

# IGBT Modules

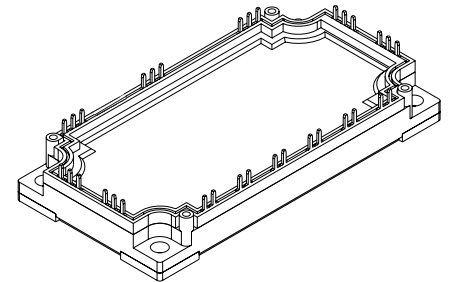
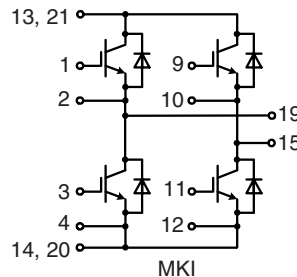
## H Bridge

Short Circuit SOA Capability  
Square RBSOA

$$I_{C25} = 125 \text{ A}$$

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

$$V_{CE(sat) \text{ typ.}} = 3.3 \text{ V}$$



### IGBTs

Symbol	Conditions	Maximum Ratings	
$V_{CES}$	$T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$	1200	V
$V_{GES}$		$\pm 20$	V
$I_{C25}$	$T_C = 25^{\circ}\text{C}$	125	A
$I_{C80}$	$T_C = 80^{\circ}\text{C}$	85	A
$I_{CM}$	$V_{GE} = \pm 15 \text{ V}; R_G = 5.6 \Omega; T_{VJ} = 125^{\circ}\text{C}$	200	A
$V_{CEK}$	RBSOA; clamped inductive load; $L = 100 \mu\text{H}$	$V_{CES}$	
$t_{SC}$	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 5.6 \Omega; T_{VJ} = 125^{\circ}\text{C}$ SCSOA; non-repetitive	10	$\mu\text{s}$
$P_{tot}$	$T_C = 25^{\circ}\text{C}$	640	W

### Features

- Fast NPT 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

Symbol	Conditions	Characteristic Values ( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)			
		min.	typ.	max.	
$V_{CE(sat)}$	$I_C = 100 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		3.3 4.0	V V	
$V_{GE(th)}$	$I_C = 4 \text{ mA}; V_{GE} = V_{CE}$	4.5		6.5 V	
$I_{CES}$	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		4.0	1.3 mA mA	
$I_{GES}$	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$			600 nA	
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$ $E_{on}$ $E_{off}$	Inductive load, $T_{VJ} = 125^{\circ}\text{C}$ $V_{CE} = 600 \text{ V}; I_C = 100 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 5.6 \Omega$		130 60 365 30 12.0 5.0	ns ns ns ns mJ mJ	
$C_{ies}$		$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$		6.5	nF
$Q_{Gon}$		$V_{CE} = 600 \text{ V}; V_{GE} = \pm 15 \text{ V}; I_C = 100 \text{ A}$		1.1	$\mu\text{C}$
$R_{thJC}$		(per IGBT)			0.19 K/W

### Typical Applications

- motor control
  - . DC motor amature winding
  - . DC motor excitation winding
  - . synchronous motor excitation winding
- supply of transformer primary winding
  - . power supplies
  - . welding
  - . X-ray
  - . battery charger

## Diodes

Symbol	Conditions	Maximum Ratings	
$I_{F25}$	$T_C = 25^\circ\text{C}$	200	A
$I_{F80}$	$T_C = 80^\circ\text{C}$	130	A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F$	$I_F = 100\text{ A}; V_{GE} = 0\text{ V}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$	2.3	2.6	V
$I_{RM}$ $t_{rr}$	$I_F = 120\text{ A}; di_F/dt = -750\text{ A}/\mu\text{s}; T_{VJ} = 125^\circ\text{C}$ $V_R = 600\text{ V}; V_{GE} = 0\text{ V}$	82		A
		200		ns
$R_{thJC}$	(per diode)			0.3 K/W

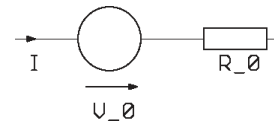
## Module

Symbol	Conditions	Maximum Ratings	
$T_{VJ}$	operating	-40...+125	$^\circ\text{C}$
$T_{JM}$		+150	$^\circ\text{C}$
$T_{stg}$		-40...+125	$^\circ\text{C}$
$V_{ISOL}$	$I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz}$	2500	V~
$M_d$	Mounting torque (M5)	3 - 6	Nm

