

# 2MBI450UE-120



## IGBT Module U-Series 1200V / 450A 2 in one-package

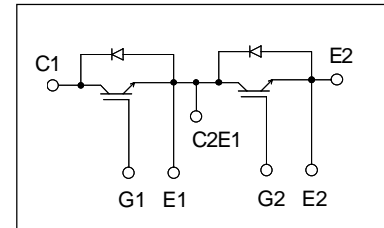
### ■ Features

- High speed switching
- Voltage drive
- Low inductance module structure

### ■ Applications

- Inverter for Motor drive
- AC and DC Servo drive amplifier
- Uninterruptible power supply
- Industrial machines, such as Welding machines

### ■ Equivalent Circuit Schematic



### ■ Maximum ratings and characteristics

#### ● Absolute maximum ratings (at Tc=25°C unless otherwise specified)

| Item                        | Symbol                | Conditions | Rating               | Unit |   |
|-----------------------------|-----------------------|------------|----------------------|------|---|
| Collector-Emitter voltage   | V <sub>CES</sub>      |            | 1200                 | V    |   |
| Gate-Emitter voltage        | V <sub>GES</sub>      |            | ±20                  | V    |   |
| Collector current           | I <sub>c</sub>        | Continuous | T <sub>c</sub> =25°C | 675  | A |
|                             |                       |            | T <sub>c</sub> =80°C | 450  |   |
|                             | I <sub>cp</sub>       | 1ms        | T <sub>c</sub> =25°C | 1350 |   |
|                             |                       |            | T <sub>c</sub> =80°C | 900  |   |
|                             |                       |            |                      | 900  |   |
|                             | -I <sub>c</sub>       |            | 450                  |      |   |
|                             | -I <sub>c</sub> pulse |            | 900                  |      |   |
| Collector Power Dissipation | P <sub>c</sub>        | 1 device   | 2080                 | W    |   |
| Junction temperature        | T <sub>j</sub>        |            | +150                 | °C   |   |
| Storage temperature         | T <sub>stg</sub>      |            | -40 to +125          |      |   |
| Isolation voltage           | V <sub>iso</sub>      | AC:1min.   | 2500                 | VAC  |   |
| Screw Torque                | Mounting *2           |            | 3.5                  | N·m  |   |
|                             | Terminals *2          |            | 4.5                  |      |   |

\*1 : All terminals should be connected together when isolation test will be done.

\*2 : Recommendable value : Mounting 2.5 to 3.5 N·m(M5 or M6), Terminals 3.5 to 4.5N·m(M6)

