

# 1MBH15D-060

Molded IGBT

## 600V / 15A Molded Package

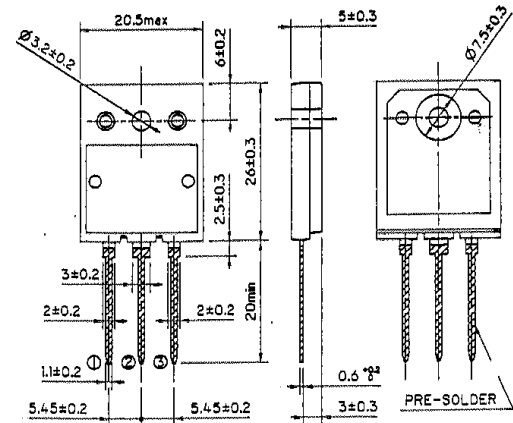
### Outline drawings, mm TO-3PL

#### Features

- Small molded package
- Low power loss
- Soft switching with low switching surge and noise
- High reliability, high ruggedness (RBSOA, SCSOA etc.)
- Comprehensive line-up

#### Applications

- Inverter for Motor drive
- AC and DC Servo drive amplifier
- Uninterruptible power supply



#### CONNECTION

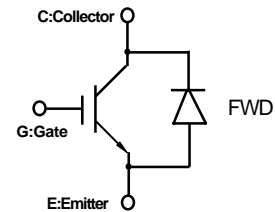


#### Maximum ratings and characteristics

##### Absolute maximum ratings (Tc=25°C)

| Item                          | Symbol           | Rating                | Unit              |     |   |
|-------------------------------|------------------|-----------------------|-------------------|-----|---|
| Collector-Emitter voltage     | V <sub>CEs</sub> | 600                   | V                 |     |   |
| Gate-Emitter voltage          | V <sub>GES</sub> | ±20                   | V                 |     |   |
| Collector current             | DC               | T <sub>c</sub> =25°C  | I <sub>c25</sub>  | 37  | A |
|                               |                  | T <sub>c</sub> =110°C | I <sub>c110</sub> | 15  | A |
|                               | 1ms              | T <sub>c</sub> =25°C  | I <sub>cp</sub>   | 132 | A |
| Max. power dissipation (IGBT) | P <sub>c</sub>   | 140                   | W                 |     |   |
| Max. power dissipation (FWD)  | P <sub>c</sub>   | 75                    | W                 |     |   |
| Operating temperature         | T <sub>j</sub>   | +150                  | °C                |     |   |
| Storage temperature           | T <sub>stg</sub> | -40 to +150           | °C                |     |   |
| Screw torque                  | -                | 70                    | N·cm              |     |   |

