

# 1MBH15D-060

Molded IGBT

600V / 15A Molded Package

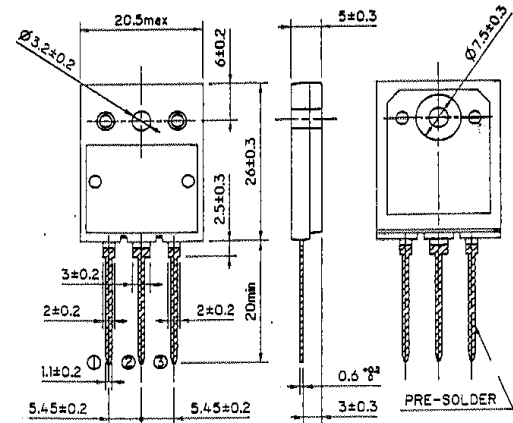
■ Outline drawings, mm TO-3PL

## ■ 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

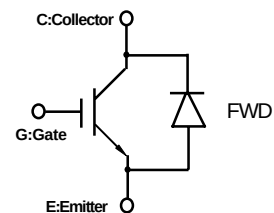


## ■ Maximum ratings and characteristics

### ● 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·m  |

## ■ Equivalent Circuit Schematic



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

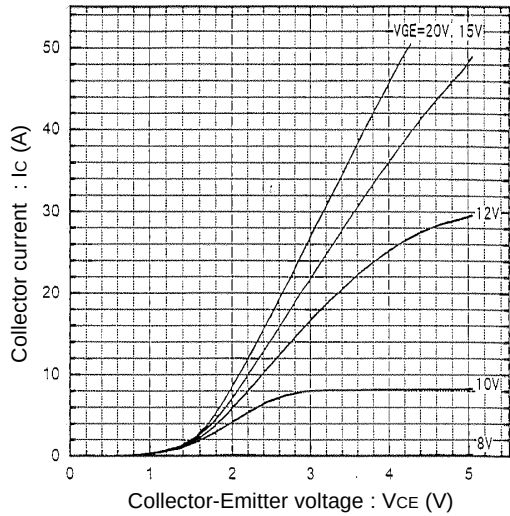
| Item                                 | Symbol               | Characteristics  |      |      | Conditions                                                                      | Unit |
|--------------------------------------|----------------------|------------------|------|------|---------------------------------------------------------------------------------|------|
|                                      |                      | 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                                                         | μs   |
|                                      |                      | 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                                                           |      |
| FWD forward on voltage               | V <sub>F</sub>       | —                | —    | 3.0  | I <sub>F</sub> =15A                                                             | V    |
|                                      |                      | —                | —    | 0.3  | I <sub>F</sub> =15A, V <sub>GE</sub> =-10V, V <sub>R</sub> =200V, di/dt=100A/μs |      |

### ● Thermal resistance characteristics

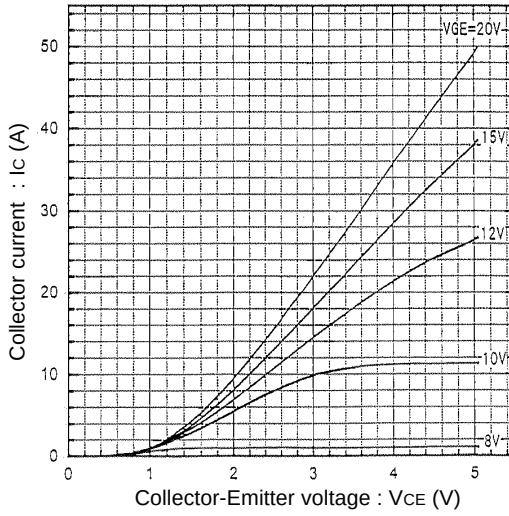
| Item               | Symbol               | Characteristics |      |      | Conditions | Unit |
|--------------------|----------------------|-----------------|------|------|------------|------|
|                    |                      | Min.            | Typ. | Max. |            |      |
| Thermal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

Characteristics

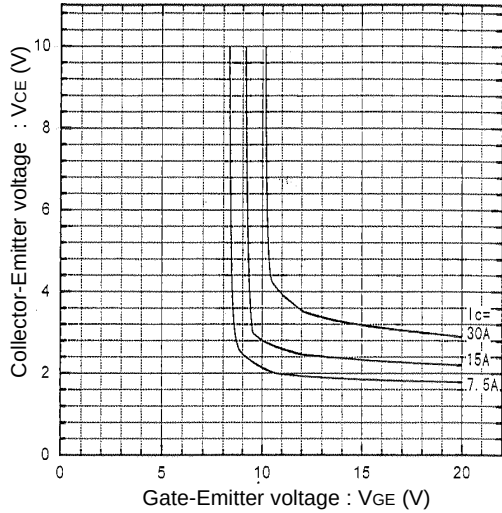
Collector current vs. Collector-Emitter voltage  
Tj=25°C



