

IGBT MODULE (N series)

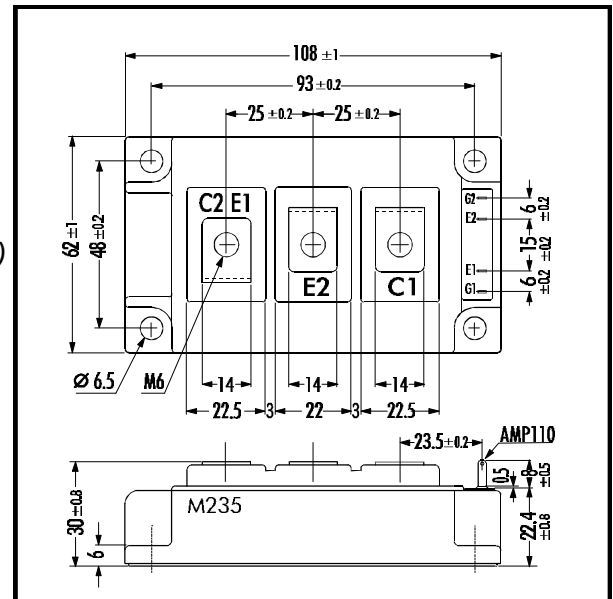
■ Features

- Square RBSOA
- Low Saturation Voltage
- Less Total Power Dissipation
- Improved FWD Characteristic
- Minimized Internal Stray Inductance
- Overcurrent Limiting Function (~3 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 ($T_c=25^\circ\text{C}$)

Items	Symbols	Ratings	Units
Collector-Emitter Voltage	V_{CES}	600	V
Gate -Emitter Voltage	V_{GES}	± 20	V
Collector Current	Continuous	I_C	400
	1ms	$I_{C \text{ PULSE}}$	800
	Continuous	$-I_C$	400
	1ms	$-I_{C \text{ PULSE}}$	800
Max. Power Dissipation	P_C	1500	W
Operating Temperature	T_j	+150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 ~ +125	$^\circ\text{C}$
Isolation Voltage	A.C. 1min. V_{is}	2500	V
Screw Torque	Mounting *1	3.5	Nm
	Terminals *2	4.5	

Note: *1:Recommendable Value; 2.5 ~ 3.5 Nm (M5) or (M6)
*2:Recommendable Value; 3.5 ~ 4.5 Nm (M6)

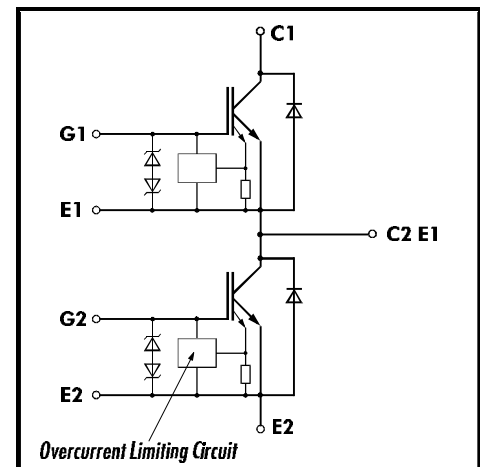
• Electrical Characteristics (at $T_j=25^\circ\text{C}$)

Items	Symbols	Test Conditions	Min.	Typ.	Max.	Units
Zero Gate Voltage Collector Current	I_{CES}	$V_{GE}=0V$ $V_{CE}=600V$			2.0	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$			30	μA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=20V$ $I_C=400mA$	4.5		7.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=400A$			2.8	V
Input capacitance	C_{ies}	$V_{GE}=0V$		26400		pF
Output capacitance	C_{oes}	$V_{CE}=10V$		5870		
Reverse Transfer capacitance	C_{res}	$f=1MHz$		2670		
Turn-on Time	t_{ON}	$V_{CC}=300V$		0.6	1.2	μs
	t_r	$I_C=400A$		0.2	0.6	
Turn-off Time	t_{OFF}	$V_{GE}=\pm 15V$		0.6	1.0	
	t_f	$R_G=4.7\Omega$		0.2	0.35	
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

