

1200V / 15A

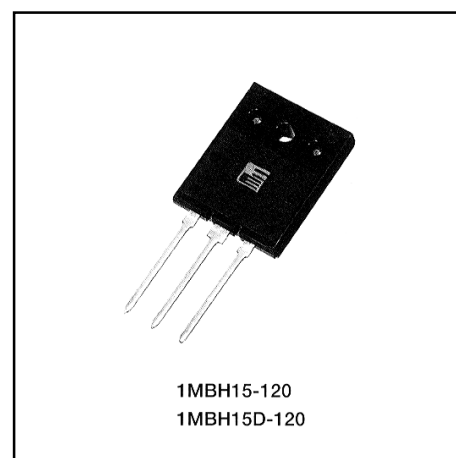
## Molded Package

## ■ 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 (at  $T_c=25^\circ\text{C}$  unless otherwise specified)

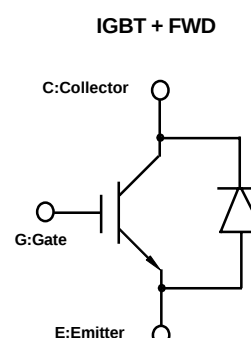
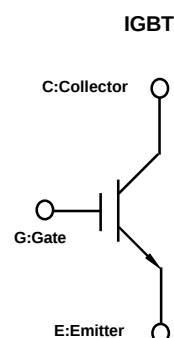
## 1MBH15-120 / IGBT

| Item                         |     |          | Symbol           | Rating      | Unit |
|------------------------------|-----|----------|------------------|-------------|------|
| Collector-Emitter voltage    |     |          | V <sub>CES</sub> | 1200        | V    |
| Gate-Emitter voltage         |     |          | V <sub>GES</sub> | ±20         | V    |
| Collector current            | DC  | Tc=25°C  | Ic25             | 26          | A    |
|                              |     | Tc=100°C | Ic100            | 15          | A    |
|                              | 1ms | Tc=25°C  | Icp              | 78          | A    |
| Max. power dissipation(IGBT) |     |          | Pc               | 245         | W    |
| Operating temperature        |     |          | Tj               | +150        | °C   |
| Storage temperature          |     |          | Tstg             | -40 to +150 | °C   |
| Screw torque                 |     |          | -                | 70          | N·m  |

## 1MBH15D-120 / IGBT+FWD

| Item                          |     |                       | Symbol            | Rating      | Unit |
|-------------------------------|-----|-----------------------|-------------------|-------------|------|
| Collector-Emitter voltage     |     |                       | V <sub>CES</sub>  | 1200        | V    |
| Gate-Emitter voltaga          |     |                       | V <sub>GES</sub>  | ±20         | V    |
| Collector<br>current          | DC  | T <sub>c</sub> =25°C  | I <sub>c25</sub>  | 26          | A    |
|                               |     | T <sub>c</sub> =100°C | I <sub>c100</sub> | 15          | A    |
|                               | 1ms | T <sub>c</sub> =25°C  | I <sub>cp</sub>   | 78          | A    |
| Max. power dissipation (IGBT) |     |                       | P <sub>c</sub>    | 245         | W    |
| Max. power dissipation (FWD)  |     |                       | P <sub>c</sub>    | 120         | W    |
| Operating temperature         |     |                       | T <sub>j</sub>    | +150        | °C   |
| Storage temperature           |     |                       | T <sub>slg</sub>  | -40 to +150 | °C   |
| Screw torque                  |     |                       | -                 | 70          | N·m  |

## ■ Equivalent Circuit Schematic



● Electrical characteristics (at T<sub>j</sub>=25°C unless otherwise specified)

1MBH15-120 / IGBT

| 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> =1200V | 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> | —               | —    | 3.5  | V <sub>GE</sub> =15V, I <sub>C</sub> =15A   | V    |
| Input capacitance                    | C <sub>ies</sub>     | —               | 1700 | —    | V <sub>GE</sub> =0V                         | pF   |
| Output capacitance                   | C <sub>oes</sub>     | —               | 300  | —    | V <sub>CE</sub> =10V                        |      |
| Reverse transfer capacitance         | C <sub>res</sub>     | —               | 120  | —    | f=1MHz                                      |      |
| Turn-on time                         | t <sub>on</sub>      | —               | —    | 1.2  | V <sub>CC</sub> =600V I <sub>C</sub> =15A   | μs   |
|                                      | t <sub>r</sub>       | —               | —    | 0.6  | V <sub>GE</sub> =±15V                       |      |
| Turn-off time                        | t <sub>off</sub>     | —               | —    | 1.5  | R <sub>G</sub> =120 ohm                     |      |
|                                      | t <sub>f</sub>       | —               | —    | 0.5  | (Half Bridge)                               |      |