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

| Item                                 | Symbols                            | Conditions  | Characteristics       |      |      | Unit |   |
|--------------------------------------|------------------------------------|---|-----------------------|------|------|------|---|
|                                      |                                    |   | Min.                  | Typ. | Max. |      |   |
| Zero gate voltage collector current  | I <sub>CES</sub>                   | V <sub>GE</sub> =0V, V <sub>CE</sub> =1200V       | –                     | –    | 3.0  | mA   |   |
| Gate-Emitter leakage current         | I <sub>GES</sub>                   | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V        | –                     | –    | 600  | nA   |   |
| Gate-Emitter threshold voltage       | V <sub>GE(th)</sub>                | V <sub>CE</sub> =20V, I <sub>c</sub> =450mA       | 4.5                   | 6.5  | 8.5  | V    |   |
| Collector-Emitter saturation voltage | V <sub>CE(sat)</sub><br>(terminal) | V <sub>GE</sub> =15V, I <sub>c</sub> =450A        | T <sub>j</sub> =25°C  | –    | 2.00 | 2.35 | V |
|                                      |                                    |   | T <sub>j</sub> =125°C | –    | 2.25 | –    |   |
|                                      | V <sub>CE(sat)</sub><br>(chip)     |   | T <sub>j</sub> =25°C  | –    | 1.75 | 2.10 |   |
|                                      |                                    |   | T <sub>j</sub> =125°C | –    | 2.00 | –    |   |
| Input capacitance                    | C <sub>ies</sub>                   | V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=1MHz | –                     | 50   | –    | nF   |   |
| Turn-on time                         | t <sub>on</sub>                    | V <sub>CC</sub> =600V                             | –                     | 0.36 | 1.20 | μs   |   |
|                                      | t <sub>r</sub>                     | I <sub>c</sub> =450A                              | –                     | 0.21 | 0.60 |      |   |
|                                      | t <sub>r(i)</sub>                  | V <sub>GE</sub> =±15V                             | –                     | 0.03 | –    |      |   |
| Turn-off time                        | t <sub>off</sub>                   | R <sub>G</sub> =0.68 Ω                            | –                     | 0.37 | 1.00 | μs   |   |
|                                      | t <sub>f</sub>                     |   | –                     | 0.07 | 0.30 |      |   |
| Forward on voltage                   | V <sub>F</sub><br>(terminal)       | V <sub>GE</sub> =0V<br>I <sub>F</sub> =450A       | T <sub>j</sub> =25°C  | –    | 1.85 | 2.15 | V |
|                                      |                                    |   | T <sub>j</sub> =125°C | –    | 1.95 | –    |   |
|                                      | V <sub>F</sub><br>(chip)           |   | T <sub>j</sub> =25°C  | –    | 1.60 | 1.90 |   |
|                                      |                                    |   | T <sub>j</sub> =125°C | –    | 1.70 | –    |   |
| Reverse recovery time                | t <sub>rr</sub>                    | I <sub>F</sub> =450A                              | –                     | –    | 0.35 | μs   |   |
| Lead resistance, terminal-chip*3     | R lead                             |   | –                     | 0.45 | –    | mΩ   |   |

\*3:Biggest internal terminal resistance among arm.

#### ● Thermal resistance characteristics

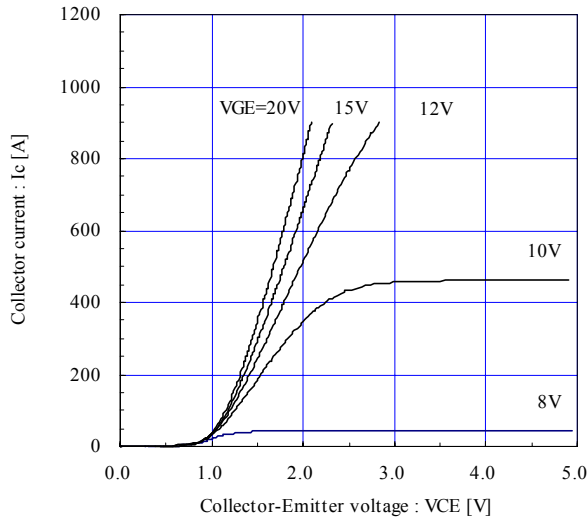
| Items                      | Symbols                 | Conditions            | Characteristics |        |       | Unit |
|----------------------------|-------------------------|-----------------------|-----------------|--------|-------|------|
|                            |                         |                       | Min.            | Typ.   | Max.  |      |
| Thermal resistance         | R <sub>th(j-c)</sub>    | IGBT                  | –               | –      | 0.060 | °C/W |
|                            | R <sub>th(j-c)</sub>    | FWD                   | –               | –      | 0.08  | °C/W |
| Contact Thermal resistance | R <sub>th(c-f)</sub> *4 | With thermal compound | –               | 0.0167 | –     | °C/W |

\*4 : This is the value which is defined mounting on the additional cooling fin with thermal compound.