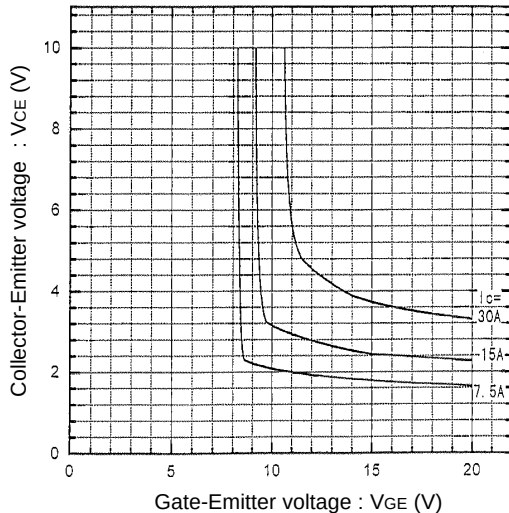
Collector current vs. Collector-Emitter voltage  
Tj=125°C



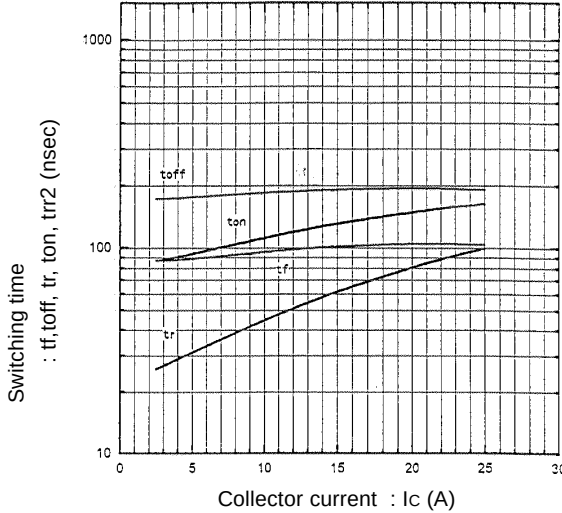
Collector-Emitter voltage vs. Gate-Emitter voltage  
Tj=25°C



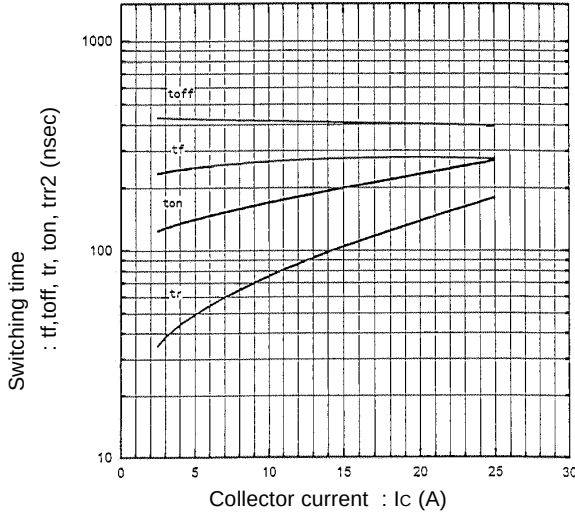
Collector-Emitter voltage vs. Gate-Emitter voltage  
Tj=125°C



Switching time vs. Collector current  
VCC=300V, RG=16Ω, VGE=±15V, Tj=25°C



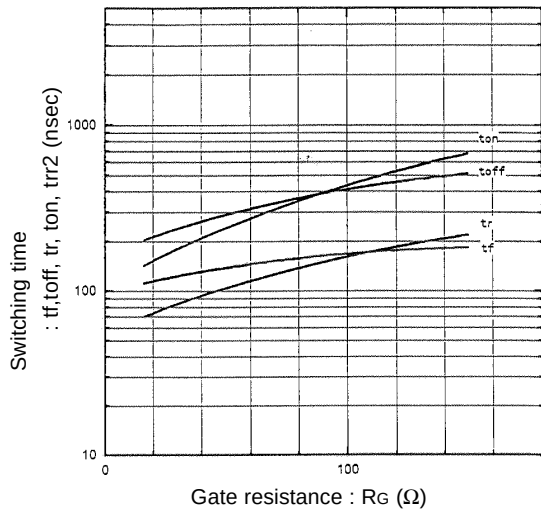
Switching time vs. Collector current  
VCC=300V, RG=16Ω, VGE=±15V, Tj=125°C



