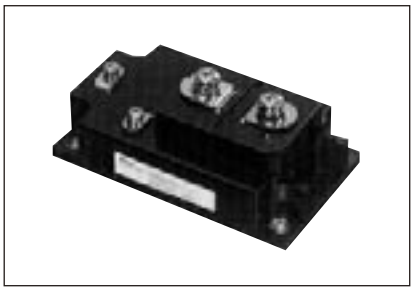
# 1MBI200S-120

IGBT Modules

## IGBT MODULE (S series)
## 1200V / 200A / 1 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

### Maximum Ratings and Characteristics

● **Absolute Maximum Ratings (at Tc=25°C unless otherwise specified)**

| Items | Symbols | Conditions | | Maximum ratings | Units |
|---|---|---|---|---|---|
| Collector-Emitter voltage | $V_{CES}$ | | | 1200 | V |
| Gate-Emitter voltage | $V_{GES}$ | | | ±20 | V |
| Collector current | Ic | Continuous | Tc=25°C | 300 | A |
| | | | Tc=80°C | 200 | |
| | Ic pulse | 1ms | Tc=25°C | 600 | |
| | | | Tc=80°C | 400 | |
| | -Ic | | | 200 | |
| | -Ic pulse | 1ms | | 400 | |
| Collector power dissipation | Pc | 1 device | | 1500 | W |
| Junction temperature | Tj | | | 150 | °C |
| Storage temperature | Tstg | | | -40 to +125 | °C |
| Isolation voltage (*1) | $V_{iso}$ | AC : 1min. | | 2500 | V |
| Screw torque | Mounting (*2) | | | 3.5 | N·m |
| | Terminals (*2) | | | 4.5 | |
| | Terminals (*2) | | | 1.7 | |

Note *1: All terminals should be connected together when isolation test will be done.
Note *2: Recommendable value : Mounting : 2.5+-3.5 N·m (M5 or M6), Terminal : 3.5+-4.5 N·m (M6), 1.3+-1.7 N·m (M4)

● **Electrical characteristics (at Tj= 25°C unless otherwise specified)**

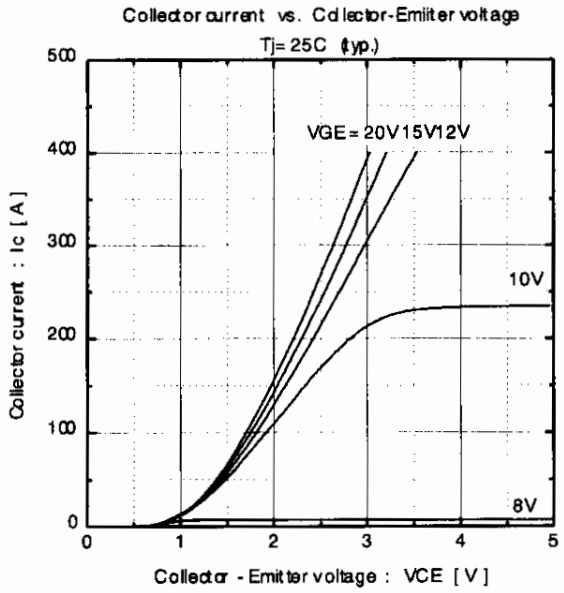
| Items | Symbols | Conditions | | Characteristics min. | Characteristics typ. | Characteristics max. | Units |
|---|---|---|---|---|---|---|---|
| Zero gate voltage collector current | $I_{CES}$ | $V_{GE}$ = 0V, $V_{CE}$ = 1200V | | - | - | 4.0 | mA |
| Gate-Emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | - | - | 0.8 | μA |
| Gate-Emitter threshold voltage | $V_{GE(th)}$ | $V_{CE}$ = 20V, $I_C$ = 200mA | | 5.5 | 7.2 | 8.5 | V |
| Collector-Emitter saturation voltage | $V_{CE(sat)}$ | $V_{GE}$ = 15V, $I_C$ = 200A | Tj=25°C | - | 2.3 | 2.6 | V |
| | | | Tj=125°C | - | 2.8 | - | |
| Input capacitance | Cies | $V_{GE}$ = 0V, $V_{CE}$ = 10V, f = 1MHz | | - | 24000 | - | pF |
| Output capacitance | Coes | | | - | 5000 | - | |
| Reverse transfer capacitance | Cres | | | - | 4400 | - | |
| Turn-on time | ton | $V_{CC}$ = 600V, $I_C$ = 200A, $V_{GE}$ = ±15V, $R_G$ = 4.7Ω | | - | 0.35 | 1.2 | μs |
| | tr | | | - | 0.25 | 0.6 | |
| | tr (i) | | | - | 0.1 | - | |
| Turn-off time | toff | | | - | 0.45 | 1.0 | |
| | tf | | | - | 0.08 | 0.3 | |
| Forward on voltage | $V_F$ | $I_F$ = 200A | Tj=25°C | - | 2.7 | 3.5 | V |
| | | | Tj=125°C | - | 2.4 | - | |
| Reverse recovery time | trr | $I_F$ = 200A | | - | - | 0.35 | μs |