1MBH15D-120 / IGBT+FWD

| 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> =1200V               | 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> | —               | —    | 3.5  | V <sub>GE</sub> =15V, I <sub>C</sub> =15A                 | V    |
| Input capacitance                    | C <sub>ies</sub>     | —               | 1700 | —    | V <sub>GE</sub> =0V                                       | pF   |
| Output capacitance                   | C <sub>oes</sub>     | —               | 300  | —    | V <sub>CE</sub> =10V                                      |      |
| Reverse transfer capacitance         | C <sub>res</sub>     | —               | 120  | —    | f=1MHz                                                    |      |
| Turn-on time                         | t <sub>on</sub>      | —               | —    | 1.2  | V <sub>CC</sub> =600V, I <sub>C</sub> =15A                | μs   |
|                                      | t <sub>r</sub>       | —               | —    | 0.6  | V <sub>GE</sub> =±15V                                     |      |
| Turn-off time                        | t <sub>off</sub>     | —               | —    | 1.5  | R <sub>G</sub> =120 ohm                                   |      |
|                                      | t <sub>f</sub>       | —               | —    | 0.5  | (Half Bridge)                                             |      |
| FWD forward on voltage               | V <sub>F</sub>       | —               | —    | 3.0  | I <sub>F</sub> =15A, V <sub>GE</sub> =0V                  | V    |
| Reverse recovery time                | t <sub>rr</sub>      | —               | —    | 0.35 | I <sub>F</sub> =15A, V <sub>GE</sub> =-10V, di/dt=100A/μs | μs   |

● Thermal resistance characteristics

1MBH15-120 / IGBT

| Item               | Symbol               | Characteristics |      |      | Conditions | Unit |
|--------------------|----------------------|-----------------|------|------|------------|------|
|                    |                      | Min.            | Typ. | Max. |            |      |
| Thermal resistance | R <sub>th(j-c)</sub> | —               | —    | 0.51 | IGBT       | °C/W |

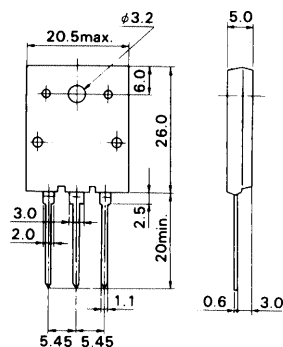
1MBH15D-120 / IGBT+FWD

| Item               | Symbol               | Characteristics |      |      | Conditions | Unit |
|--------------------|----------------------|-----------------|------|------|------------|------|
|                    |                      | Min.            | Typ. | Max. |            |      |
| Thermal resistance | R <sub>th(j-c)</sub> | —               | —    | 0.51 | IGBT       | °C/W |
|                    | R <sub>th(j-c)</sub> | —               | —    | 1.04 | FWD        | °C/W |

