

## IGBT MODULE ( N series )

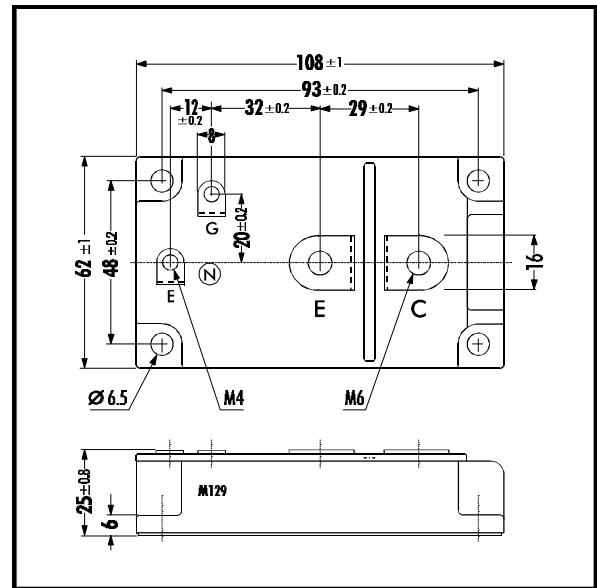
### ■ Features

- 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



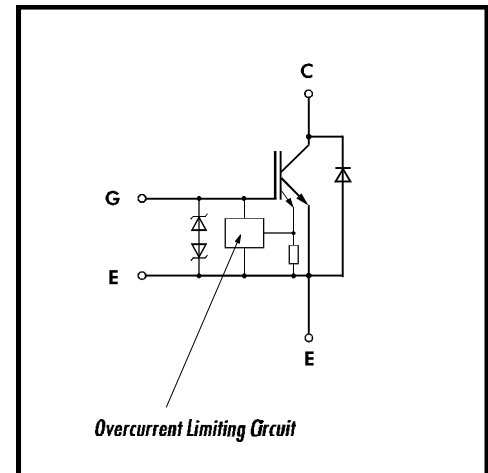
## ■ Maximum Ratings and Characteristics

### • Absolute Maximum Ratings ( T<sub>c</sub>=25°C )

Items	Symbols	Ratings	Units
Collector-Emitter Voltage	V <sub>CEs</sub>	1200	V
Gate -Emitter Voltage	V <sub>GES</sub>	± 20	V
Collector Current	Continuous	I <sub>C</sub>	400
	1ms	I <sub>C PULSE</sub>	800
	Continuous	-I <sub>C</sub>	400
	1ms	-I <sub>C PULSE</sub>	800
Max. Power Dissipation	P <sub>C</sub>	3100	W
Operating Temperature	T <sub>i</sub>	+150	°C
Storage Temperature	T <sub>stg</sub>	-40 ~ +125	°C
Isolation Voltage	V <sub>is</sub>	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<sub>f</sub>=25°C )

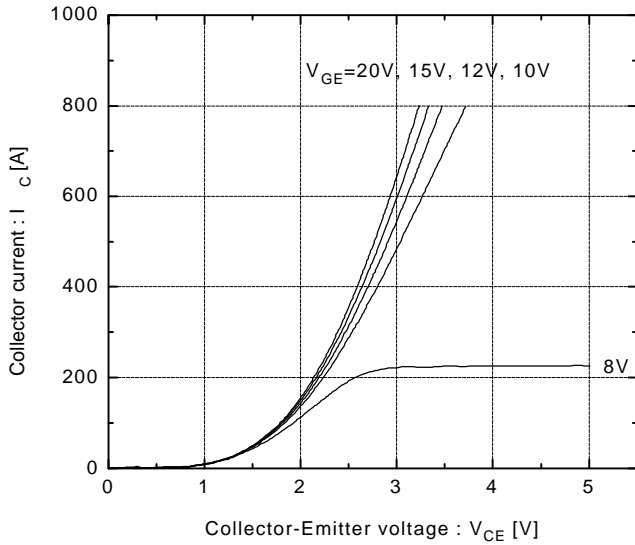
Items	Symbols	Test Conditions	Min.	Typ.	Max.	Units
Zero Gate Voltage Collector Current	I <sub>CEs</sub>	V <sub>GE</sub> =0V V <sub>CE</sub> =1200V			4.0	mA
Gate-Emitter Leakage Current	I <sub>GES</sub>	V <sub>CE</sub> =0V V <sub>GE</sub> =± 20V			60	μA
Gate-Emitter Threshold Voltage	V <sub>GE(th)</sub>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