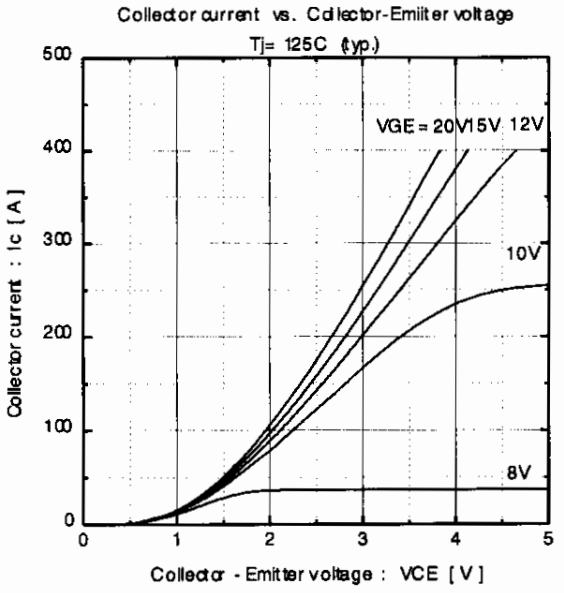
● **Thermal resistance characteristics**

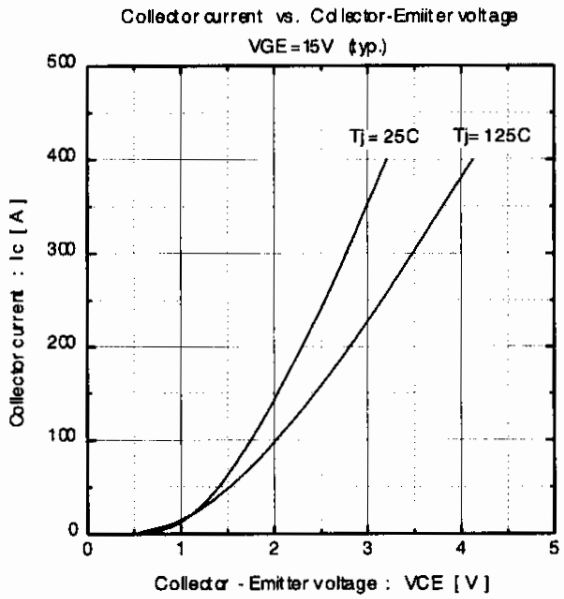
| Items | Symbols | Conditions | Characteristics min. | Characteristics typ. | Characteristics max. | Units |
|---|---|---|---|---|---|---|
| Thermal resistance (1device) | Rth(j-c) | IGBT | - | - | 0.085 | °C/W |
| | | FWD | - | - | 0.22 | |
| Contact thermal resistance | Rth(c-f) | with Thermal Compound (*3) | - | 0.0125 | - | |

