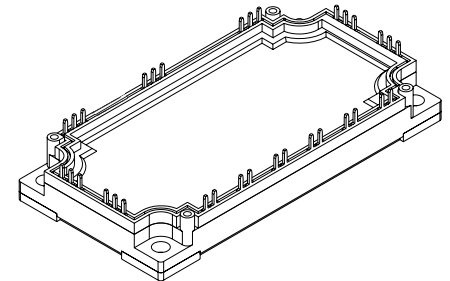
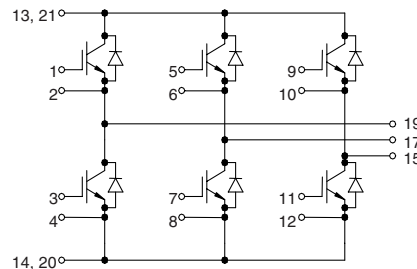


# IGBT Modules

## Sixpack

Short Circuit SOA Capability  
Square RBSOA

Preliminary data



### Features

- NPT IGBT technology
- low saturation voltage
- low switching losses
- switching frequency up to 30 kHz
- square RBSOA, no latch up
- high short circuit capability
- positive temperature coefficient for easy paralleling
- MOS input, voltage controlled
- ultra fast free wheeling diodes
- solderable pins for PCB mounting
- package with copper base plate

### Advantages

- space savings
- reduced protection circuits
- package designed for wave soldering

### Typical Applications

- AC motor control
- AC servo and robot drives
- power supplies

| IGBTs               |                                                                                                                              |                                          |               |
|---------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------|
| Symbol              | Conditions                                                                                                                   | Maximum Ratings                          |               |
| $V_{CES}$           | $T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$                                                                        | 600                                      | V             |
| $V_{GES}$           |                                                                                                                              | $\pm 20$                                 | V             |
| $I_{C25}$           | $T_C = 25^{\circ}\text{C}$                                                                                                   | 130                                      | A             |
| $I_{C80}$           | $T_C = 80^{\circ}\text{C}$                                                                                                   | 88                                       | A             |
| <b>RBSOA</b>        | $V_{GE} = \pm 15 \text{ V}; R_G = 2.2 \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>Clamped inductive load; $L = 100 \mu\text{H}$ | $I_{CM} = 200$<br>$V_{CEK} \leq V_{CES}$ | A             |
| $t_{SC}$<br>(SCSOA) | $V_{CE} = V_{CES}; V_{GE} = \pm 15 \text{ V}; R_G = 2.2 \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>non-repetitive              | 10                                       | $\mu\text{s}$ |
| $P_{tot}$           | $T_C = 25^{\circ}\text{C}$                                                                                                   | 410                                      | W             |

| Symbol                                                                 | Conditions                                                                                                                                       | Characteristic Values<br>( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified) |                                     |                                  |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------|----------------------------------|
|                                                                        |                                                                                                                                                  | min.                                                                                   | typ.                                | max.                             |
| $V_{CE(sat)}$                                                          | $I_C = 100 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                      |                                                                                        | 2.0<br>2.3                          | 2.5<br>V                         |
| $V_{GE(th)}$                                                           | $I_C = 1.5 \text{ mA}; V_{GE} = V_{CE}$                                                                                                          | 4.5                                                                                    |                                     | 6.5 V                            |
| $I_{CES}$                                                              | $V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                          |                                                                                        | 0.9                                 | 1.2 mA<br>mA                     |
| $I_{GES}$                                                              | $V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$                                                                                                |                                                                                        |                                     | 400 nA                           |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$<br>$E_{on}$<br>$E_{off}$ | Inductive load, $T_{VJ} = 125^{\circ}\text{C}$<br>$V_{CE} = 300 \text{ V}; I_C = 100 \text{ A}$<br>$V_{GE} = \pm 15 \text{ V}; R_G = 2.2 \Omega$ |                                                                                        | 25<br>11<br>150<br>30<br>1.0<br>2.9 | ns<br>ns<br>ns<br>ns<br>mJ<br>mJ |
| $C_{ies}$                                                              |                                                                                                                                                  |                                                                                        | 4.3                                 | nF                               |
| $Q_{Gon}$                                                              |                                                                                                                                                  |                                                                                        | 340                                 | nC                               |
| $R_{thJC}$                                                             |                                                                                                                                                  |                                                                                        |                                     | 0.3 K/W                          |

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## Diodes

| Symbol    | Conditions                 | Maximum Ratings |   |
|-----------|----------------------------|-----------------|---|
| $I_{F25}$ | $T_C = 25^{\circ}\text{C}$ | 140             | A |
| $I_{F80}$ | $T_C = 80^{\circ}\text{C}$ | 88              | A |

| Symbol               | Conditions                                                                                                                            | Characteristic Values |            |            |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------|------------|
|                      |                                                                                                                                       | min.                  | typ.       | max.       |
| $V_F$                | $I_F = 100 \text{ A}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$                                |                       | 1.9<br>1.4 | 2.1 V<br>V |
| $I_{RM}$<br>$t_{rr}$ | $I_F = 60 \text{ A}; di_F/dt = -500 \text{ A}/\mu\text{s}; T_{VJ} = 125^\circ\text{C}$<br>$V_R = 300 \text{ V}; V_{GE} = 0 \text{ V}$ |                       | 28<br>100  | A<br>ns    |
| $R_{thJC}$           | (per diode)                                                                                                                           |                       |            | 0.61 K/W   |