#### Equivalent Circuit Schematic



##### Electrical characteristics (at Tc=25°C unless otherwise specified)

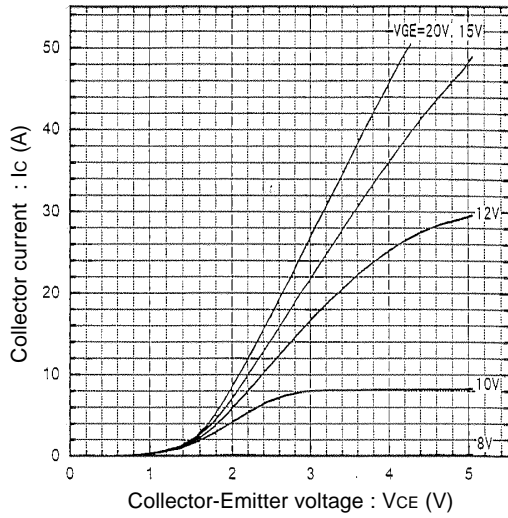
| Item                                 | Symbol               | Characteristics  |      |      | Conditions  | Unit                                       |    |    |
|--------------------------------------|----------------------|------------------|------|------|---|--|----|----|
|                                      |                      | Min.             | Typ. | Max. |   |  |    |    |
| Zero gate voltage collector current  | I <sub>CEs</sub>     | -                | -    | 1.0  | V <sub>GE</sub> =0V, V <sub>CE</sub> =600V                                      | mA   |    |    |
| Gate-Emitter leakage current         | I <sub>GES</sub>     | -                | -    | 20   | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V                                      | µA   |    |    |
| Gate-Emitter threshold voltage       | V <sub>GE(th)</sub>  | 5.5              | -    | 8.5  | V <sub>CE</sub> =20V, I <sub>c</sub> =15mA                                      | V  |    |    |
| Collector-Emitter saturation voltage | V <sub>CE(sat)</sub> | -                | -    | 3.0  | V <sub>GE</sub> =15V, I <sub>c</sub> =15A                                       | V  |    |    |
| Input capacitance                    | C <sub>ies</sub>     | -                | 1000 | -    | V <sub>GE</sub> =0V   | pF   |    |    |
| Output capacitance                   | C <sub>oes</sub>     | -                | 200  | -    | V <sub>CE</sub> =10V  |  |    |    |
| Reverse transfer capacitance         | C <sub>res</sub>     | -                | 40   | -    | f=1MHz  |  |    |    |
| Switching Time                       | Turn-on time         | t <sub>on</sub>  | -    | -    | 1.2   | V <sub>CC</sub> =300V, I <sub>c</sub> =15A | µs |    |
|                                      |                      | t <sub>r</sub>   | -    | -    | 0.6   | V <sub>GE</sub> =±15V                      |    |    |
|                                      | Turn-off time        | t <sub>off</sub> | -    | -    | 1.0   | R <sub>G</sub> =160 ohm                    |    |    |
|                                      |                      | t <sub>f</sub>   | -    | -    | 0.35  | (Half Bridge)                              |    |    |
|                                      | Turn-on time         | t <sub>on</sub>  | -    | 0.16 | -   | V <sub>CC</sub> =300V, I <sub>c</sub> =15A |    | µs |
|                                      |                      | t <sub>r</sub>   | -    | 0.11 | -   | V <sub>GE</sub> =+15V                      |    |    |
| Turn-off time                        | t <sub>off</sub>     | -                | 0.30 | -    | R <sub>G</sub> =16 ohm  |  |    |    |
|                                      | t <sub>f</sub>       | -                | -    | 0.35 | (Half Bridge)   |  |    |    |
| FWD forward on voltage               | V <sub>F</sub>       | -                | -    | 3.0  | I <sub>F</sub> =15A   | V  |    |    |
| Reverse recovery time                | t <sub>rr</sub>      | -                | -    | 0.3  | I <sub>F</sub> =15A, V <sub>GE</sub> =-10V, V <sub>R</sub> =200V, di/dt=100A/µs | µs   |    |    |

##### Thermal resistance characteristics

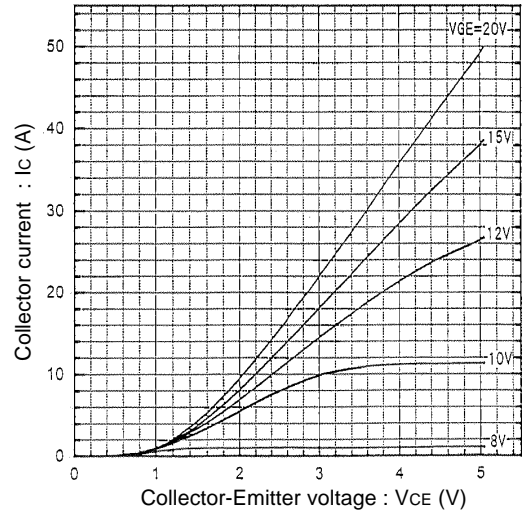
| Item               | Symbol               | Characteristics |      |      | Conditions | Unit |
|--------------------|----------------------|-----------------|------|------|------------|------|
|                    |                      | Min.            | Typ. | Max. |            |      |
| Thermal resistance | R <sub>th(j-c)</sub> | -               | -    | 0.89 | IGBT       | °C/W |
|                    | R <sub>th(j-c)</sub> | -               | -    | 1.66 | FWD        | °C/W |