■ Characteristics

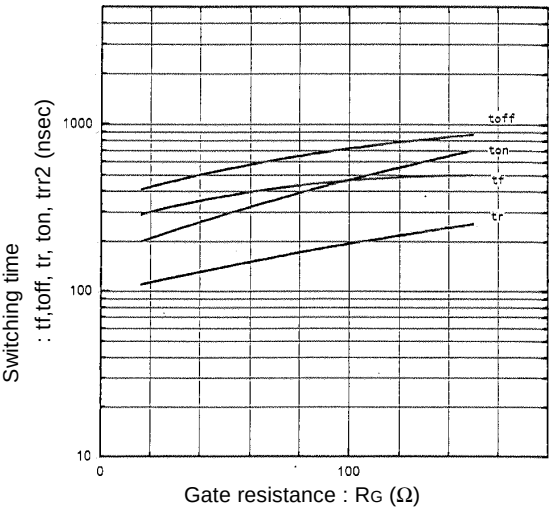
Switching time vs.  $R_G$

$V_{CC}=300V$ ,  $I_C=15A$ ,  $V_{GE}=\pm 15V$ ,  $T_J=25^\circ C$



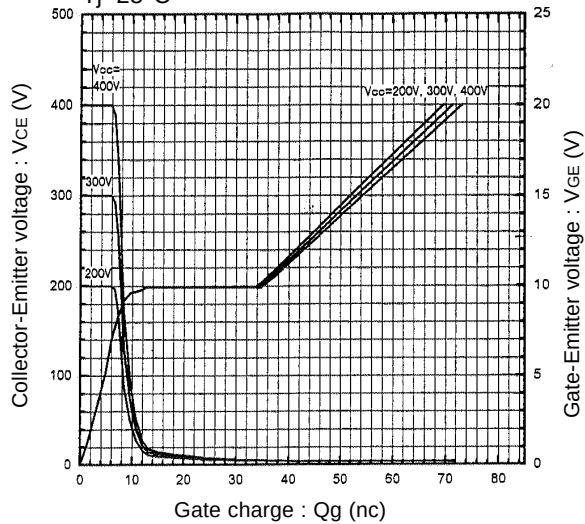
Switching time vs.  $R_G$

$V_{CC}=300V$ ,  $I_C=15A$ ,  $V_{GE}=\pm 15V$ ,  $T_J=125^\circ C$



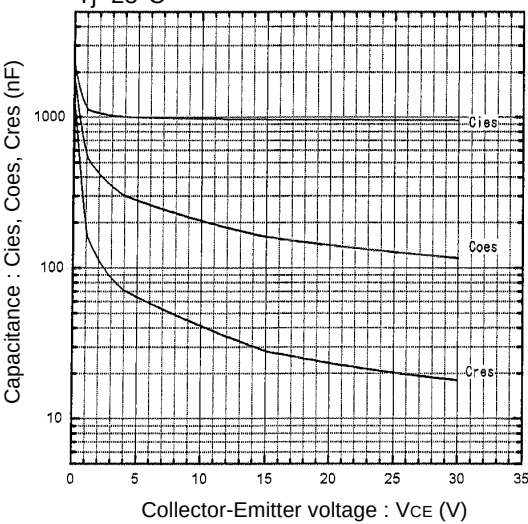
Dynamic input characteristics

$T_J=25^\circ C$



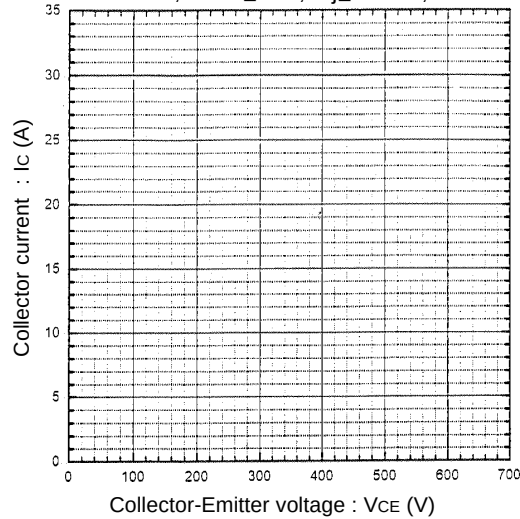
Capacitance vs. Collector-Emitter voltage

$T_J=25^\circ C$



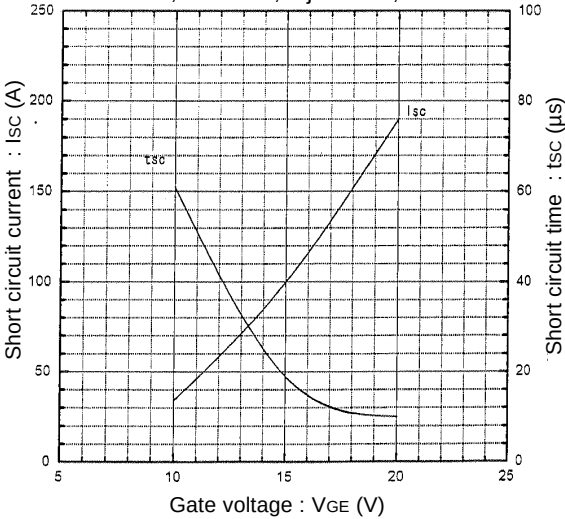
Reverse Biased Safe Operating Area

$+V_{GE}=15V$ ,  $-V_{GE}\leq 15V$ ,  $T_J\leq 125^\circ C$ ,  $R_G\geq 16\Omega$