■ Outline drawings, mm

1MBH15-120, 1MBH15D-120

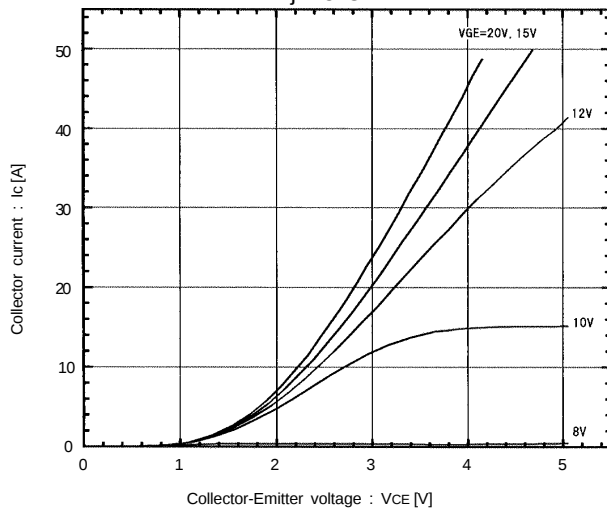
TO-3PL



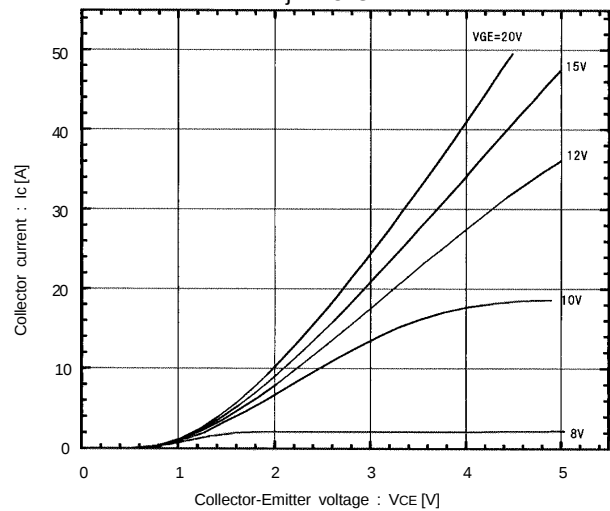
## Characteristics

1MBH15-120, 1MBH15D-120

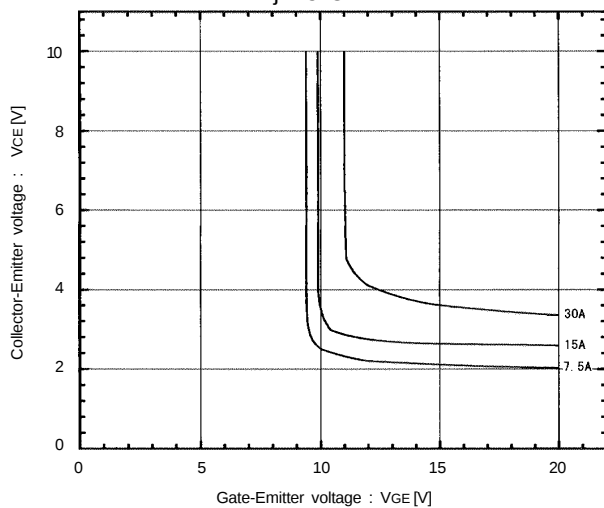
Collector current vs. Collector-Emitter voltage

 $T_j = 25^\circ\text{C}$ 

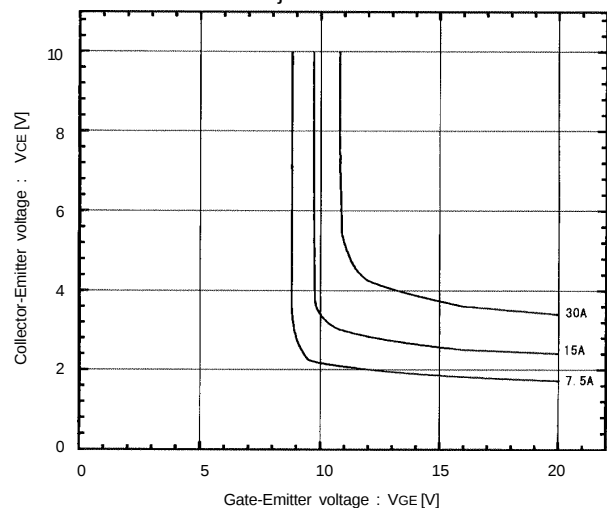
Collector current vs. Collector-Emitter voltage

 $T_j = 125^\circ\text{C}$ 

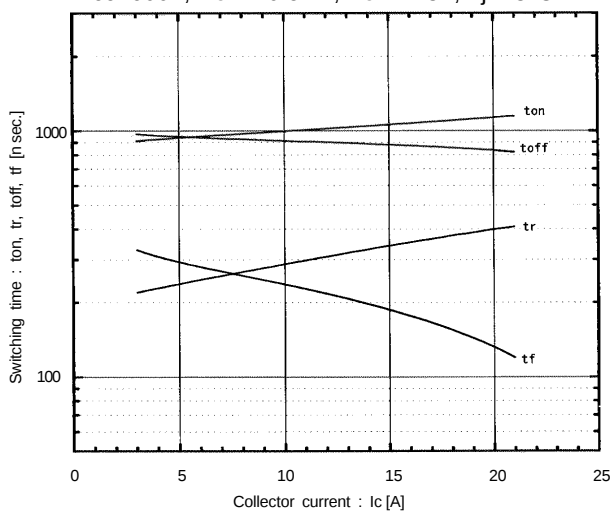
Collector-Emitter vs. Gate-Emitter voltage