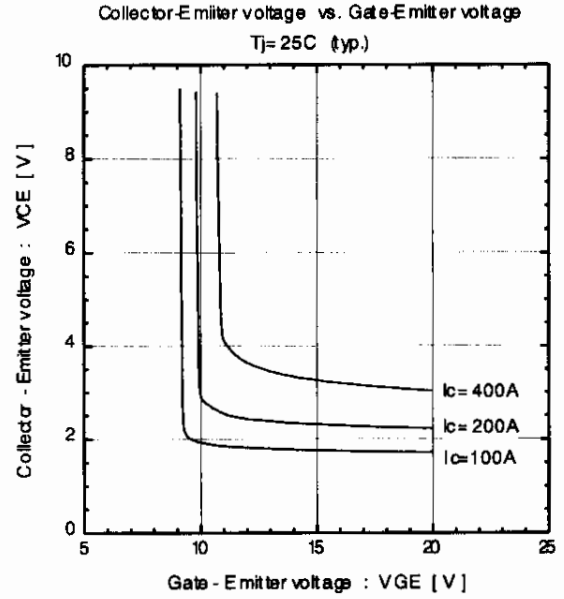
Note *3: This is the value which is defined mounting on the additional cooling fin with thermal compound.

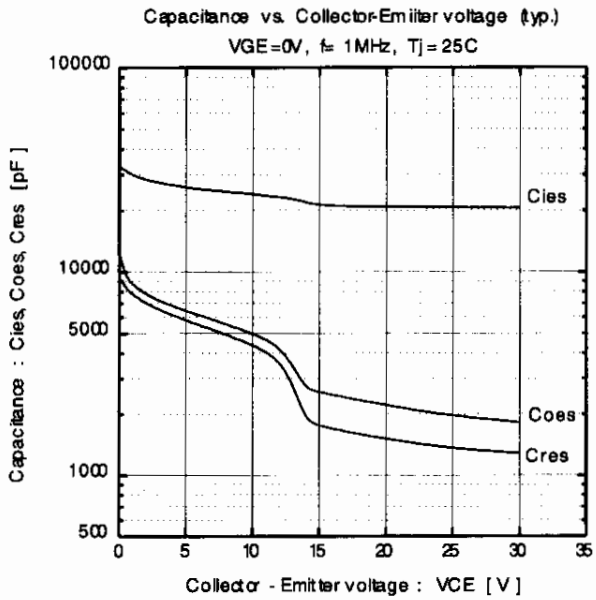
## ■ Characteristics (Representative)