### • Thermal Characteristics

Items	Symbols	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance	R <sub>th(f-c)</sub>	IGBT			0.04	°C/W
	R <sub>th(f-c)</sub>	Diode			0.12	
	R <sub>th(c-f)</sub>	With Thermal Compound		0.0125		

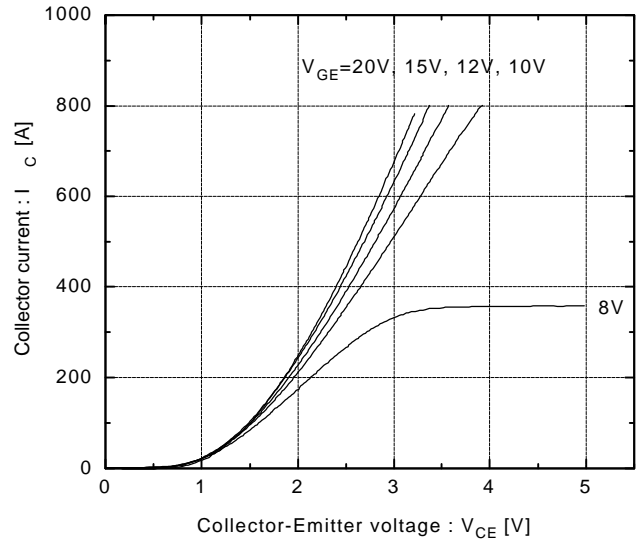
Collector current vs. Collector-Emitter voltage

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



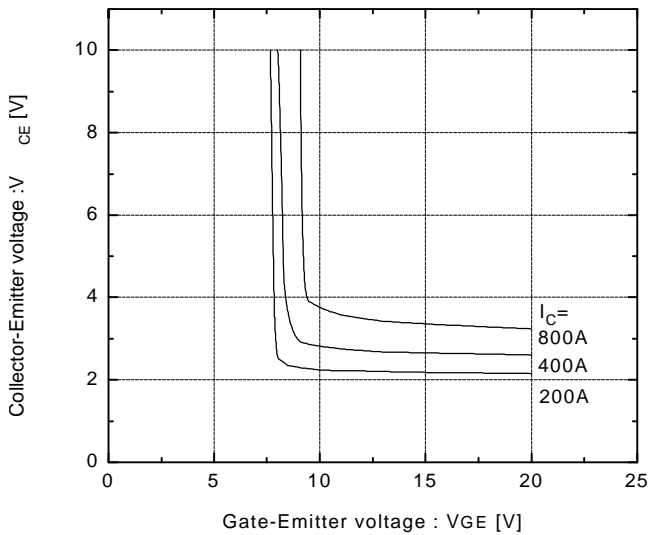
Collector current vs. Collector-Emitter voltage

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



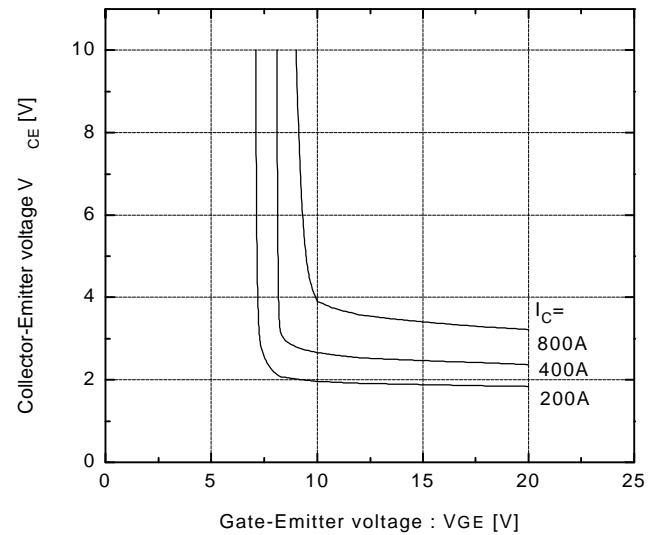
Collector-Emitter vs. Gate-Emitter voltage

