

## IGBT MODULE ( L series)

### ■ Features

- High Speed Switching
- Low Saturation Voltage
- Voltage Drive

### ■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial Machines, such as Welding Machines

### ■ Maximum Ratings and Characteristics

#### ● Absolute Maximum Ratings

| Items                     | Symbols      | Ratings         | Units         |
|---------------------------|--------------|-----------------|---------------|
| Collector-Emitter Voltage | $V_{CES}$    | 1200            | V             |
| Gate-Emitter Voltage      | $V_{GES}$    | $\pm 20$        | V             |
| Collector Current         | Continuous   | $I_C$           | 50            |
|                           | 1ms          | $I_{C\ pulse}$  | 100           |
|                           | Continuous   | $-I_C$          | 50            |
|                           | 1ms          | $-I_{C\ pulse}$ | 100           |
| Max. Power Dissipation    | $P_C$        | 400             | W             |
| Operating Temperature     | $T_j$        | +150            | $^{\circ}C$   |
| Storage Temperature       | $T_{stg}$    | -40 to +125     | $^{\circ}C$   |
| Net. Weight               |              | 510             | g             |
| Isolation Voltage         | AC. 1min.    | $V_{isol}$      | 2500          |
| Screw Torque              | Mounting *1  | 35              | kg $\cdot$ cm |
|                           | Terminals *2 | 17              |               |

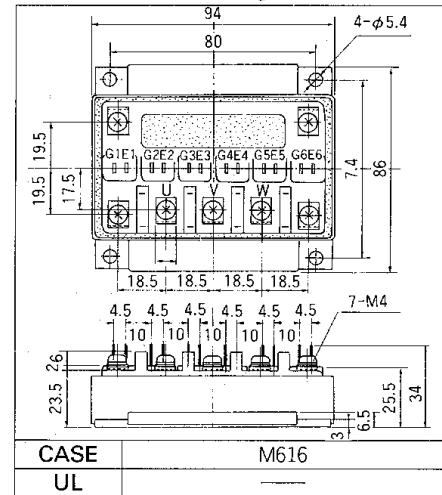
#### ● Electrical Characteristics (Tc=25 $^{\circ}C$ )

| Items                                | Symbols       | Test Conditions                               | Min. | Typ. | Max. | Units   |
|--------------------------------------|---------------|---|------|------|------|---------|
| Zero Gate Voltage Collector Current  | $I_{CES}$     | $V_{GE}=0V$ $V_{CE}=1200V$ $T_c=25^{\circ}C$  |      |      | 1.0  | mA      |
|                                      |               | $V_{GE}=0V$ $V_{CE}=1200V$ $T_c=125^{\circ}C$ |      |      | -    |         |
| Gate-Emitter Leakage Current         | $I_{GES}$     | $V_{CE}=0V$ $V_{GE}=\pm 20V$                  |      |      | 100  | nA      |
| Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $V_{CE}=20V$ $I_C=50mA$                       | 3.0  |      | 6.0  | V       |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15V$ $I_C=50A$                        |      | 2.7  | 3.5  | V       |
| Input Capacitance                    | $C_{ies}$     | $V_{GE}=0V$                                   |      | 9000 |      | pF      |
| Output Capacitance                   | $C_{oes}$     | $V_{CE}=10V$                                  |      | -    |      |         |
| Reverse Transfer Capacitance         | $C_{res}$     | $f=1MHz$                                      |      | -    |      |         |
| Turn-on Time                         | $t_{on}$      | $V_{CC}=600V$                                 |      | 0.5  | 0.8  | $\mu s$ |
|                                      | $t_r$         | $I_C=50A$                                     |      | 0.3  | 0.6  |         |
| Turn-off Time                        | $t_{off}$     | $V_{GE}=\pm 15V$                              |      | 0.8  | 1.5  |         |
|                                      | $t_f$         | $R_G=25\Omega$                                |      | 0.3  | 0.5  |         |
| Diode Forward On-Voltage             | $V_F$         | $I_F=50A$ $V_{GE}=0V$                         |      |      | 2.5  | V       |
| Reverse Recovery Time                | $t_{rr}$      | $I_F=50A$ $-di/dt=150A/\mu s$ $V_{GE}=-10V$   |      | 200  | 350  | ns      |