Characteristics (Representative)

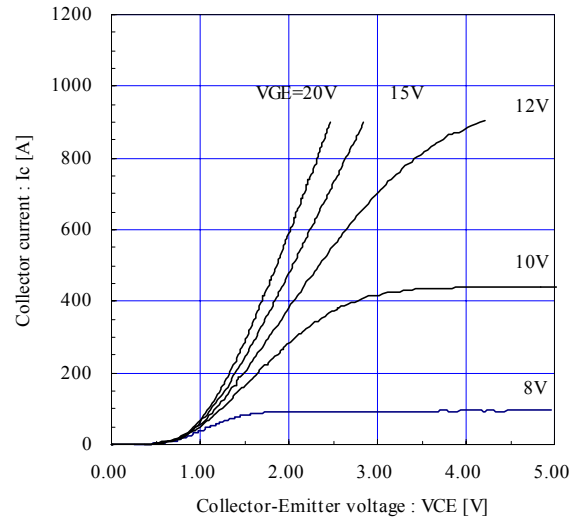
Collector current vs. Collector-Emitter voltage (typ.)

T<sub>j</sub>= 25°C / chip



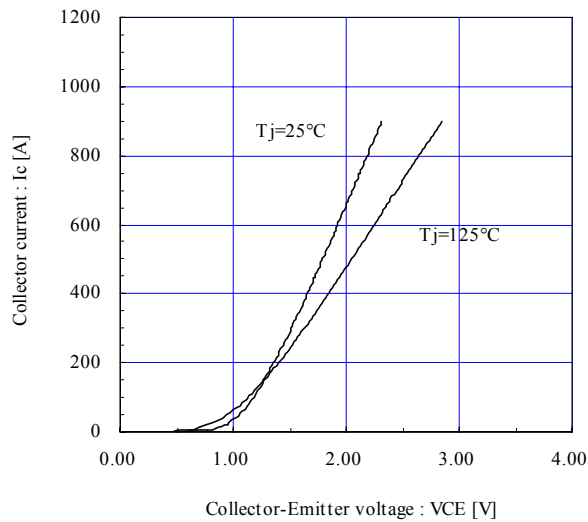
Collector current vs. Collector-Emitter voltage (typ.)

T<sub>j</sub>= 125°C / chip



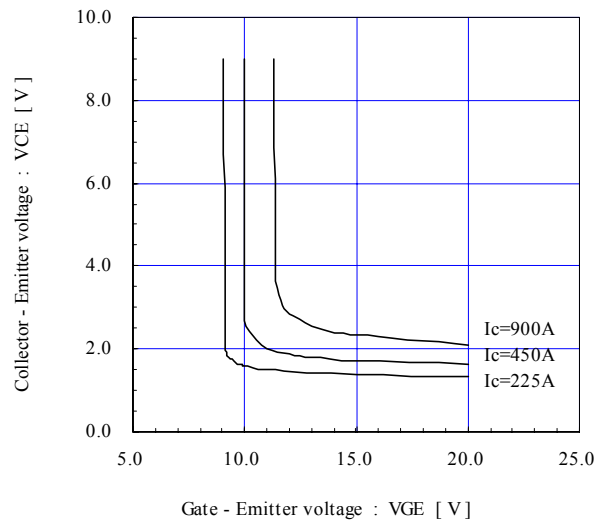
Collector current vs. Collector-Emitter voltage (typ.)

VGE=15V / chip



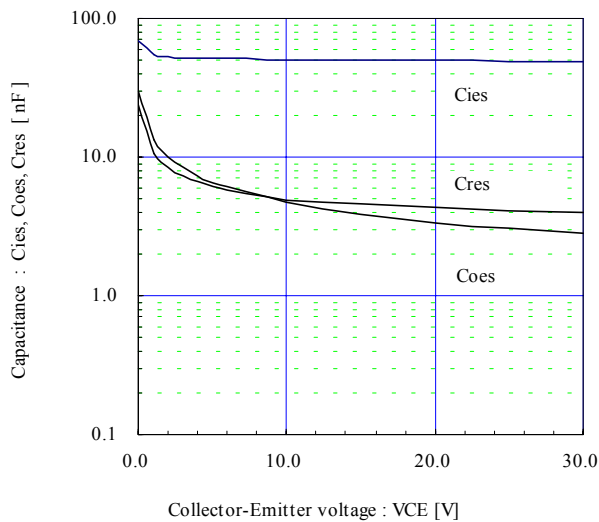
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)