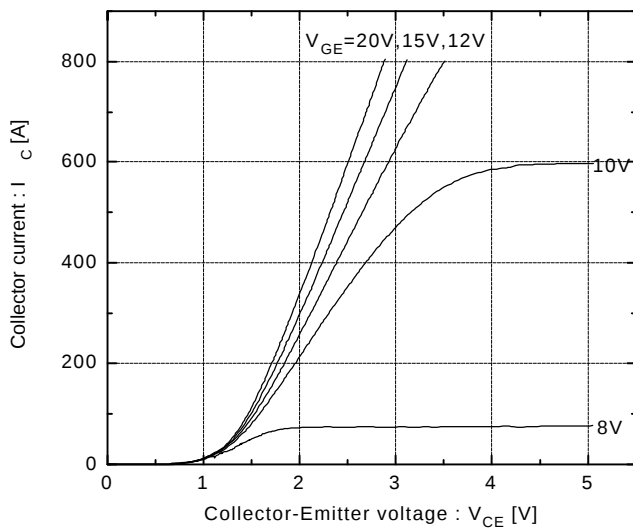
Items	Symbols	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance	$R_{th(j-c)}$	IGBT			0.085	$^\circ\text{C/W}$
	$R_{th(j-e)}$	Diode			0.15	
	$R_{th(c-f)}$	With Thermal Compound		0.025		

■ Equivalent Circuit



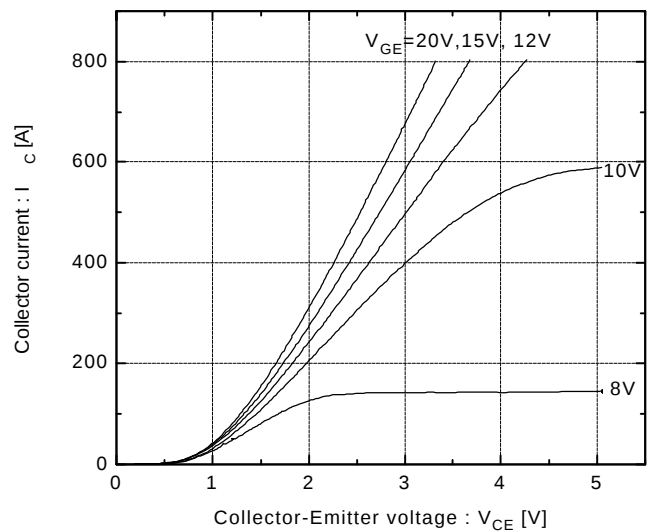
Collector current vs. Collector-Emmitter voltage

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



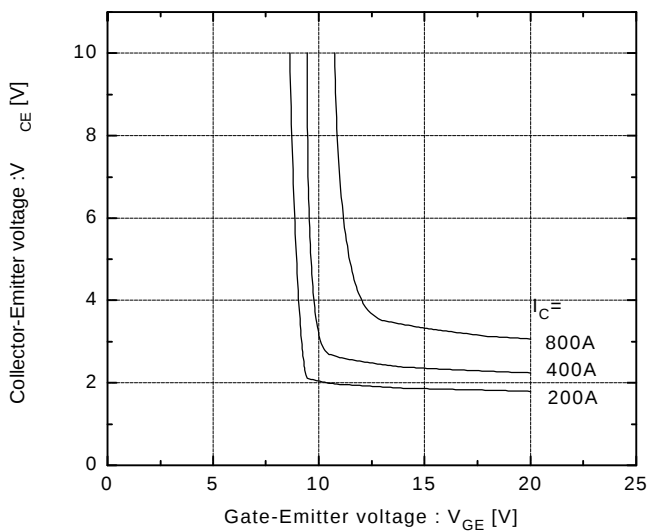
Collector current vs. Collector-Emmitter voltage

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



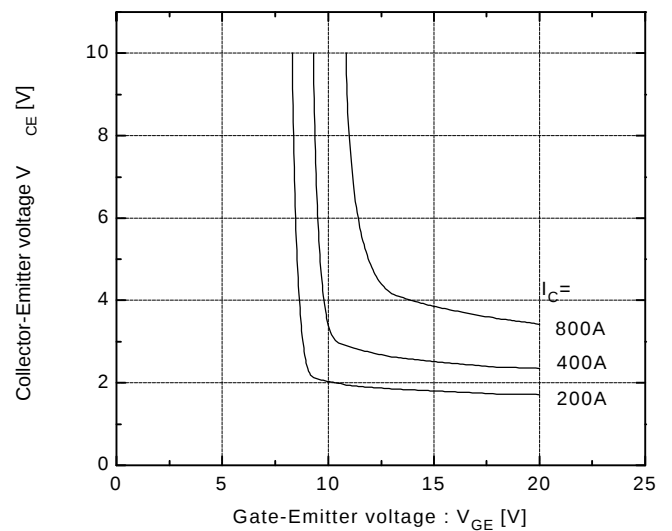
Collector-Emmitter vs. Gate-Emmitter voltage