Characteristics

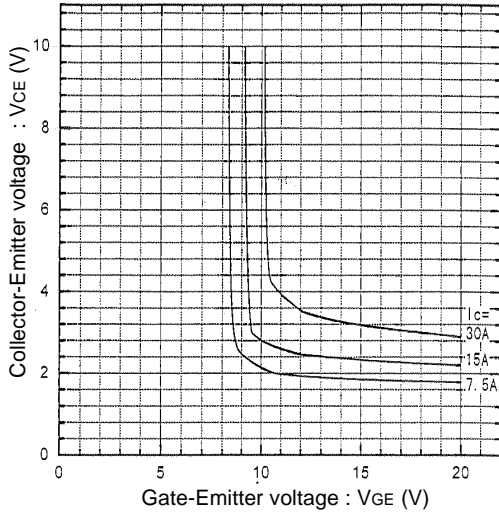
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>=25°C



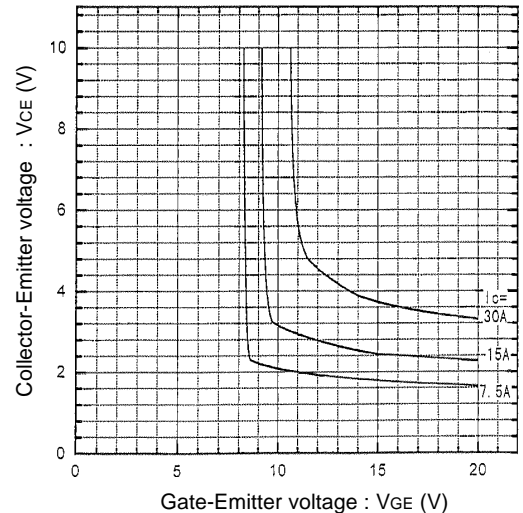
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>=125°C



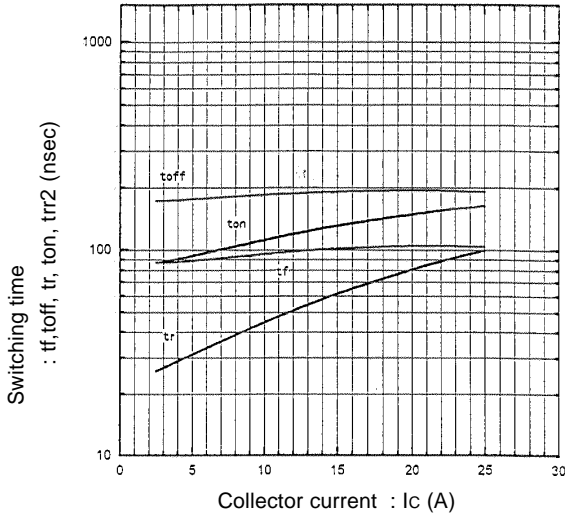
Collector-Emitter voltage vs. Gate-Emitter voltage  
T<sub>j</sub>=25°C



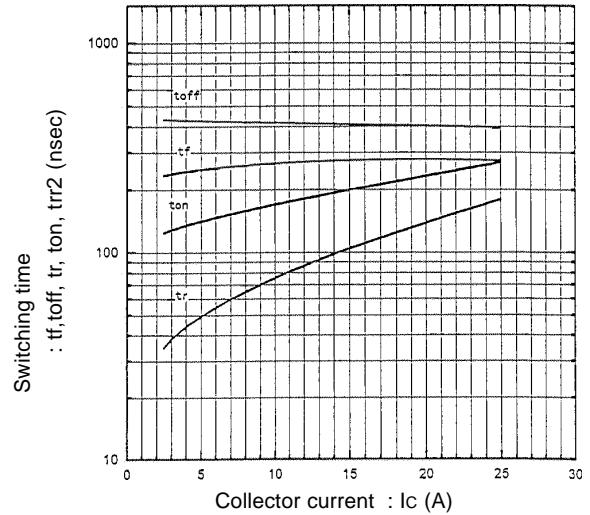
Collector-Emitter voltage vs. Gate-Emitter voltage  
T<sub>j</sub>=125°C