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



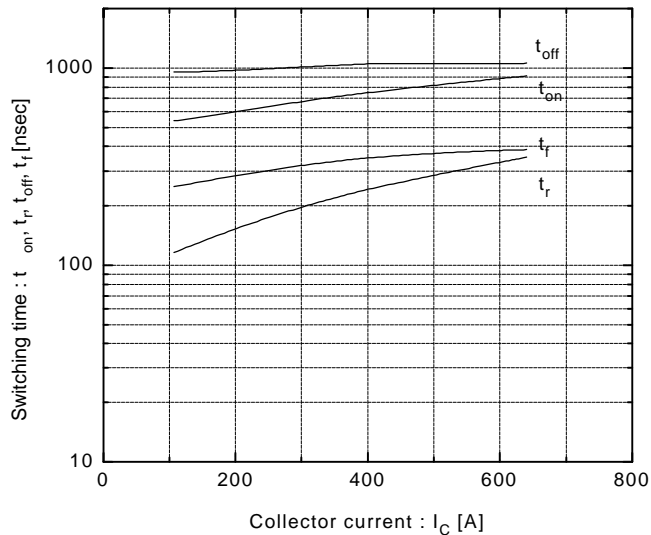
Collector-Emitter vs. Gate-Emitter voltage

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



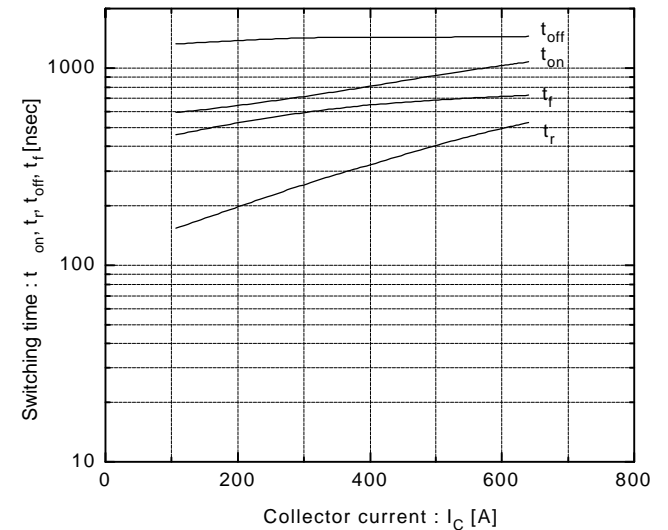
Switching time vs. Collector current

$V_{CC}=600\text{V}, R_G=1.8\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$



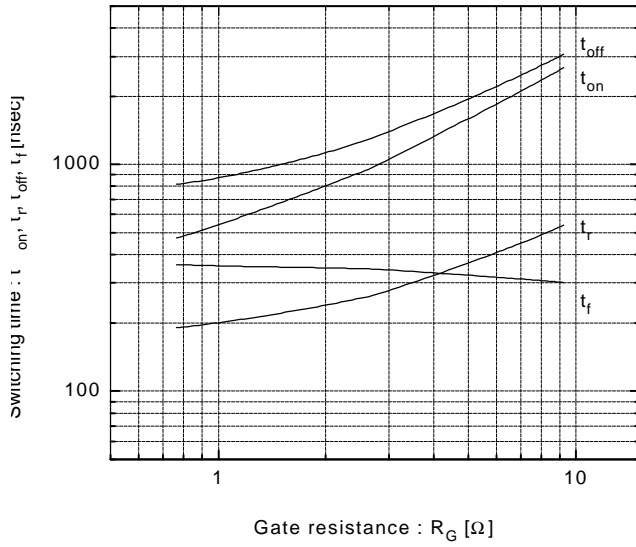
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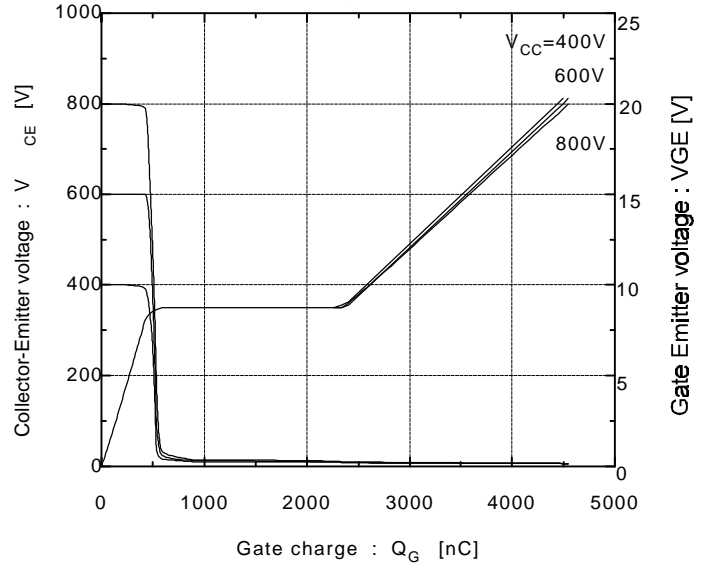
Switching time vs.  $R_G$