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

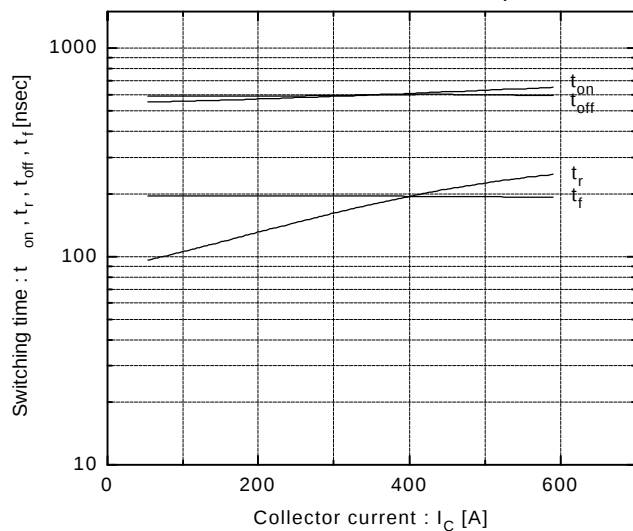


Collector-Emmitter vs. Gate-Emmitter voltage

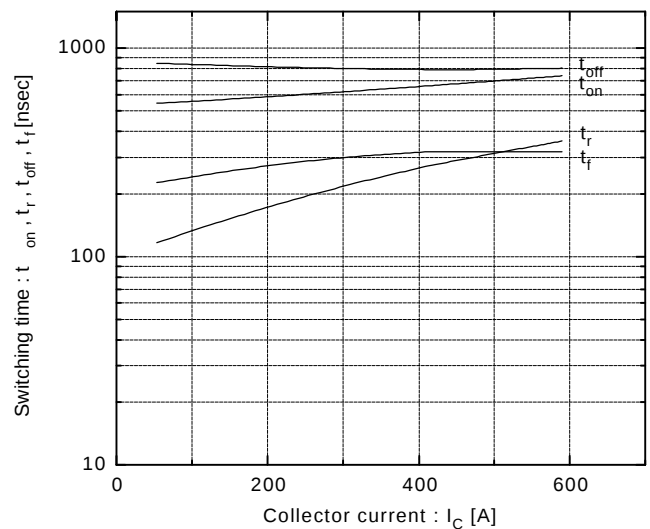
$T_J=125^{\circ}\text{C}$



Switching time vs. Collector current
 $V_{CC}=300\text{V}$, $R_G=4.7\Omega$, $V_{GE}=15\text{V}$, $T_J=25^{\circ}\text{C}$

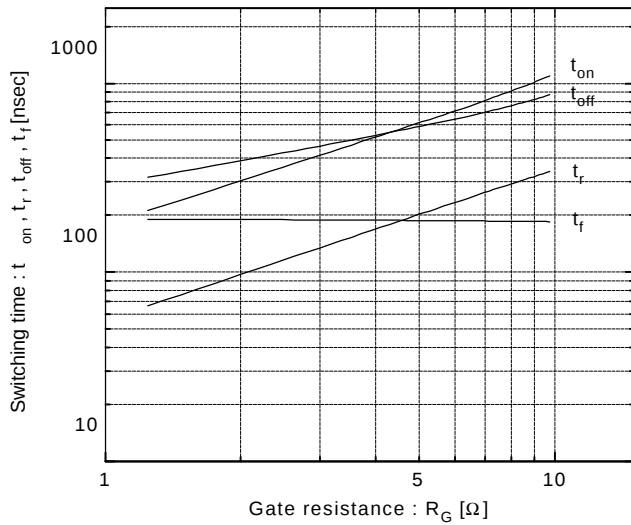


Switching time vs. Collector current
 $V_{CC}=300\text{V}$, $R_G=4.7\Omega$, $V_{GE}=\pm 15\text{V}$, $T_J=125^{\circ}\text{C}$