Switching time vs. Collector current  
V<sub>CC</sub>=300V, R<sub>G</sub>=16Ω, V<sub>GE</sub>=±15V, T<sub>j</sub>=25°C

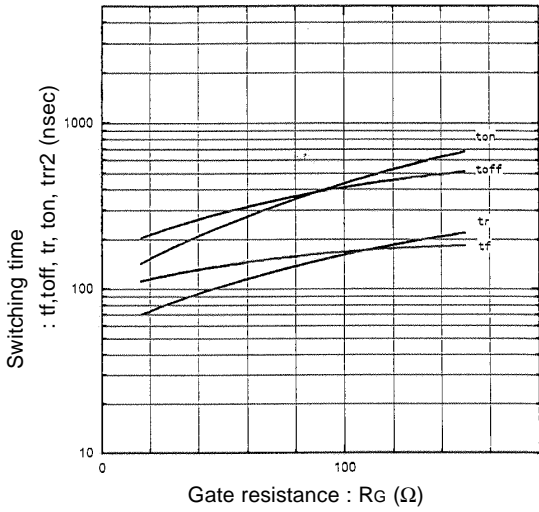


Switching time vs. Collector current  
V<sub>CC</sub>=300V, R<sub>G</sub>=16Ω, V<sub>GE</sub>=±15V, T<sub>j</sub>=125°C

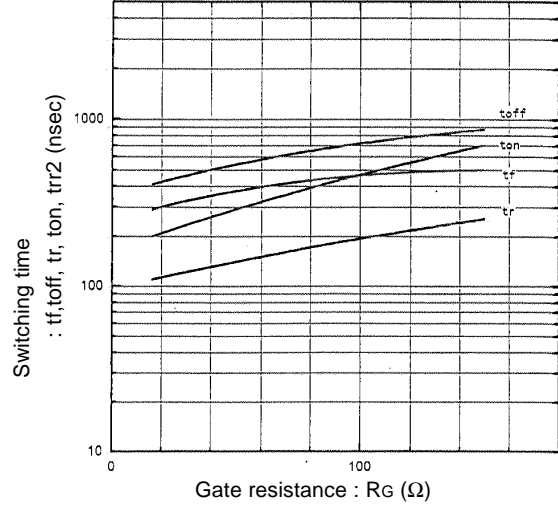


Characteristics

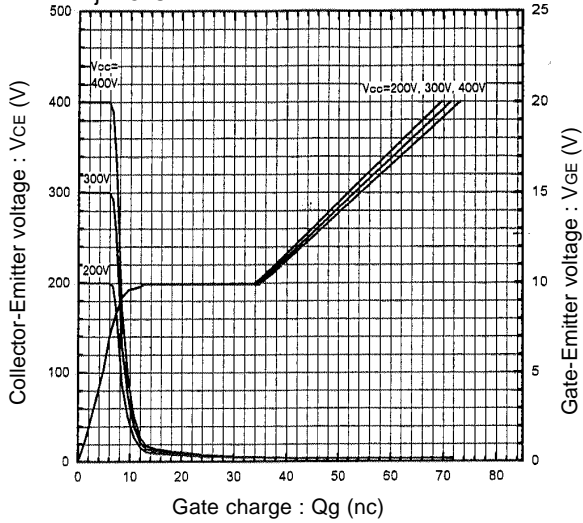
Switching time vs.  $R_G$   
 $V_{CC}=300V, I_C=15A, V_{GE}=\pm 15V, T_j=25^\circ C$