T<sub>j</sub>=25°C / chip



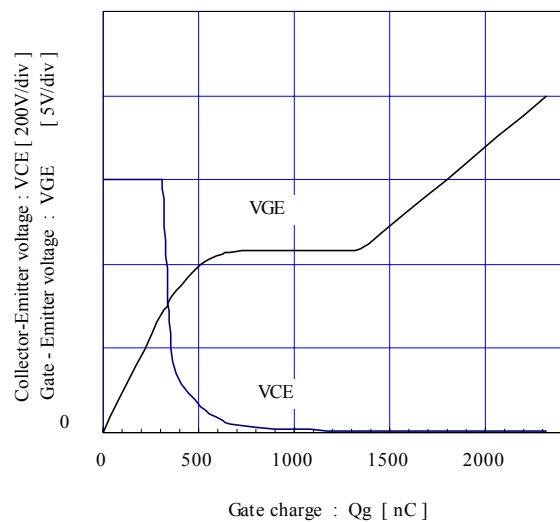
Capacitance vs. Collector-Emitter voltage (typ.)

VGE=0V, f= 1MHz, T<sub>j</sub>= 25°C

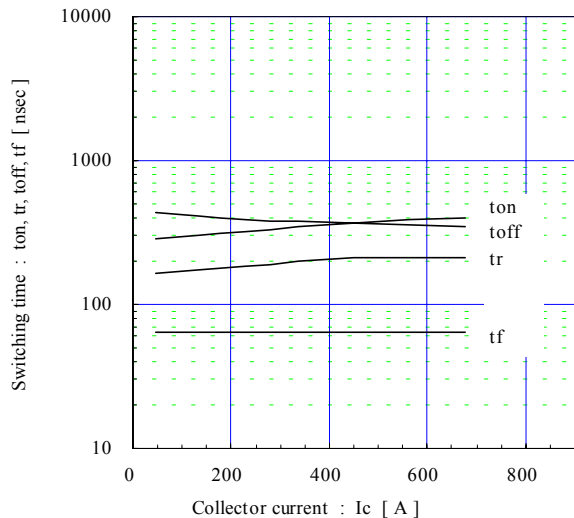


Dynamic Gate charge (typ.)