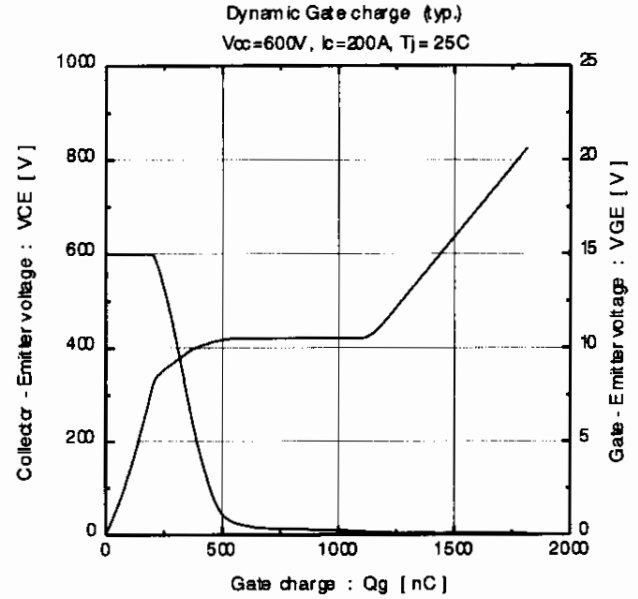


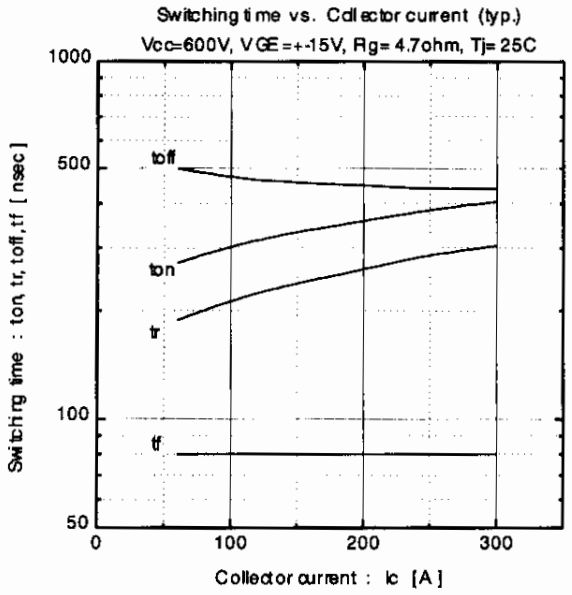



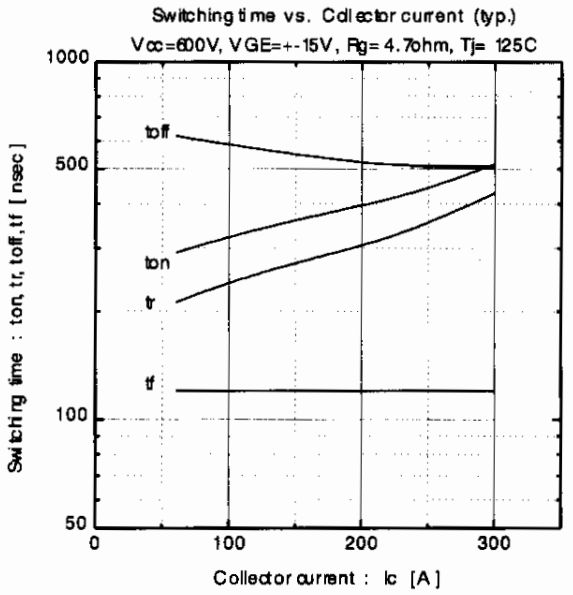



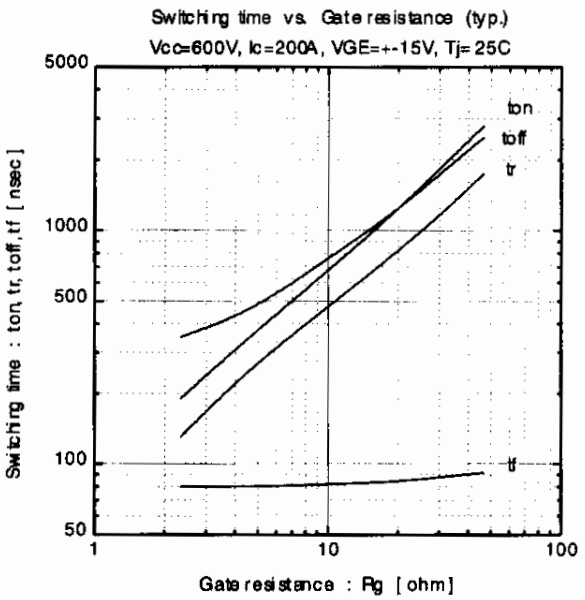



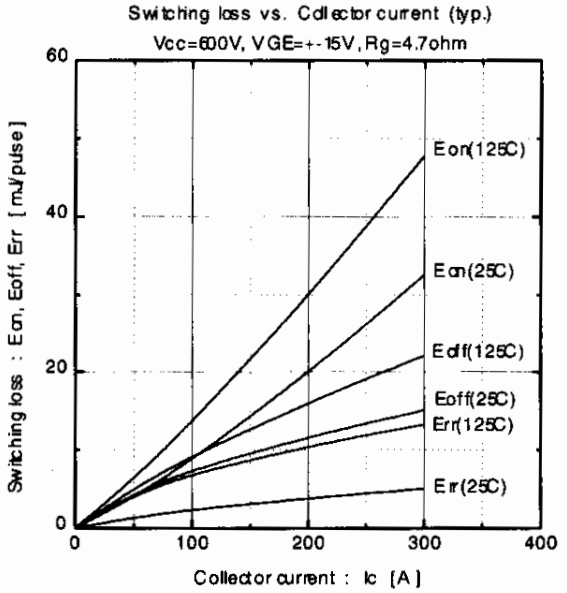



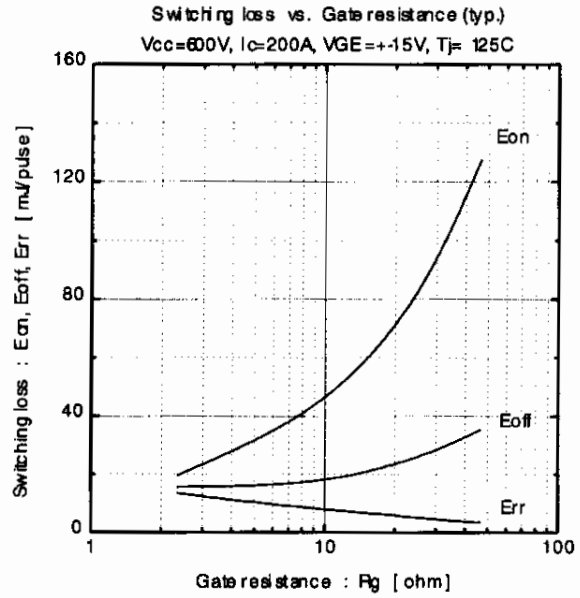



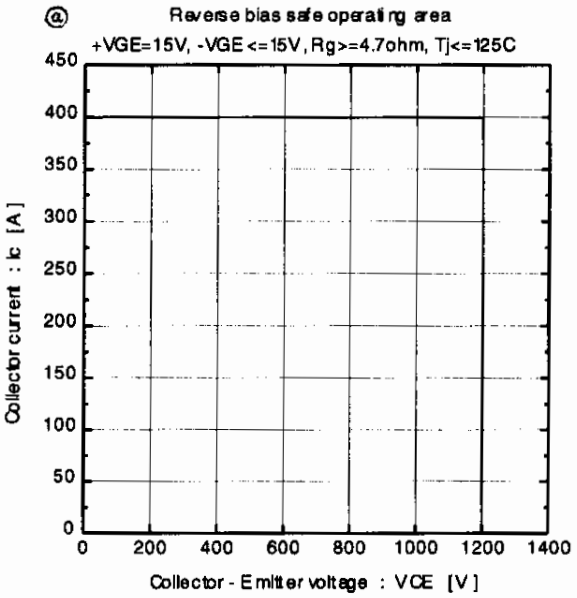

Switching time vs. Collector current (typ.)
Vcc=600V, VGE=+-15V, Rg= 4.7ohm, Tj= 25C