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



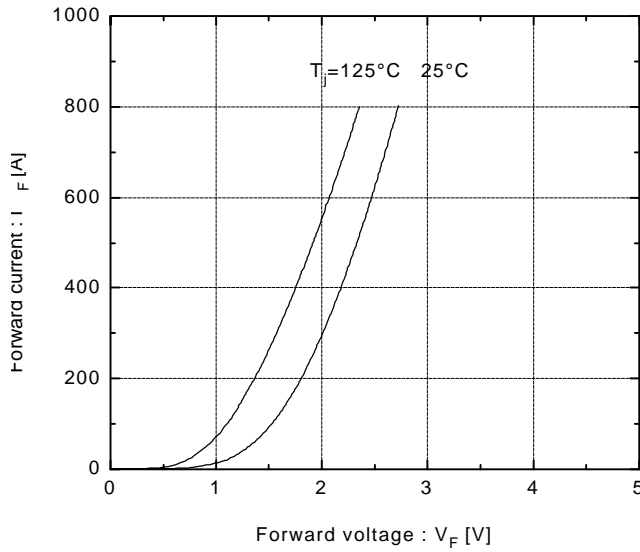
Dynamic input characteristics

$T_J=25^\circ C$



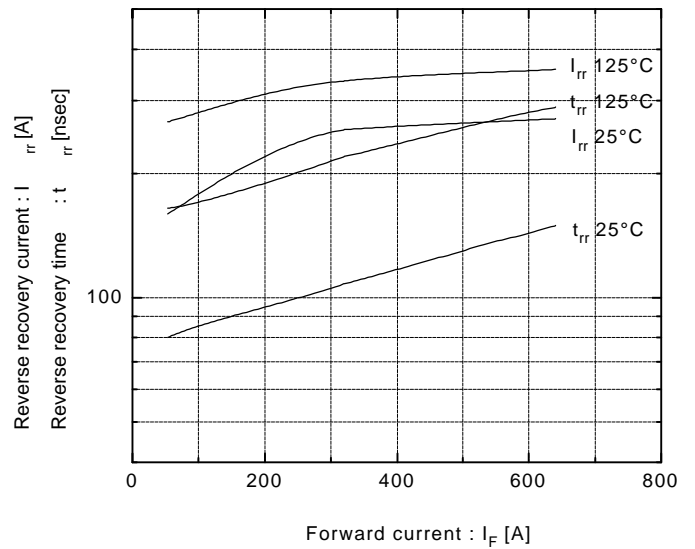
Forward current vs. Forward voltage

$V_{GE}=0V$

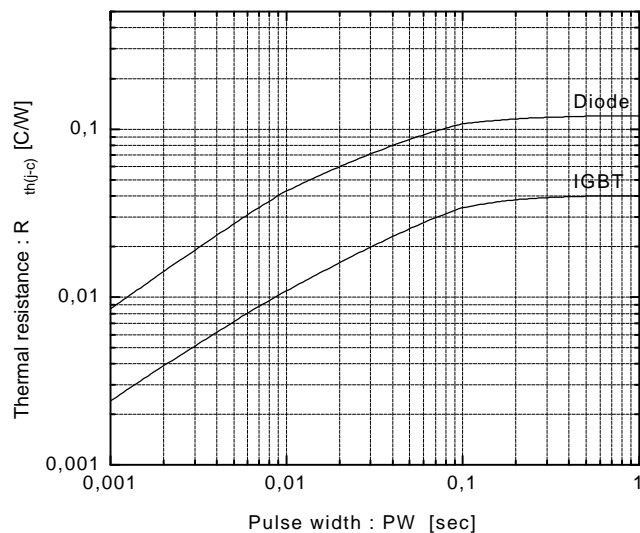


Reverse recovery characteristics

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

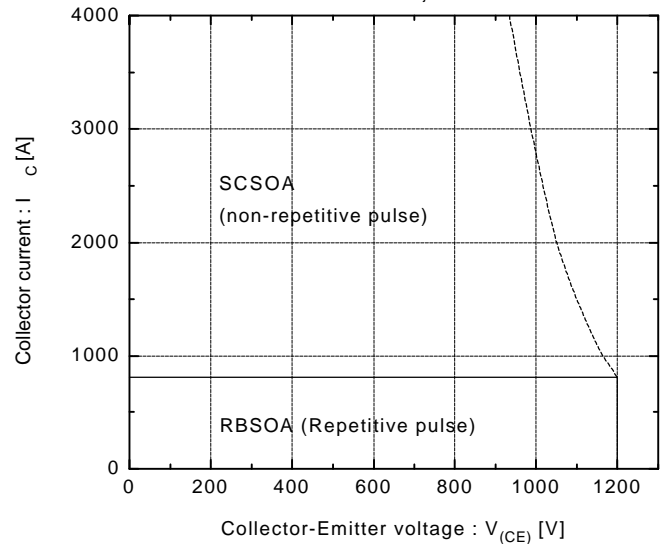