 $T_j = 25^\circ\text{C}$ 

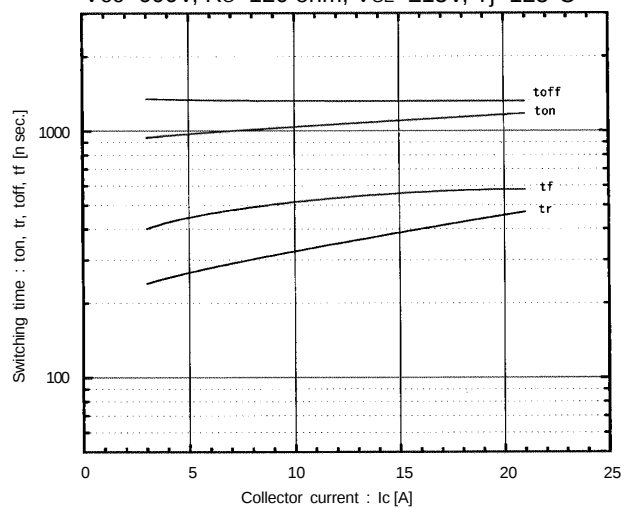
Collector-Emitter vs. Gate-Emitter voltage

 $T_j = 125^\circ\text{C}$ 

Switching time vs. Collector current

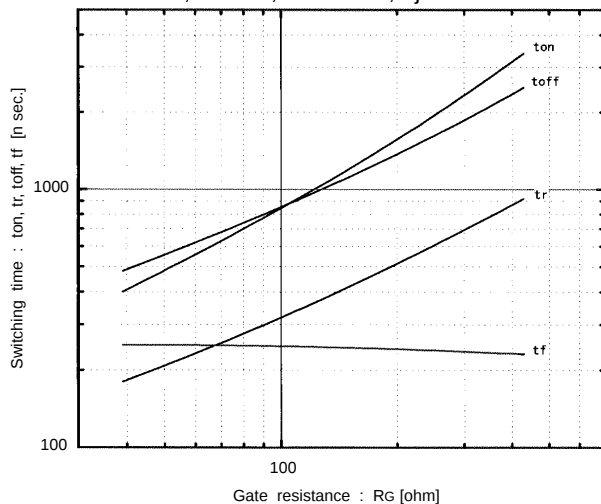
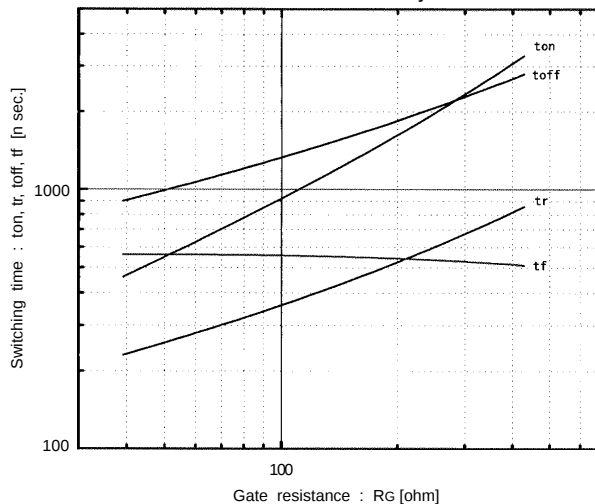
 $V_{CC} = 600\text{V}, R_G = 120\ \Omega, V_{GE} = \pm 15\text{V}, T_j = 25^\circ\text{C}$ 

Switching time vs. Collector current

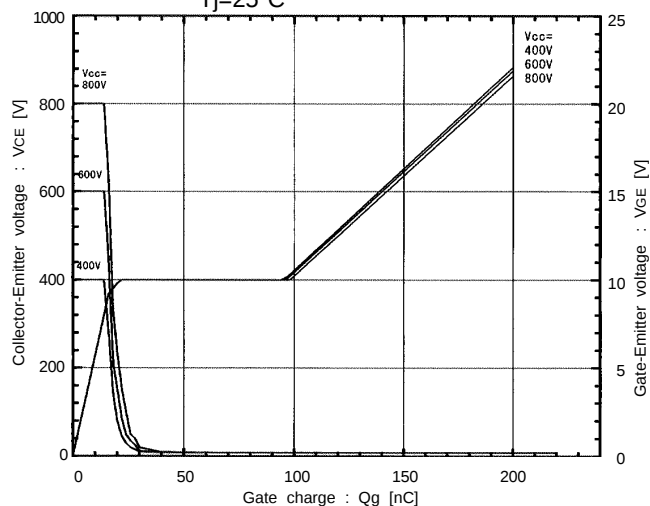
 $V_{CC} = 600\text{V}, R_G = 120\ \Omega, V_{GE} = \pm 15\text{V}, T_j = 125^\circ\text{C}$ 