Switching time : ton, tr, toff, tf [ nsec ]
Collector current : Ic [A]
toff
ton
tr
tf
1000
500
100
50
0
100
200
300

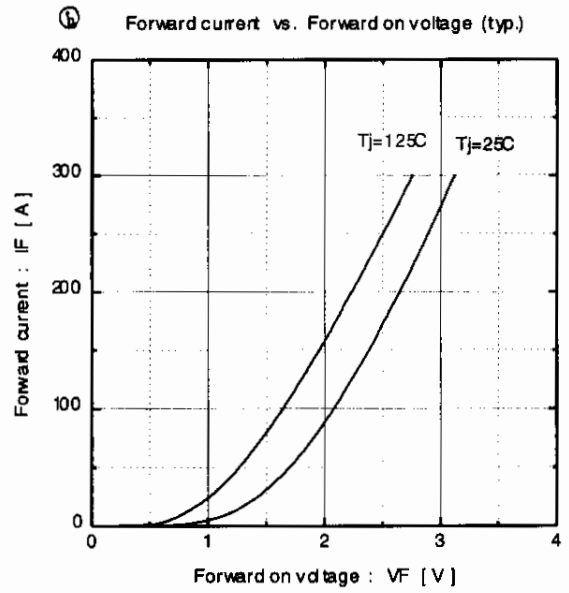

Switching time vs. Collector current (typ.)
Vcc=600V, VGE=+-15V, Rg= 4.7ohm, Tj= 125C
Switching time : ton, tr, toff, tf [ nsec ]
Collector current : Ic [A]
toff
ton
tr
tf
1000
500
100
50
0
100
200
300