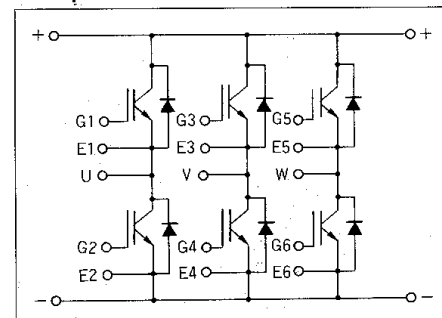
#### ● Thermal Characteristics

| Items              | Symbols       | Test Conditions       | Min. | Typ. | Max.  | Units         |
|--------------------|---------------|-----------------------|------|------|-------|---------------|
| Thermal Resistance | $R_{th(j-c)}$ | IGBT                  |      |      | 0.312 | $^{\circ}C/W$ |
|                    | $R_{th(j-e)}$ | Diode                 |      |      | 0.60  |               |
|                    | $R_{th(c-f)}$ | With Thermal compound |      | 0.05 |       |               |

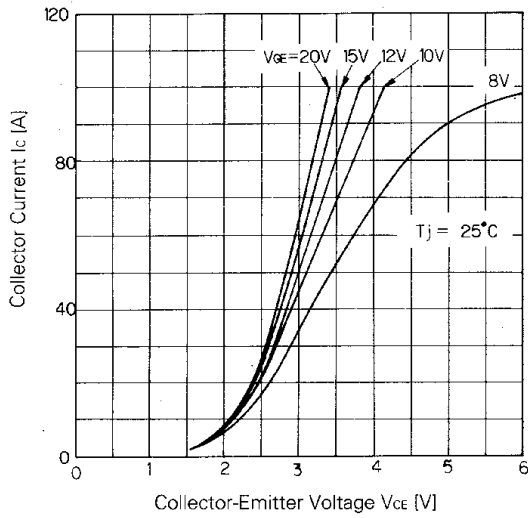
### ■ Outline Drawings



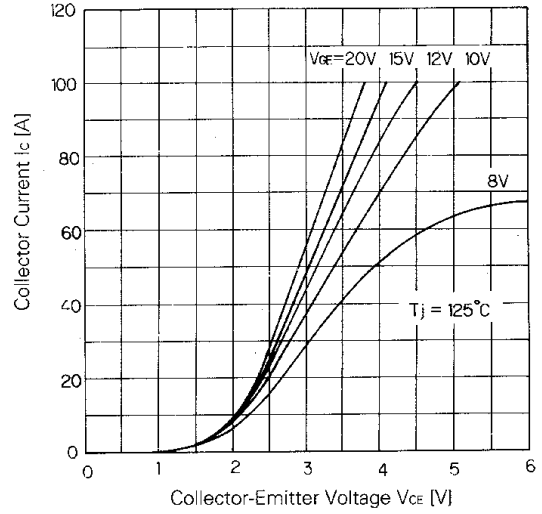
### ■ Equilavelent Circuit Schematic



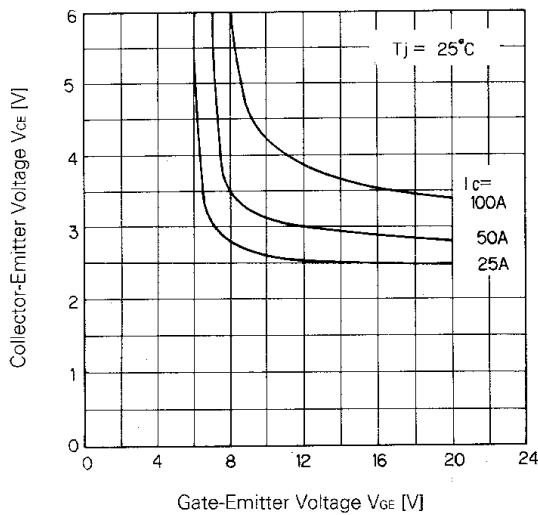
\*1 Recommendable Value 25 to 35kg $\cdot$ cm (M5)  
\*2 Recommendable Value 13 to 17kg $\cdot$ cm (M4)



