

IGBT MODULE (N series)

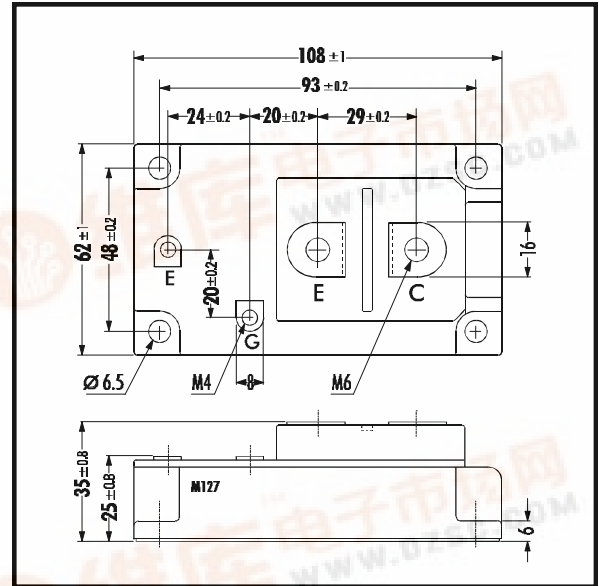
Features

- Square RBSOA
- Low Saturation Voltage
- Less Total Power Dissipation
- Improved FWD Characteristic
- Minimized Internal Stray Inductance
- Overcurrent Limiting Function (4-5 Times Rated Current)

Applications

- High Power Switching
- A.C. Motor Controls
- D.C. Motor Controls
- Uninterruptible Power Supply

Outline Drawing



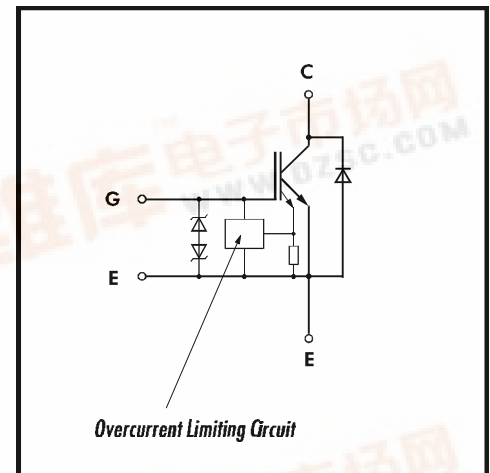
Maximum Ratings and Characteristics

Absolute Maximum Ratings (T_c=25°C)

| Items | Symbols | Ratings | Units |
|---------------------------|----------------------------|-----------------------|-------|
| Collector-Emitter Voltage | V _{CES} | 1200 | V |
| Gate -Emitter Voltage | V _{GES} | ± 20 | V |
| Collector Current | Continuous | I _C | 400 |
| | 1ms | I _{C PULSE} | 800 |
| | Continuous | -I _C | 400 |
| | 1ms | -I _{C PULSE} | 800 |
| Max. Power Dissipation | P _C | 3100 | W |
| Operating Temperature | T _j | +150 | °C |
| Storage Temperature | T _{stg} | -40 ~ +125 | °C |
| Isolation Voltage | A.C. 1min. V _{is} | 2500 | V |
| Screw Torque | Mounting *1 | 3.5 | Nm |
| | Terminals *2 | 4.5 | |
| | Terminals *3 | 1.7 | |

Note: *1:Recommendable Value; 2.5 - 3.5 Nm (M5) or (M6)
*2:Recommendable Value; 3.5 - 4.5 Nm (M6)
*3:Recommendable Value; 1.3 - 1.7 Nm (M4)

Equivalent Circuit



Electrical Characteristics (at T_j=25°C)