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$R_{pin-chip}$			1.8	m $\Omega$
$d_S$	Creepage distance on surface	10		mm
$d_A$	Strike distance in air	10		mm
$R_{thCH}$	with heatsink compound		0.01	K/W
Weight			300	g

## Equivalent Circuits for Simulation

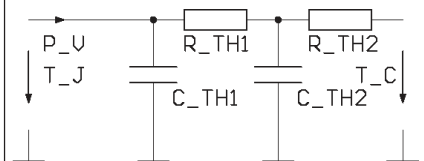
### Conduction



IGBT (typ. at  $V_{GE} = 15\text{ V}; T_J = 125^\circ\text{C}$ )  
 $V_0 = 2.05\text{ V}; R_0 = 19.5\text{ m}\Omega$

Free Wheeling Diode (typ. at  $T_J = 125^\circ\text{C}$ )  
 $V_0 = 1.27\text{ V}; R_0 = 4.3\text{ m}\Omega$

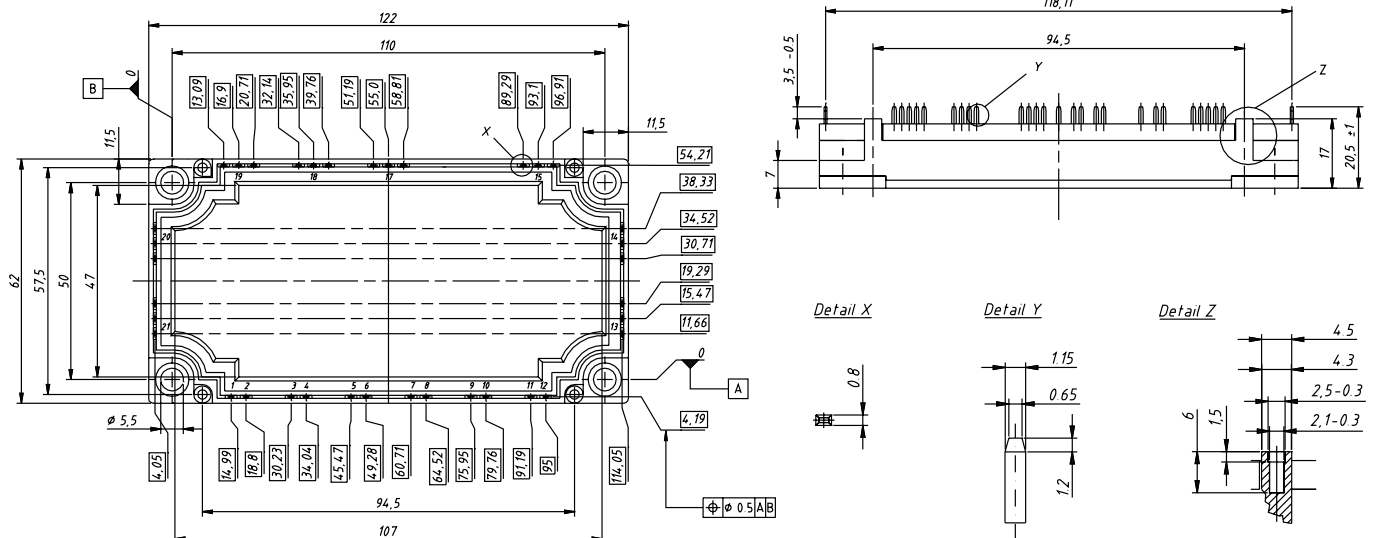
### Thermal Response



IGBT (typ.)  
 $C_{th1} = 0.409\text{ J/K}; R_{th1} = 0.14\text{ K/W}$   
 $C_{th2} = 2.203\text{ J/K}; R_{th2} = 0.05\text{ K/W}$

Free Wheeling Diode (typ.)  
 $C_{th1} = 0.301\text{ J/K}; R_{th1} = 0.24\text{ K/W}$   
 $C_{th2} = 2.005\text{ J/K}; R_{th2} = 0.062\text{ K/W}$

## Dimensions in mm (1 mm = 0.0394")



pins 5, 6, 7, 8 and 17 for MWI only