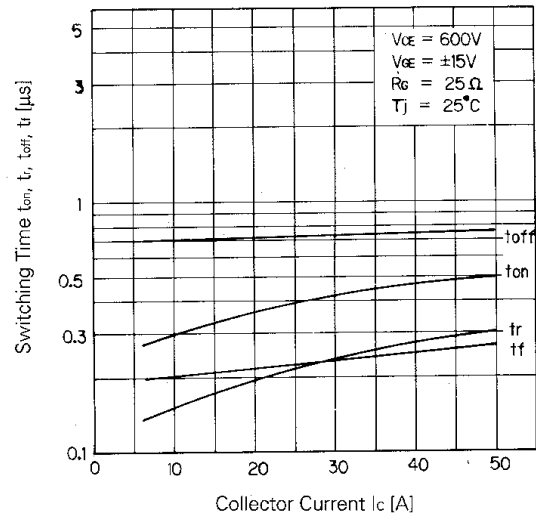
Collector Current vs. Collector-Emitter Voltage



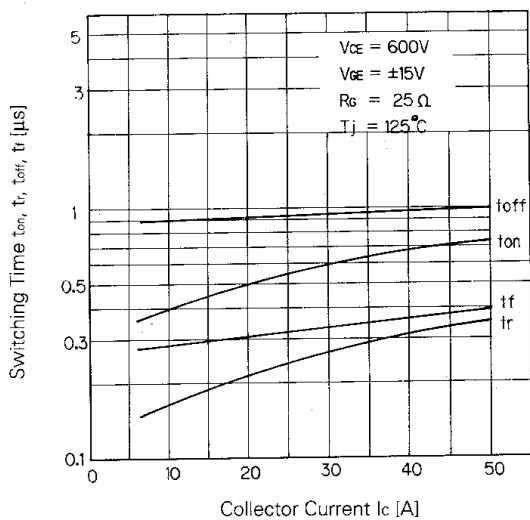
Collector Current vs. Collector-Emitter Voltage



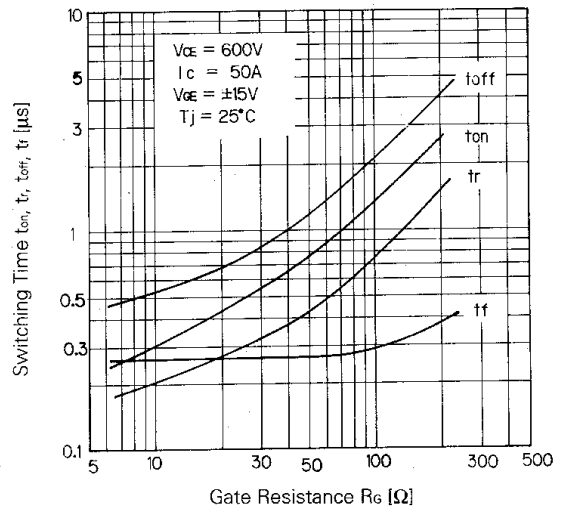
Collector-Emitter Voltage vs. Gate-Emitter Voltage