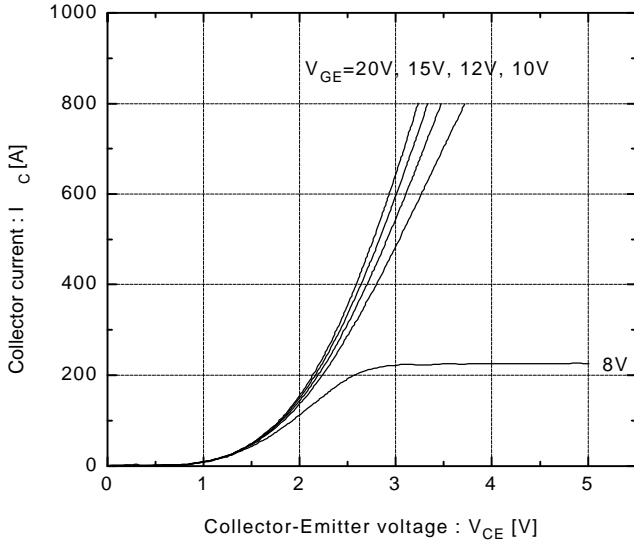
| Items | Symbols | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------------------------|----------------------|--|------|-------|------|-------|
| Zero Gate Voltage Collector Current | I _{CES} | V _{GE} =0V V _{CE} =1200V | | | 4.0 | mA |
| Gate-Emitter Leakage Current | I _{GES} | V _{CE} =0V V _{GE} =± 20V | | | 60 | µA |
| Gate-Emitter Threshold Voltage | V _{GE(th)} | V _{GE} =20V I _C =400mA | 4.5 | | 7.5 | V |
| Collector-Emitter Saturation Voltage | V _{CE(sat)} | V _{GE} =15V I _C =400A | | | 3.3 | V |
| Input capacitance | C _{ies} | V _{CE} =0V | | 64000 | | pF |
| Output capacitance | C _{oes} | V _{CE} =10V | | 23200 | | |
| Reverse Transfer capacitance | C _{res} | f=1MHz | | 20640 | | |
| Turn-on Time | t _{ON} | V _{CC} =600V | | 0.75 | 1.2 | µs |
| | t _r | I _C =400A | | 0.25 | 0.6 | |
| Turn-off Time | t _{OFF} | V _{GE} =± 15V | | 1.05 | 1.5 | |
| | t _f | R _G =1.8Ω | | 0.35 | 0.5 | |
| Diode Forward On-Voltage | V _F | I _F =400A V _{GE} =0V | | | 3.0 | V |
| Reverse Recovery Time | t _{rr} | I _F =400A | | | 350 | ns |

Thermal Characteristics

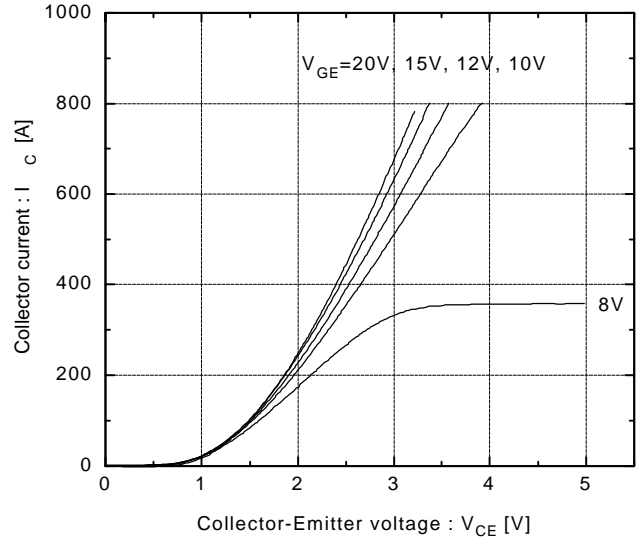
| Items | Symbols | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------|----------------------|-----------------|------|------|------|-------|
| Thermal Resistance | R _{th(j-c)} | IGBT | | | 0.04 | °C/W |
| | R _{th(j-e)} | Diode | | | 0.12 | |