Transient thermal resistance



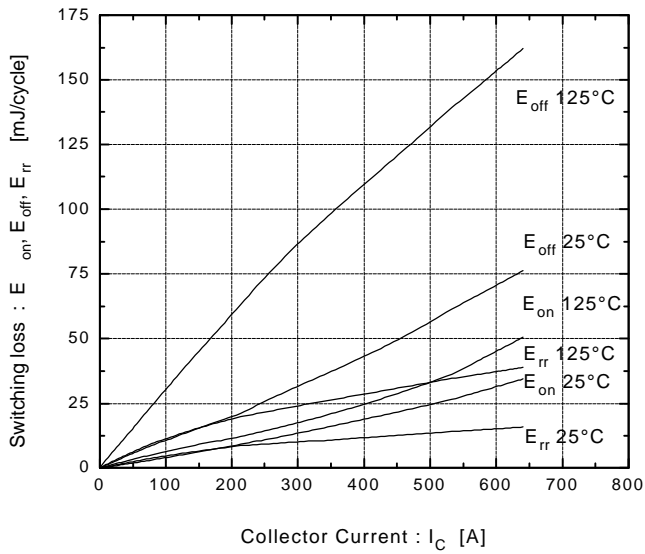
Reversed biased safe operating area

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



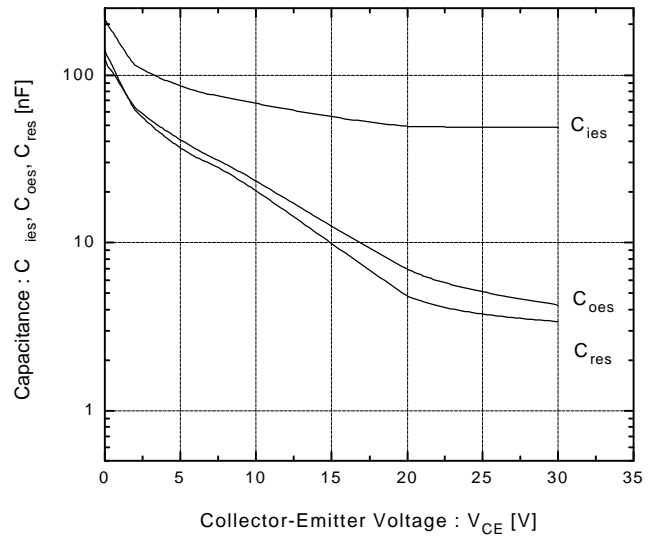
Switching loss vs. Collector current

$V_{CC}=600V, R_G=1.8\Omega, V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage

$T_J=25^\circ C$



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