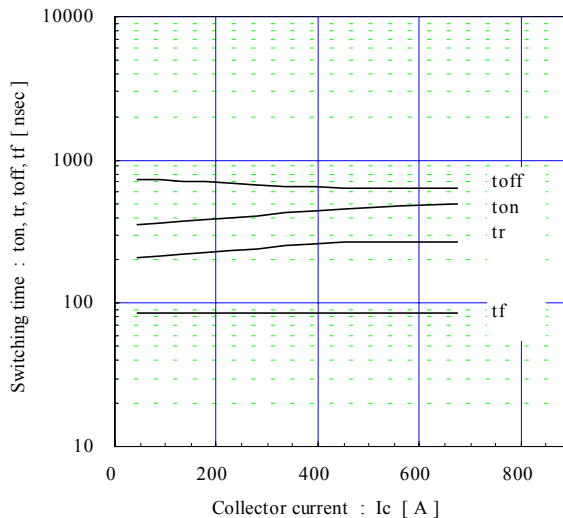
Vcc=600, Ic=450A, T<sub>j</sub>= 25°C



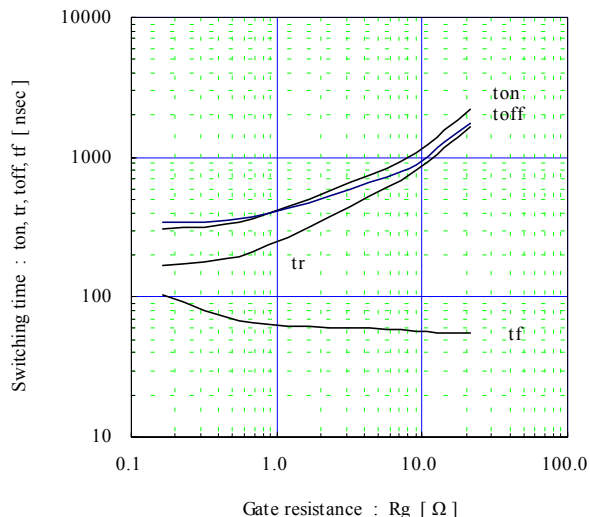
Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=0.68\Omega, T_j=25^\circ C$



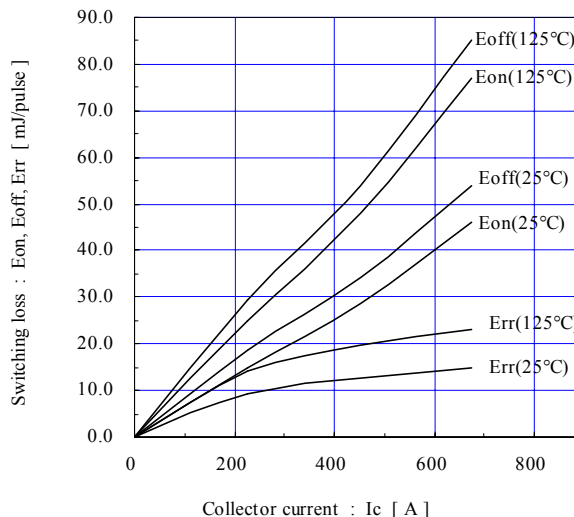
Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=0.68\Omega, T_j=125^\circ C$



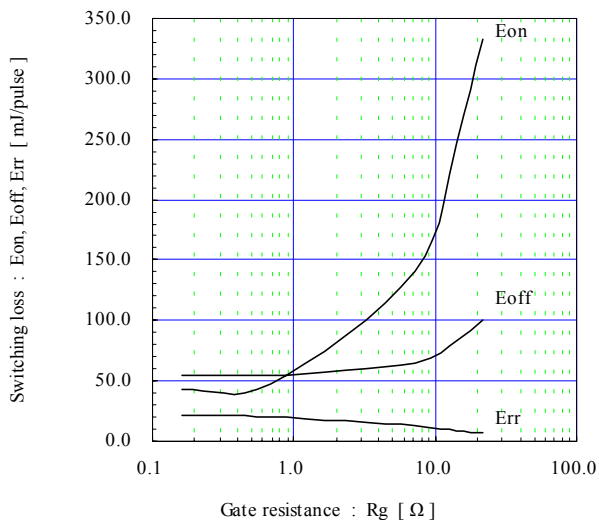
Switching time vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=450A, V_{GE}=\pm 15V, T_j=25^\circ C$



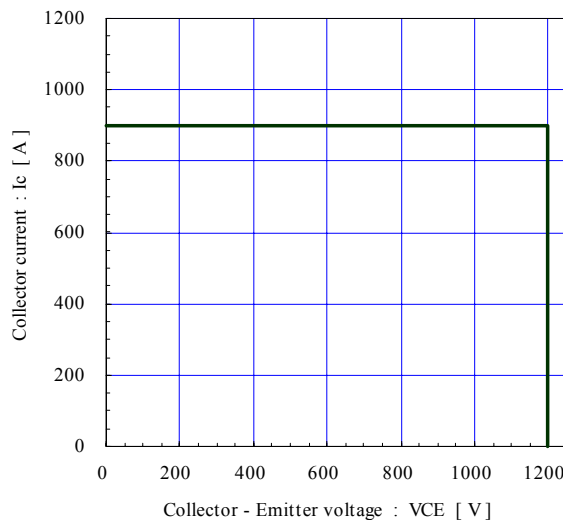
Switching loss vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=0.68\Omega$