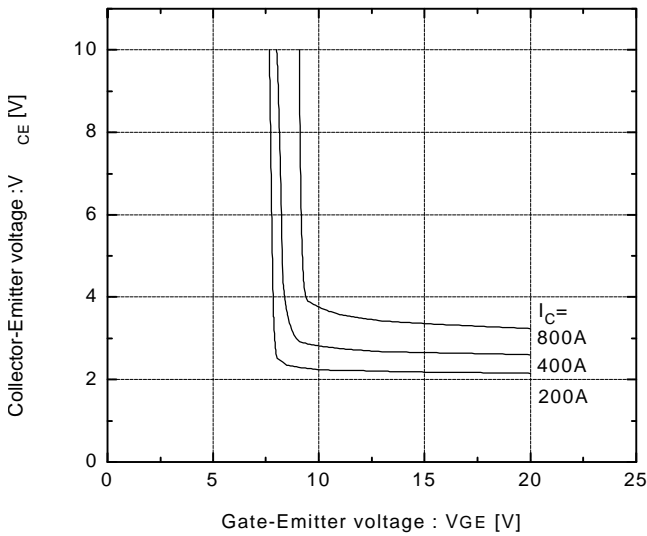
Collector current vs. Collector-Emittor voltage
 $T_j=25^\circ\text{C}$



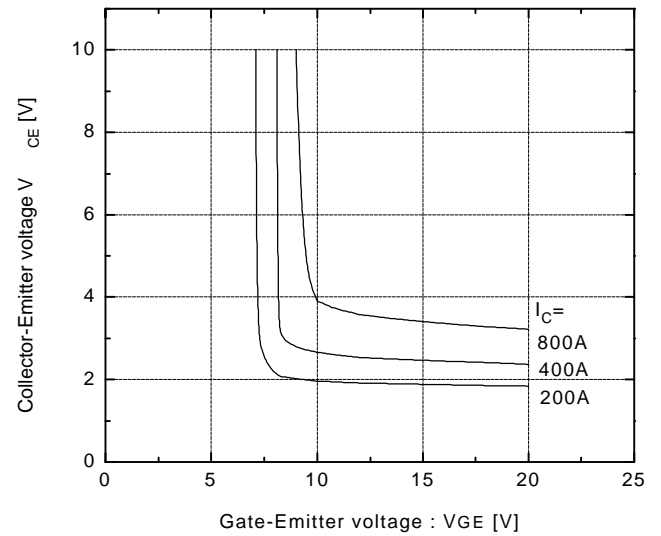
Collector current vs. Collector-Emittor voltage
 $T_j=125^\circ\text{C}$



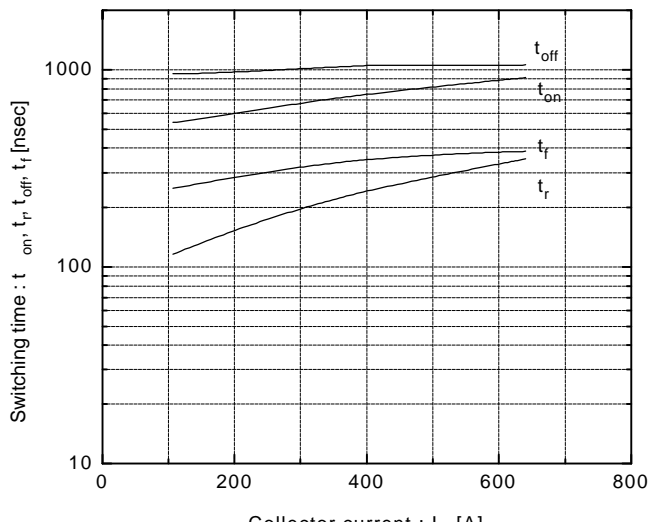
Collector-Emittor vs. Gate-Emittor voltage
 $T_j=25^\circ\text{C}$