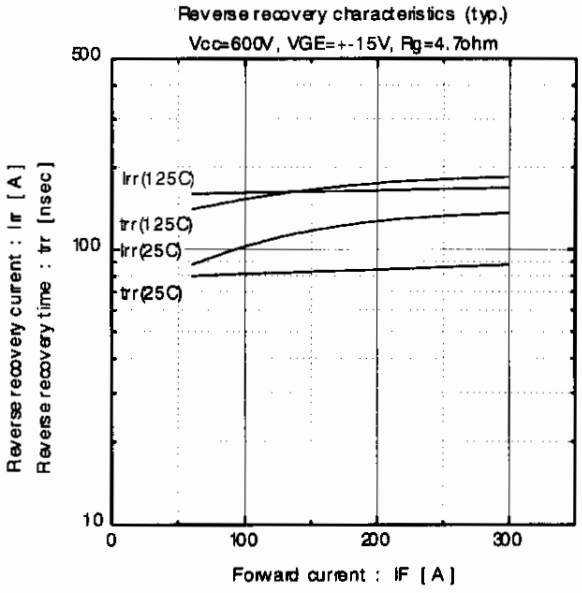

Switching time vs. Gate resistance (typ.)
Vcc=600V, Ic=200A, VGE=+-15V, Tj= 25C
Switching time : ton, tr, toff, tf [ nsec ]
Gate resistance : Rg [ohm]
ton
toff
tr
tf
5000
1000
500
100
50
1
10
100

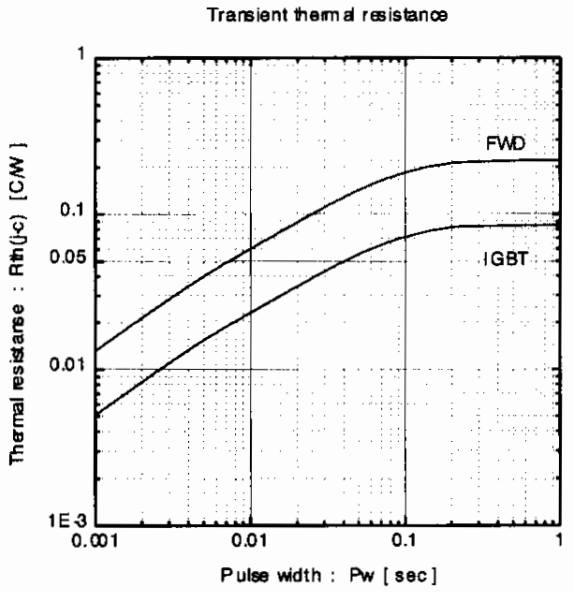

Switching loss vs. Collector current (typ.)
Vcc=600V, VGE=+-15V, Rg=4.7ohm
Switching loss : Eon, Eoff, Err [ mJ/pulse ]
Collector current : Ic [A]
Eon(125C)
Eon(25C)
Eoff(125C)
Eoff(25C)
Err(125C)
Err(25C)
60
40
20
0
0
100
200
300
400


Switching loss vs. Gate resistance (typ.)
Vcc=600V, Ic=200A, VGE=+-15V, Tj= 125C
Switching loss : Eon, Eoff, Err [ mJ/pulse ]
Gate resistance : Rg [ohm]
Eon
Eoff
Err
160
120
80
40
0
1
10
100