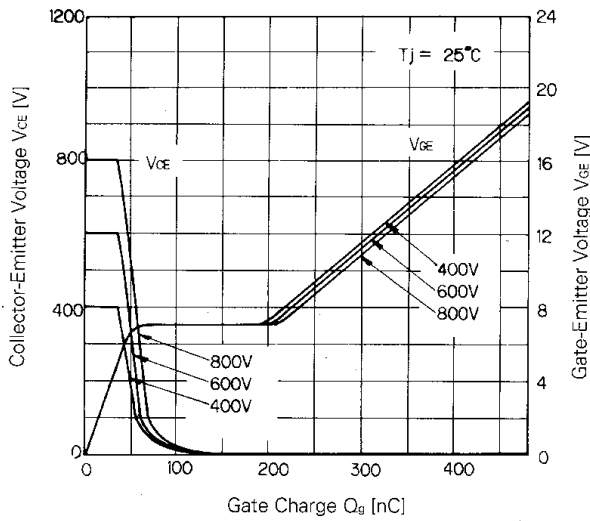
Switching Time



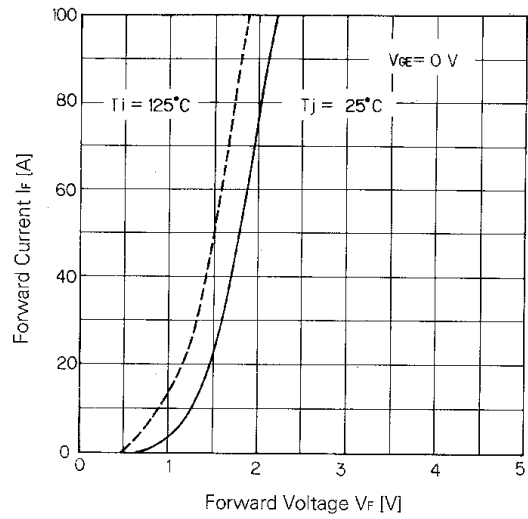
Switching Time



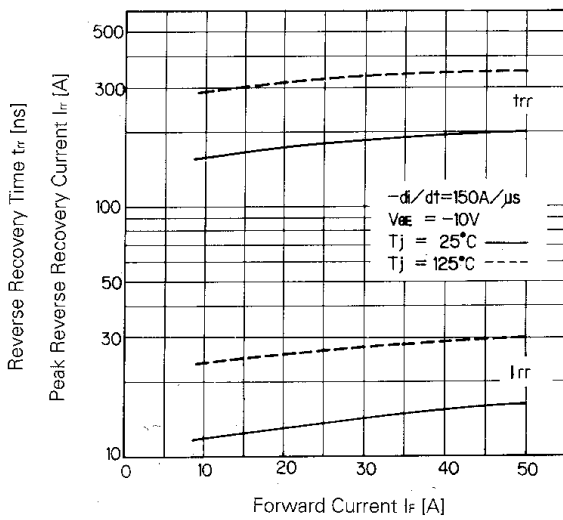
Switching Time-Gate Resistance



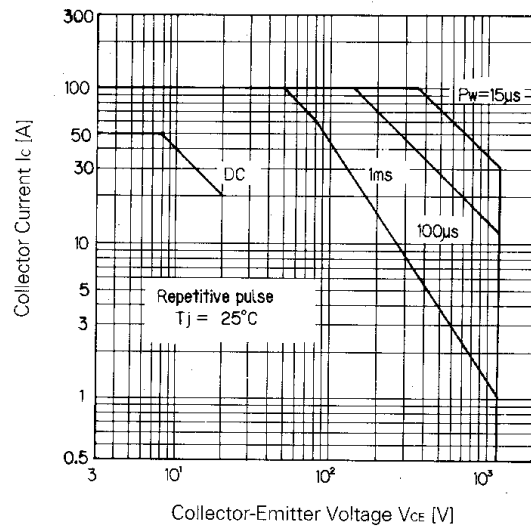
**Dynamic Input Characteristic**



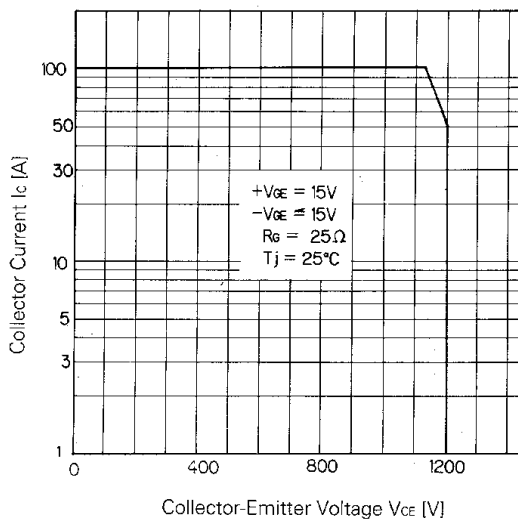
**Forward Voltage of Free Wheel Diode**



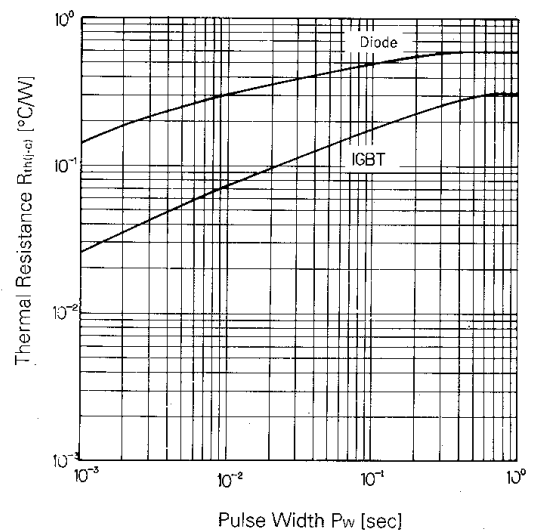
**$t_{rr}, I_{rr}-I_F$**



**Safe Operating Area**



**Reverse Biased Safe Operating Area**



**Transient Thermal Resistance**

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