## Characteristics

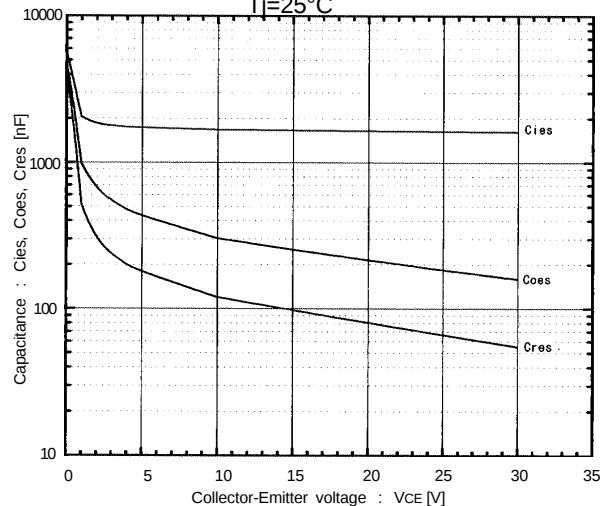
1MBH15-120,1MBH15D-120

Switching time vs.  $R_G$  $V_{CC}=600V, I_C=15A, V_{GE}=\pm 15V, T_J=25^\circ C$ Switching time vs.  $R_G$  $V_{CC}=600V, I_C=15A, V_{GE}=\pm 15V, T_J=125^\circ C$ 

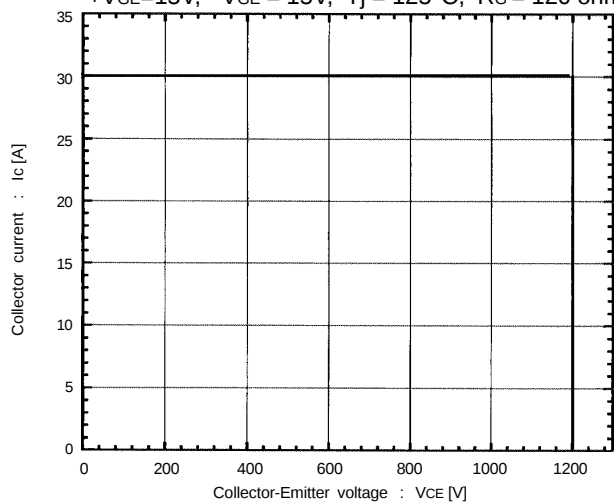
Dynamic input characteristics

 $T_J=25^\circ C$ 

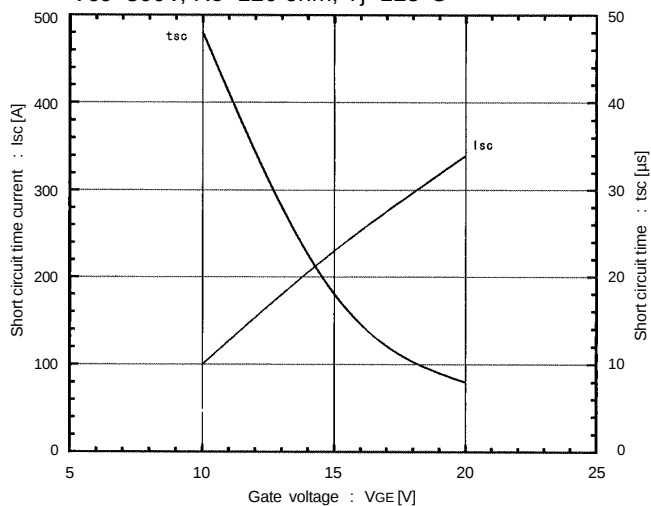
Capacitance vs. Collector-Emitter voltage