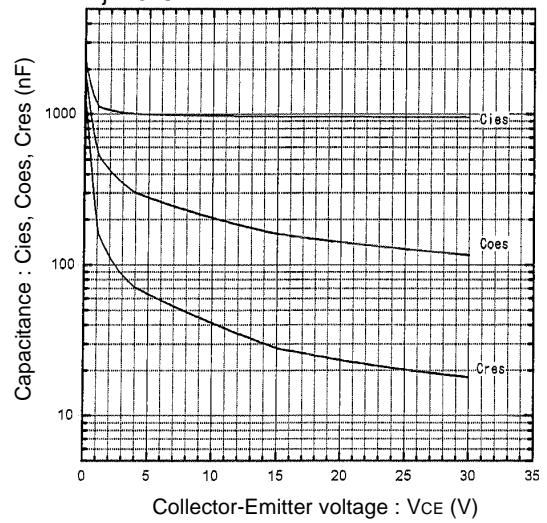
Switching time vs.  $R_G$   
 $V_{CC}=300V, I_C=15A, V_{GE}=\pm 15V, T_j=125^\circ C$



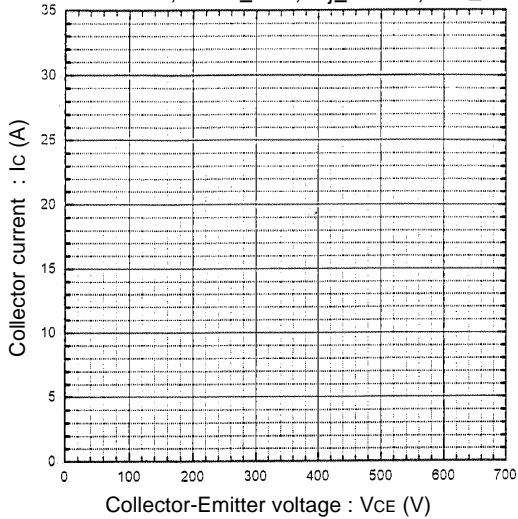
Dynamic input characteristics  
 $T_j=25^\circ C$



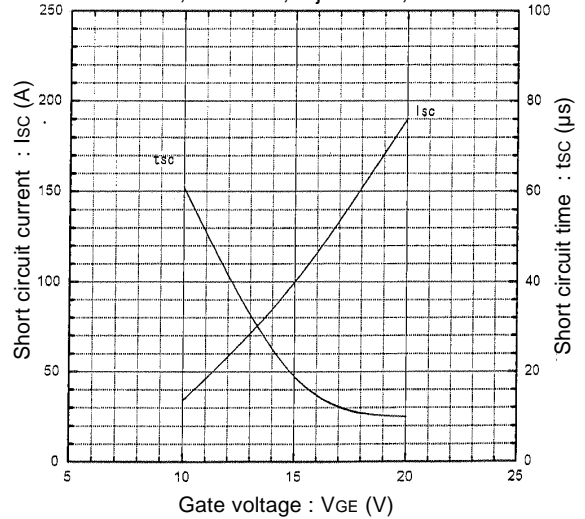
Capacitance vs. Collector-Emitter voltage  
 $T_j=25^\circ C$



Reverse Biased Safe Operating Area  
 $+V_{GE}=15V, -V_{GE}\leq 15V, T_j\leq 125^\circ C, R_G\geq 16\Omega$