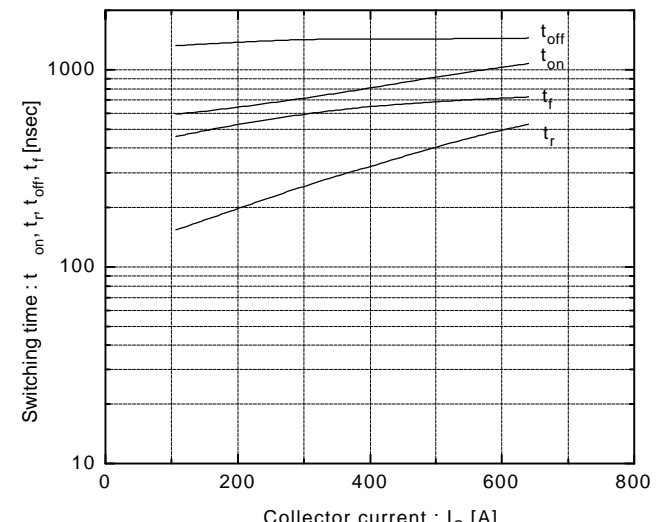
Collector-Emittor vs. Gate-Emittor voltage
 $T_j=125^\circ\text{C}$



Switching time vs. Collector current
 $V_{CC}=600\text{V}, R_G=1.8\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$

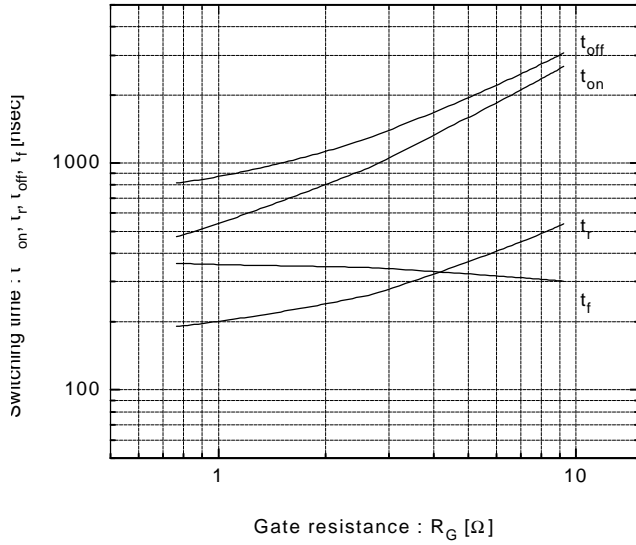


Switching time vs. Collector current
 $V_{CC}=600\text{V}, R_G=1.8\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$