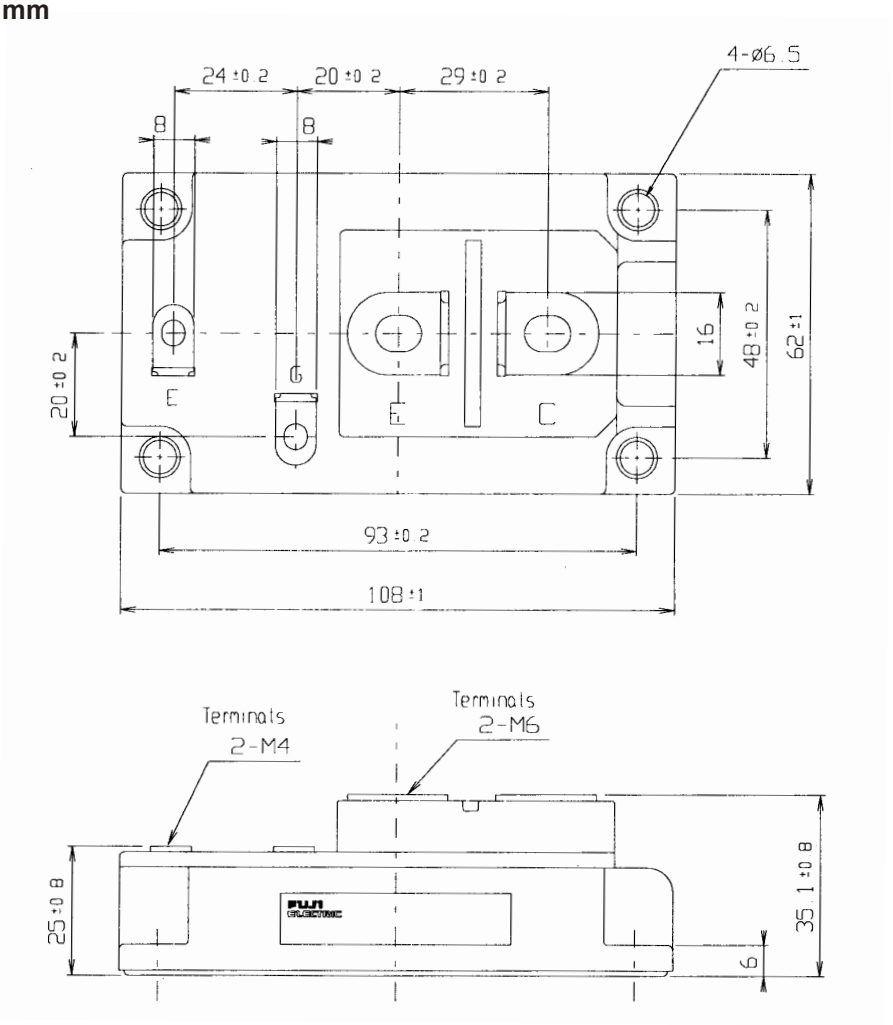

@
Reverse bias safe operating area
+VGE=15V, -VGE<=15V, Rg>=4.7ohm, Tj<=125C
Collector current : Ic [A]
Collector - Emitter voltage : VCE [V]
450
400
350
300
250
200
150
100
50
0
0
200
400
600
800
1000
1200
1400


Forward current vs. Forward on voltage (typ.)
Tj=125C
Tj=25C
Forward current : IF [A]
Forward on voltage : VF [V]
400
300
200
100
0
0
1
2
3
4

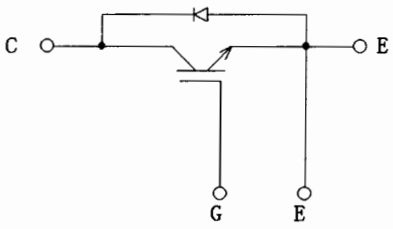

Reverse recovery characteristics (typ.)
Vcc=600V, VGE=+-15V, Rg=4.7ohm
Irr(125C)
trr(125C)
Irr(25C)
trr(25C)
Reverse recovery current : Irr [A]
Reverse recovery time : trr [nsec]
Forward current : IF [A]
500
100
10
0
100
200
300


Transient thermal resistance
FWD
IGBT
Thermal resistance : Rth(j-c) [C/W]
Pulse width : Pw [sec]
1
0.1
0.05
0.01
1E-3
0.001
0.01
0.1
1

## ■ Outline Drawings, mm




## ■ Equivalent Circuit Schematic



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