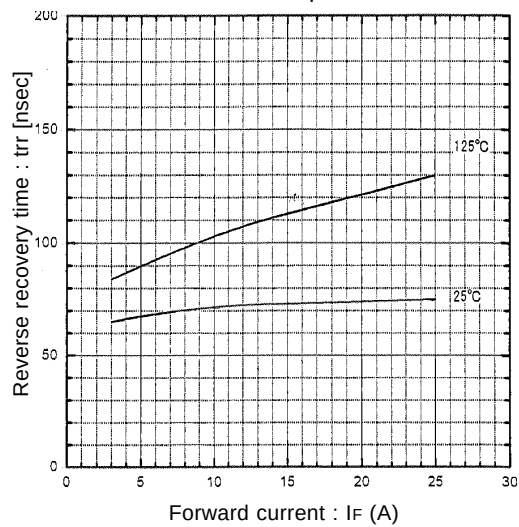
Typical short circuit capability

$V_{CC}=400V$ ,  $R_G=16\Omega$ ,  $T_J=125^\circ C$ ,

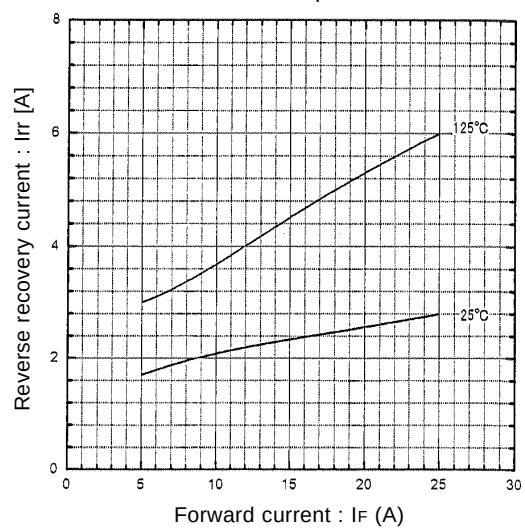


## Characteristics

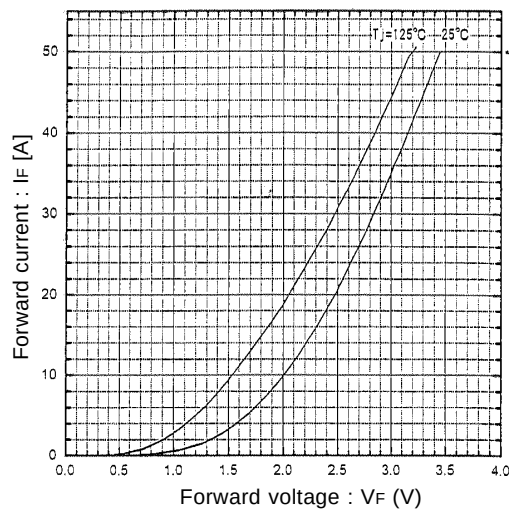
Reverse recovery time vs. Forward current  
 $V_R=200V$ ,  $-di/dt=100A/\mu sec$



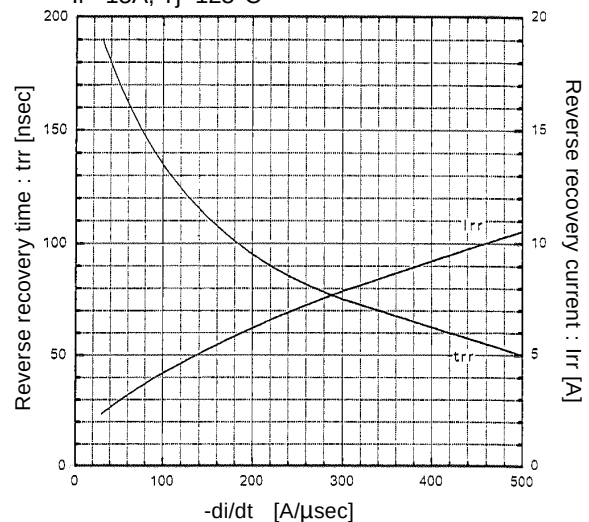
Reverse recovery current vs. Forward current  
 $V_R=200V$ ,  $-di/dt=100A/\mu sec$



Forward voltage vs. Forward current



Reverse recovery characteristics vs.  $-di/dt$   
 $I_F=15A$ ,  $T_J=125^\circ C$



Transient thermal resistance