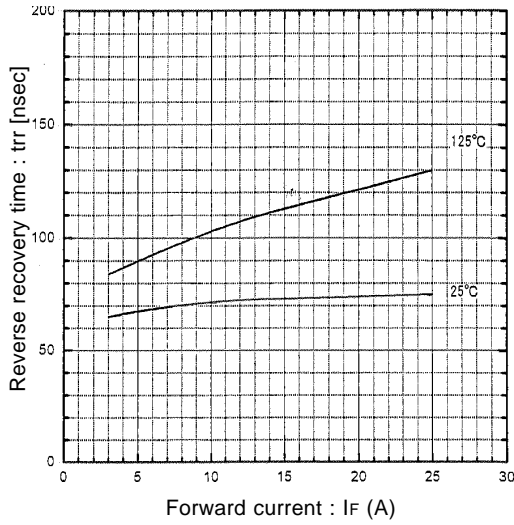


Typical short circuit capability  
 $V_{CC}=400V, R_G=16\Omega, T_j=125^\circ C,$

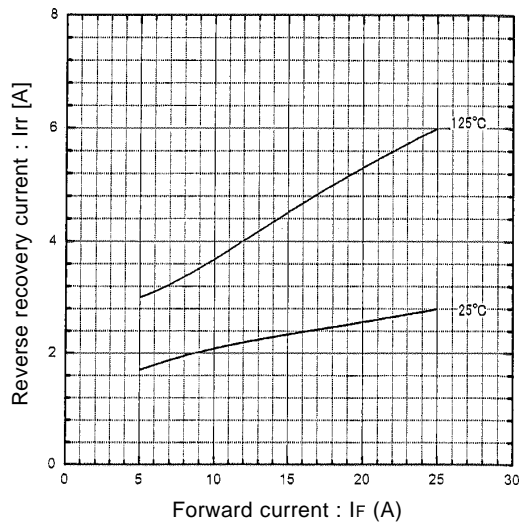


■ Characteristics

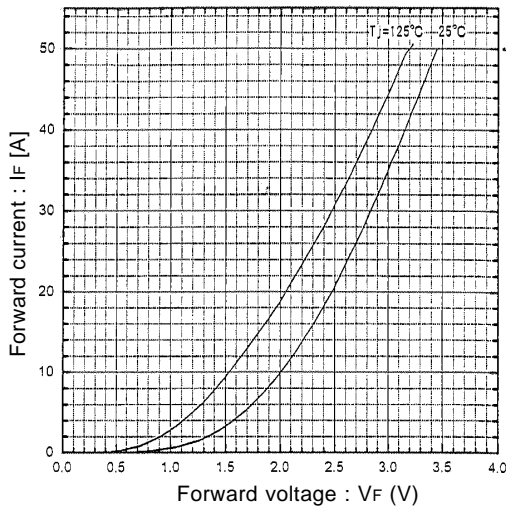
Reverse recovery time vs. Forward current  
VR=200V, -di/dt=100A/μsec



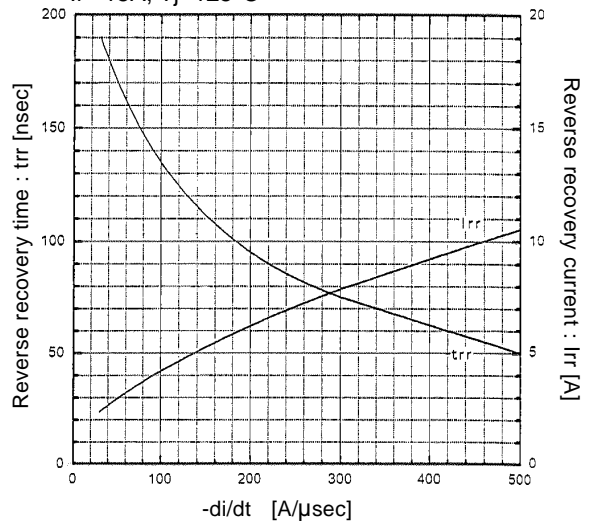
Reverse recovery current vs. Forward current  
VR=200V, -di/dt=100A/μsec



Forward voltage vs. Forward current



Reverse recovery characteristics vs. -di/dt  
IF=15A, Tj=125°C



Transient thermal resistance