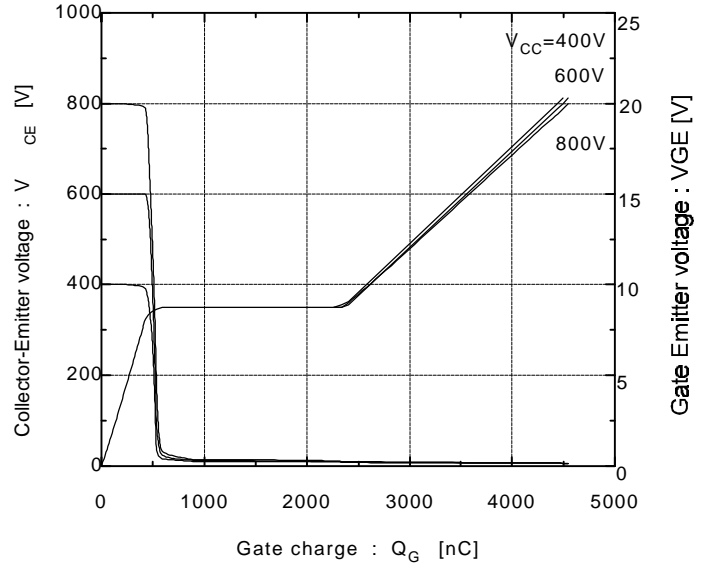
Switching time vs. R_G

$V_{CC}=600V, I_C=400A, V_{GE}=\pm 15V, T_J=25^\circ C$



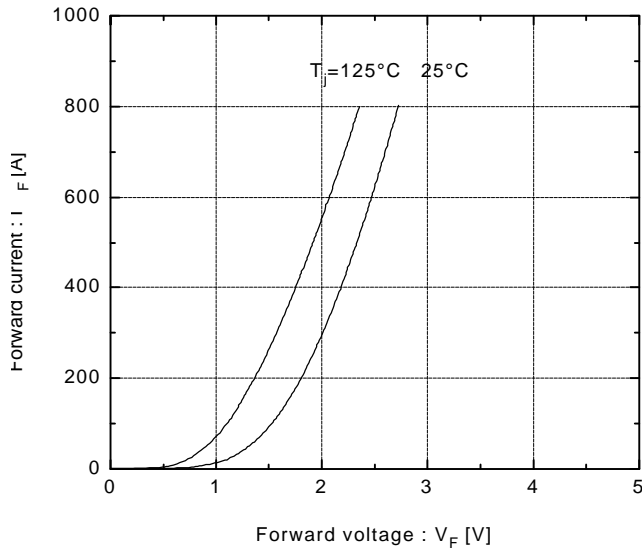
Dynamic input characteristics

$T_J=25^\circ C$



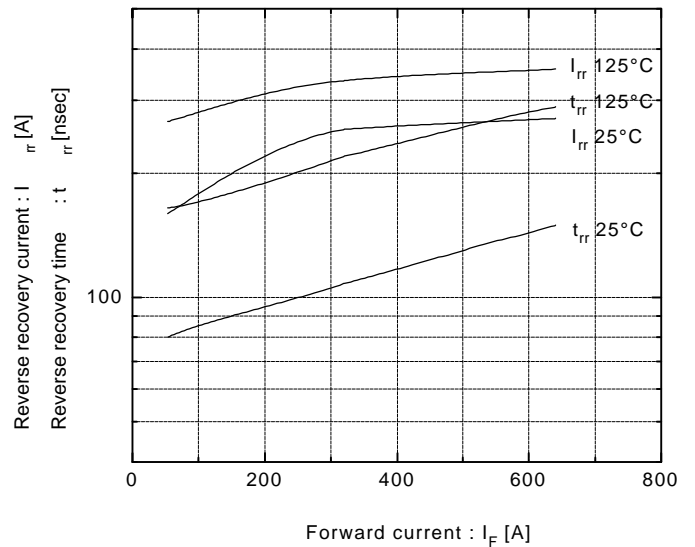
Forward current vs. Forward voltage

$V_{GE}=0V$

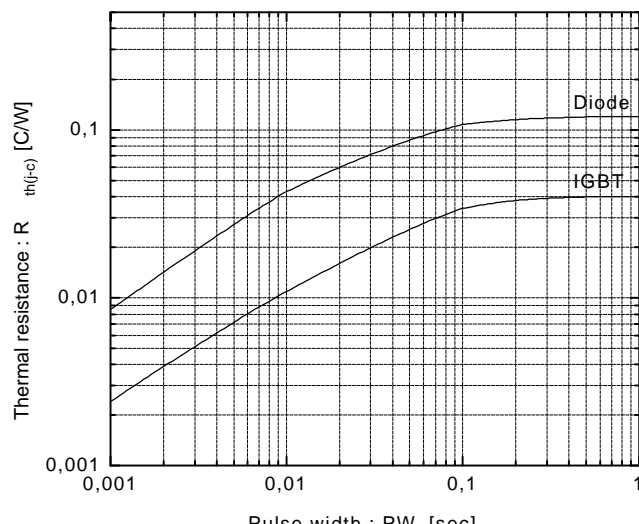


Reverse recovery characteristics

t_{rr}, I_{rr} vs. I_F

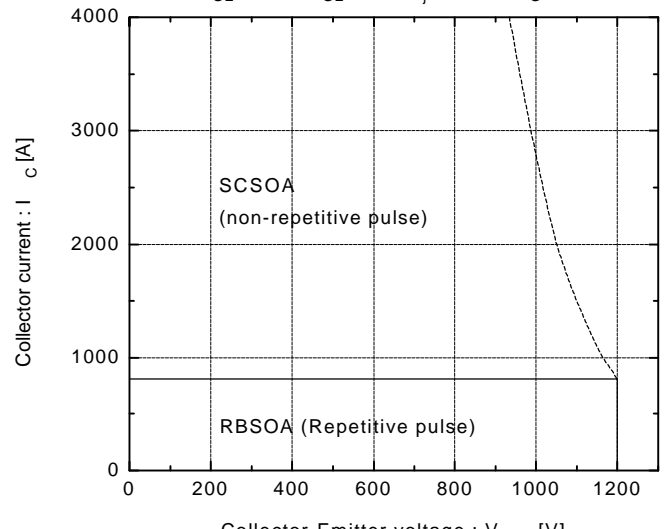


