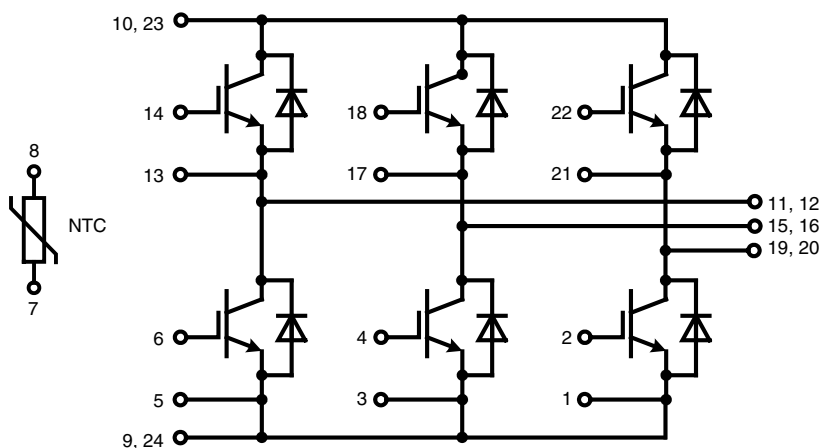
Short Circuit SOA Capability  
Square RBSOA

$I_{C25} = 58\text{ A}$   
 $V_{CES} = 1200\text{ V}$   
 $V_{CE(sat)} \text{ typ.} = 1.9\text{ V}$

Preliminary data

**Part name** (Marking on product)

MWI 60-12T6K



E72873

Pin configuration see outlines.

**Features:**

- Trench IGBTs
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance also in resonant circuits
- HiPerFRED™ diode:
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- Industry Standard Package
  - solderable pins for PCB mounting
  - isolated copper base plate

**Application:**

- AC drives
- UPS
- Welding

**Package:**

- UL registered
- Industry standard E1-pack

IGBTs						
Symbol	Definitions	Conditions	Ratings			Unit
			min.	typ.	max.	
$V_{CES}$	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$			1200	V
$V_{GES}$	max. DC gate voltage	continuous			$\pm 20$	V
$V_{GEM}$	max. transient collector gate voltage	transient			$\pm 30$	V
$I_{C25}$	collector current	$T_C = 25^{\circ}\text{C}$			58	A
$I_{C80}$		$T_C = 80^{\circ}\text{C}$			41	A
$P_{tot}$	total power dissipation	$T_C = 25^{\circ}\text{C}$			200	W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 35\text{ A}; V_{GE} = 15\text{ V}$			1.9 2.2	V V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 1.5\text{ mA}; V_{GE} = V_{CE}$	4.5		6.5	V
$I_{CES}$	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$			0.8	mA mA
$I_{GES}$	gate emitter leakage current	$V_{CE} = 0\text{ V}; V_{GE} = \pm 20\text{ V}$			400	nA
$C_{ies}$	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$			2530	pF
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 35\text{ A}$			330	nC
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 35\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 27\ \Omega$	$T_{VJ} = 125^{\circ}\text{C}$		90	ns
$t_r$	current rise time				50	ns
$t_{d(off)}$	turn-off delay time				520	ns
$t_f$	current fall time				90	ns
$E_{on}$	turn-on energy per pulse				3.5	mJ
$E_{off}$	turn-off energy per pulse				4.8	mJ
$I_{CM}$	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 27\ \Omega$ $L = 100\ \mu\text{H};$ clamped induct. load $V_{CEmax} = V_{CES} - L_S \cdot di/dt$	$T_{VJ} = 125^{\circ}\text{C}$		70	A
$t_{SC}$ (SCSOA)	short circuit safe operating area	$V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V};$ $R_G = 27\ \Omega;$ non-repetitive	$T_{VJ} = 125^{\circ}\text{C}$		10	$\mu\text{s}$
$R_{thJC}$	thermal resistance junction to case	(per IGBT)			0.62	K/W
$R_{thCH}$	thermal resistance case to heatsink	(per IGBT)			0.25	K/W

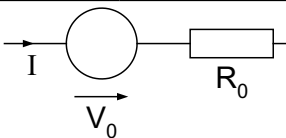
Diodes						
Symbol	Definitions	Conditions	Maximum Ratings			Unit
			min.	typ.	max.	
$V_{RRM}$	max. repetitive reverse voltage				1600	V
$I_{F25}$	forward current	$T_C = 25^{\circ}\text{C}$			49	A
$I_{F80}$		$T_C = 80^{\circ}\text{C}$			32	A
Symbol	Conditions	Characteristic Values				Unit
		min.	typ.	max.		
$V_F$	forward voltage	$I_F = 35\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	2.6 1.8	2.9	V V
$I_{RM}$	max. reverse recovery current	$V_R = 600\text{ V}; I_F = 35\text{ A}$ $di_F/dt = -600\text{ A}/\mu\text{s}$	$T_{VJ} = 100^{\circ}\text{C}$	35		A
$t_{rr}$	reverse recovery time			150		ns
$R_{thJC}$	thermal resistance junction to case	(per diode)	$T_{VJ} = 25^{\circ}\text{C}$		0.9	K/W
$R_{thCH}$	thermal resistance case to heatsink	(per diode)			0.3	K/W