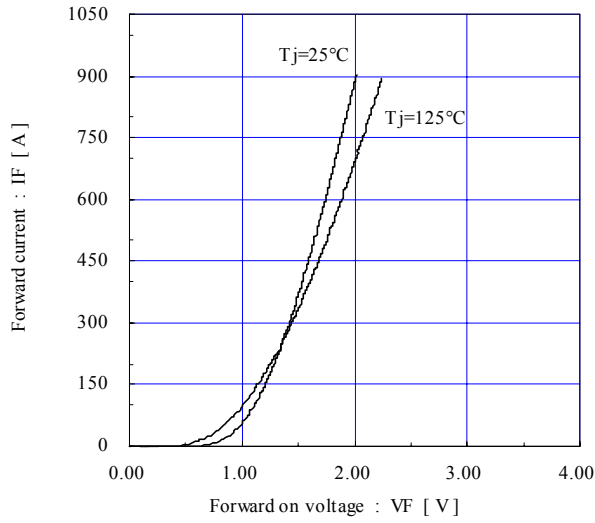
Switching loss vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=450A, V_{GE}=\pm 15V, T_j=125^\circ C$



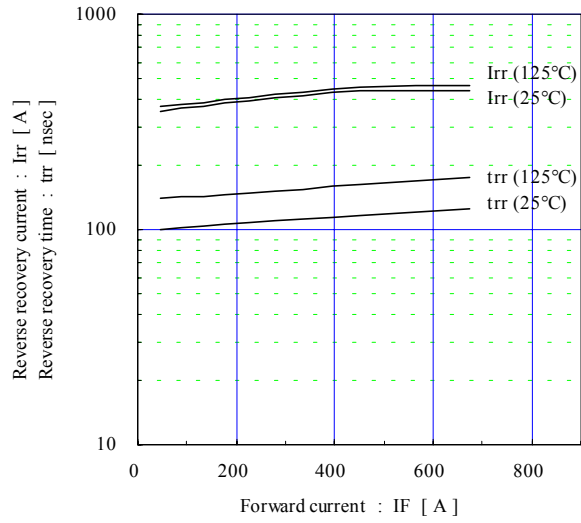
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \le 15V, R_g \ge 0.68\Omega, T_j \le 125^\circ C$



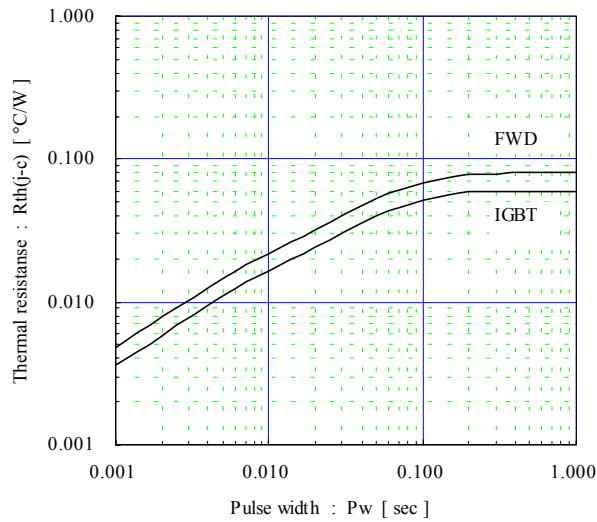
Forward current vs. Forward on voltage (typ.)  
chip



Reverse recovery characteristics (typ.)  
"Vcc=600V, VGE=±15V, Rg=0.68Ω



Transient thermal resistance (max.)



■ Outline Drawings, mm