Transient thermal resistance

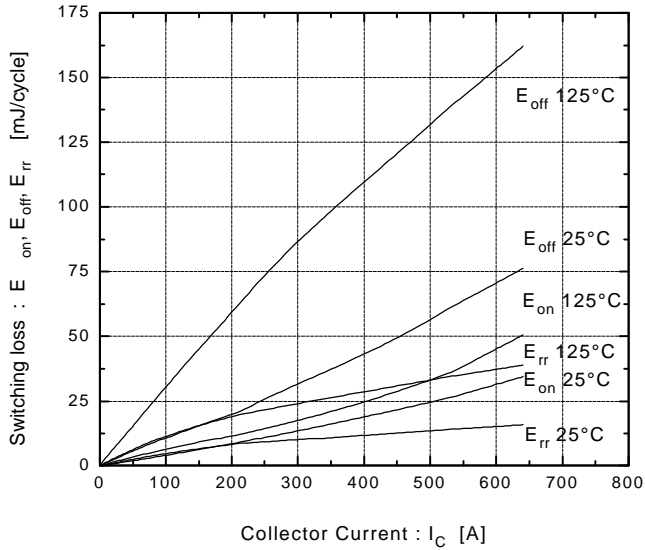


Reversed biased safe operating area

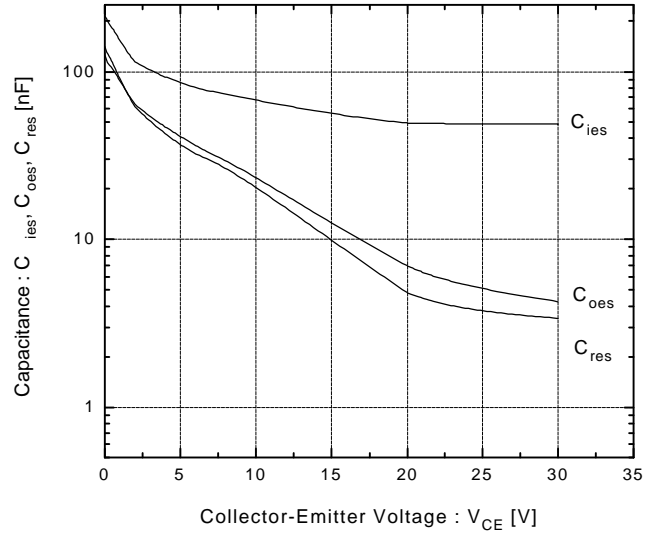
$+V_{GE}=15V, -V_{GE}\leq 15V, T_J\leq 125^\circ C, R_G\geq 1.8\Omega$



Switching loss vs. Collector current
 $V_{CC}=600V, R_G=1.8\Omega, V_{GE}=\pm 15V$



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



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