**Temperature Sensor NTC**

Symbol	Definitions	Conditions	Ratings			Unit
			min.	typ.	max.	
$R_{25}$	resistance	$T_C = 25^\circ\text{C}$	4.45	4.7	5.0	k $\Omega$
$B_{25/85}$				3510		K

**Module**

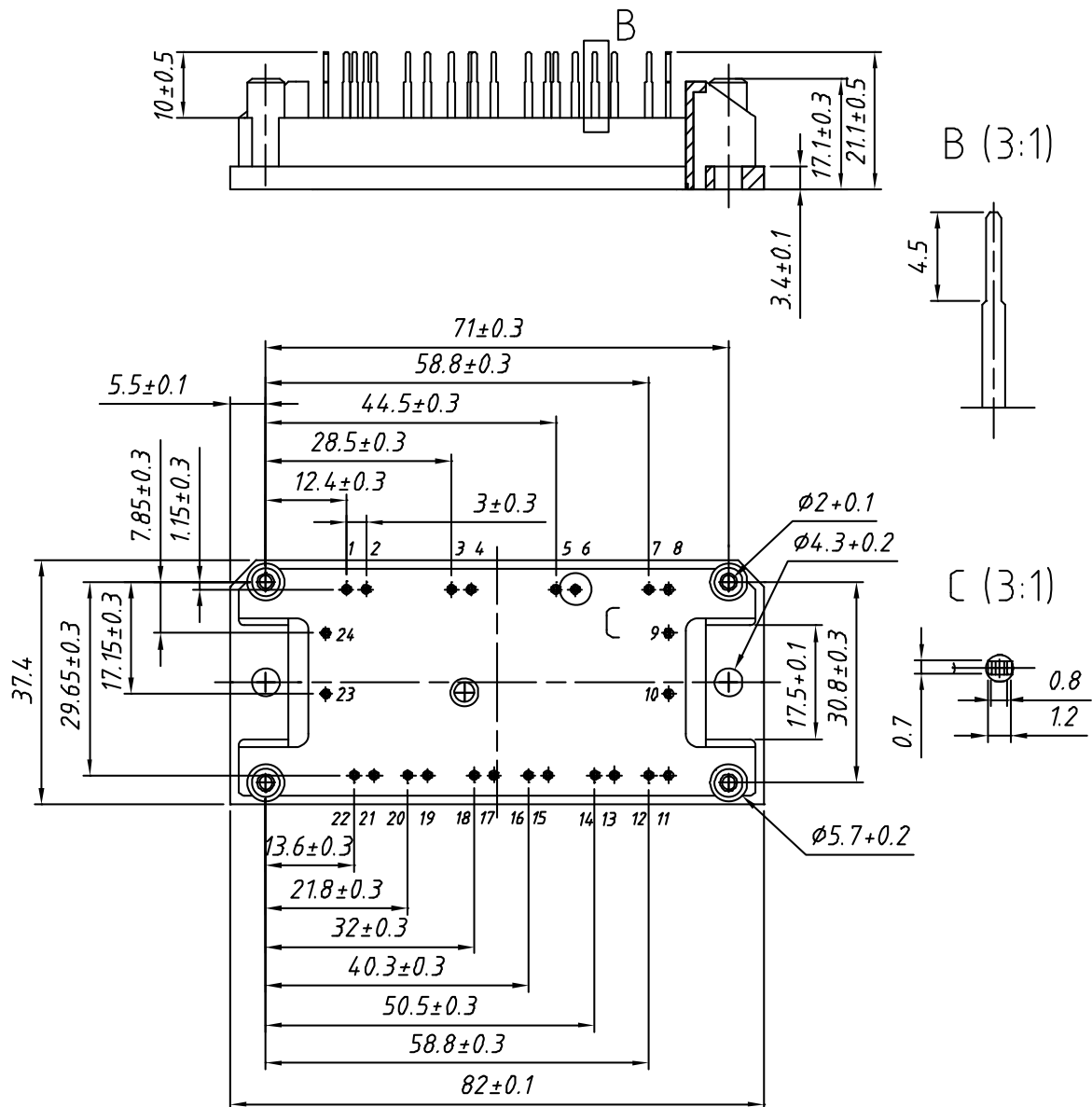
Symbol	Definitions	Conditions	Ratings			Unit
			min.	typ.	max.	
$T_{VJ}$	operating temperature		-40		125	$^\circ\text{C}$
$T_{VJM}$	max. virtual junction temperature				150	$^\circ\text{C}$
$T_{stg}$	storage temperature		-40		125	$^\circ\text{C}$
$V_{ISOL}$	isolation voltage	$I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}$			2500	V~
$M_d$	mounting torque	(M4)	2.0		2.2	Nm
$d_s$	creep distance on surface		12.7			mm
$d_A$	strike distance through air		12.7			mm
<b>Weight</b>				40		g

**Equivalent Circuits for Simulation**

**Ratings**

Symbol	Definitions	Conditions	min.	typ.	max.	Unit
$V_0$	IGBT	$T_{VJ} = 125^\circ\text{C}$		1.0		V
$R_0$				31		m $\Omega$
$V_0$	free wheeling diode	$T_{VJ} = 125^\circ\text{C}$		1.5		V
$R_0$				14		m $\Omega$

## Outline Drawing

Dimensions in mm (1 mm = 0.0394")



## Product Marking

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MWI 60-12T6K	MWI60-12T6K	Box	10	500 152