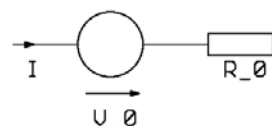
## Module

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

| Symbol                | Conditions                   | Characteristic Values |      |      |
|-----------------------|------------------------------|-----------------------|------|------|
|                       |                              | min.                  | typ. | max. |
| $R_{\text{pin-chip}}$ |                              |                       | 1.8  | mΩ   |
| $d_s$                 | Creepage distance on surface | 10                    |      | mm   |
| $d_A$                 | Strike distance in air       | 10                    |      | mm   |
| $R_{\text{thCH}}$     | with heatsink compound       |                       | 0.01 | K/W  |
| <b>Weight</b>         |                              |                       | 300  | g    |

## Equivalent Circuits for Simulation

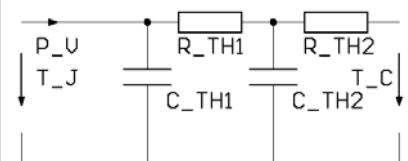
## Conduction



IGBT (typ. at  $V_{GE} = 15\text{ V}$ ;  $T_J = 125^\circ\text{C}$ )  
 $V_0 = 1.1\text{ V}$ ;  $R_0 = 12\text{ m}\Omega$

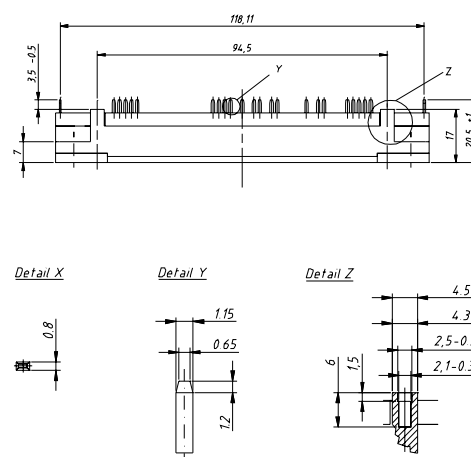
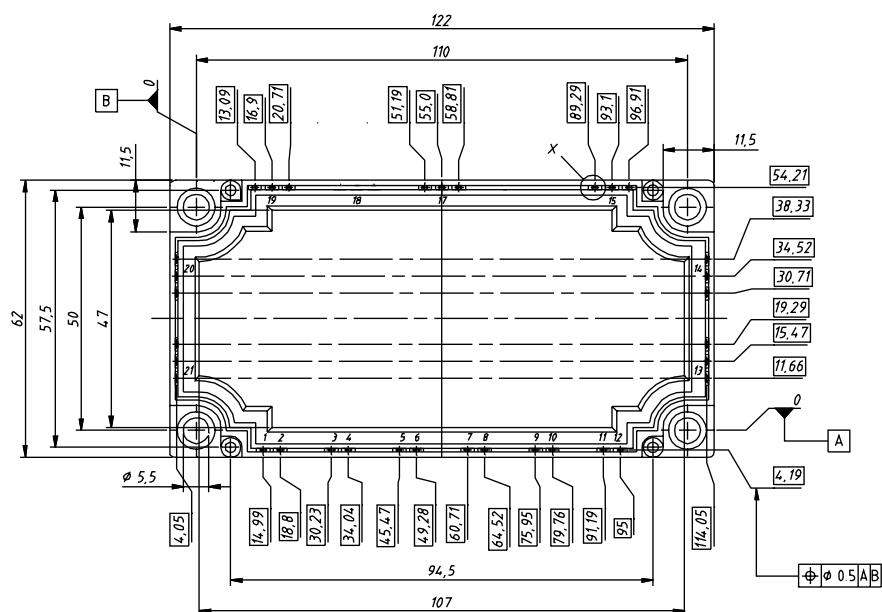
Free Wheeling Diode (typ. at  $T_J = 125^\circ\text{C}$ )  
 $V_f = 1.15\text{ V}; R_f = 2.5\text{ m}\Omega$

### Thermal Response



IGBT (typ.)  
 $C_{th1} = 0.232 \text{ J/K}; R_{th1} = 0.223 \text{ K/W}$   
 $C_{th2} = 1.504 \text{ J/K}; R_{th2} = 0.077 \text{ K/W}$

Free Wheeling Diode (typ.)  
 $C_{th1} = 0.138 \text{ J/K}; R_{th1} = 0.48 \text{ K/W}$   
 $C_{th2} = 0.957 \text{ J/K}; R_{th2} = 0.13 \text{ K/W}$



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

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