 $T_J=25^\circ C$ 

Reversed biased safe operating area

 $+V_{GE}=15V, -V_{GE} \leq 15V, T_J \leq 125^\circ C, R_G \geq 120 \text{ ohm}$ 

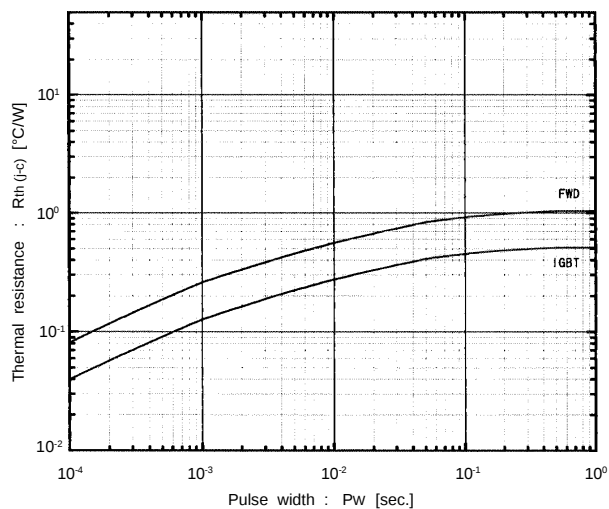
Typical short circuit capability

 $V_{CC}=800V, R_G=120 \text{ ohm}, T_J=125^\circ C$ 

## Characteristics

### 1MBH15-120, 1MBH15D-120

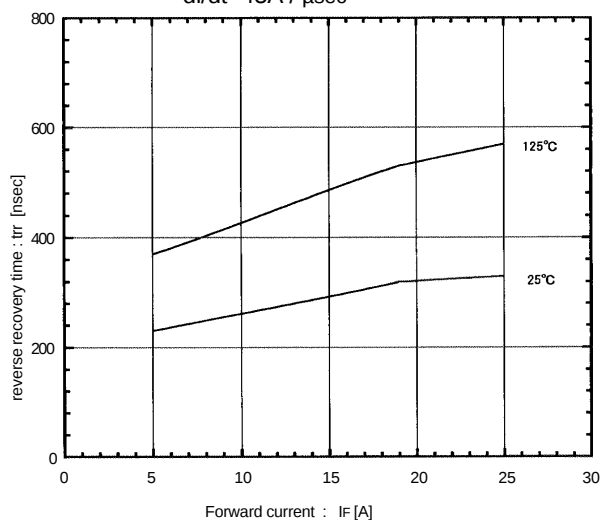
Transient thermal resistance



### 1MBH15D-120

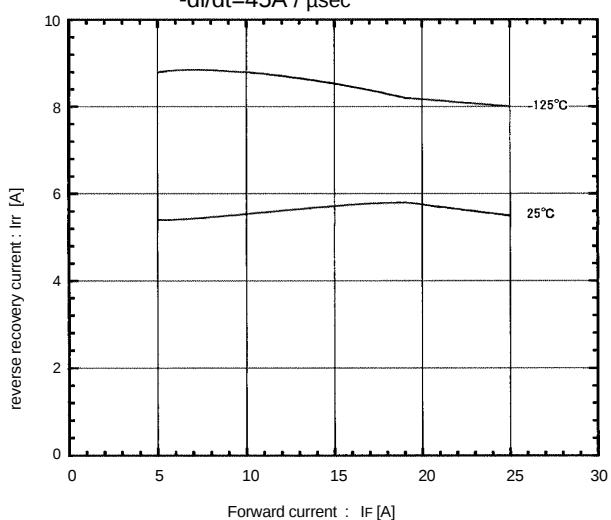
Reverse recovery time vs. Forward current

$-di/dt=45A/\mu sec$

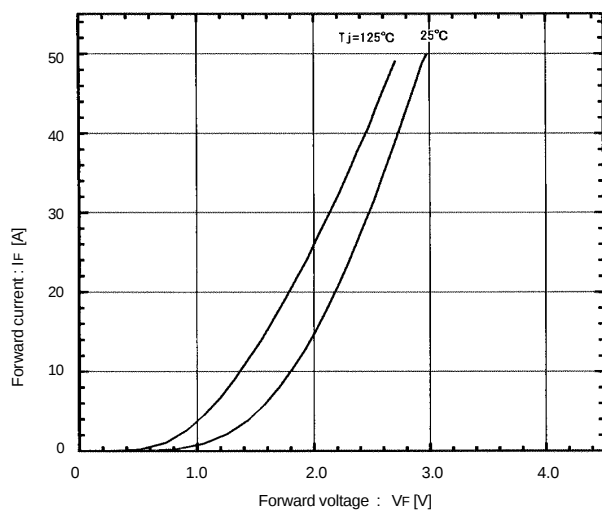


Reverse recovery current vs. Forward current

$-di/dt=45A/\mu sec$



Forward current vs. Forward voltage



Reverse recovery time characteristics vs.  $-di/dt$

$I_F=15A, T_j=125^\circ C$