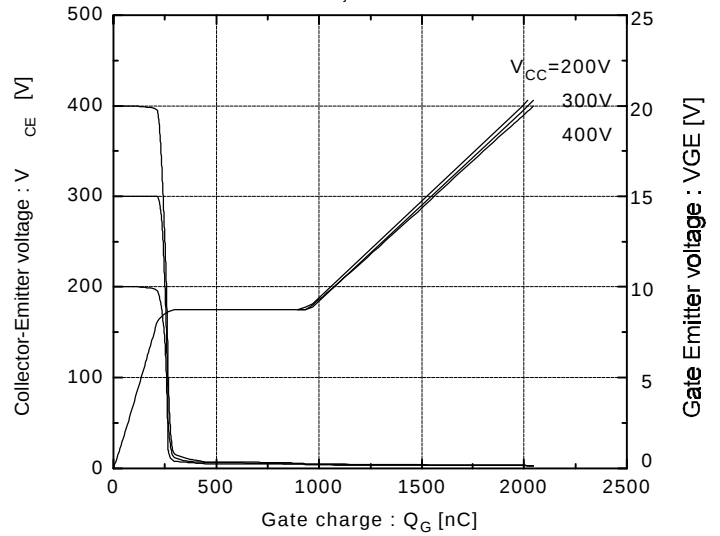
Switching time vs. R_G

$V_{CC}=300V$, $I_C=400A$, $V_{GE}=\pm 15V$, $T_J=25^\circ C$



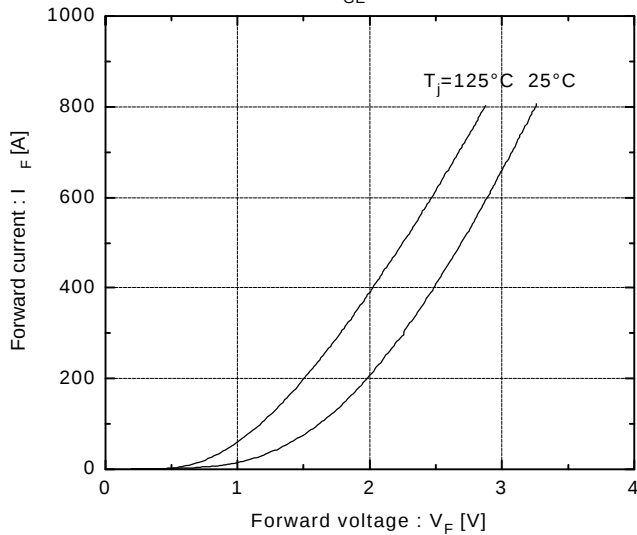
Dynamic input characteristics

$T_J=25^\circ C$



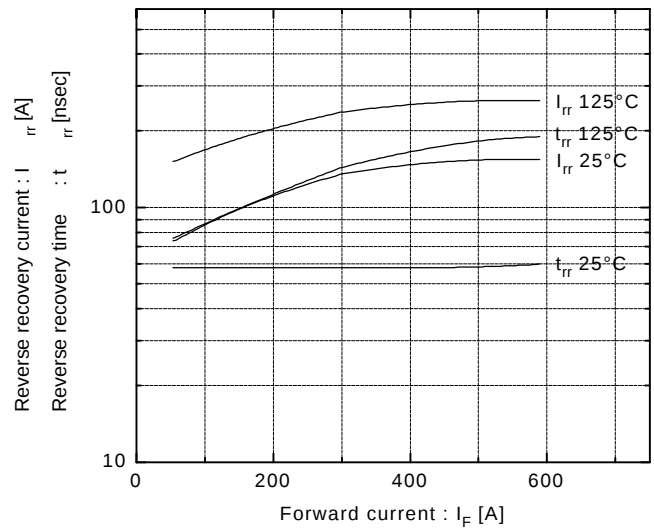
Forward current vs. Forward voltage

$V_{GE}=0V$

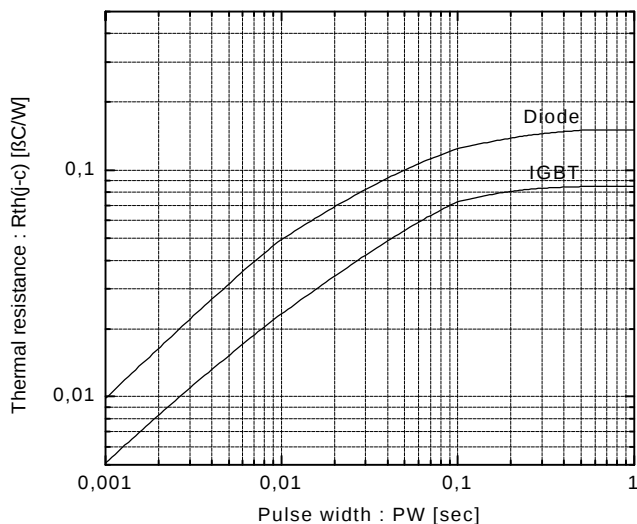


Reverse recovery characteristics

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

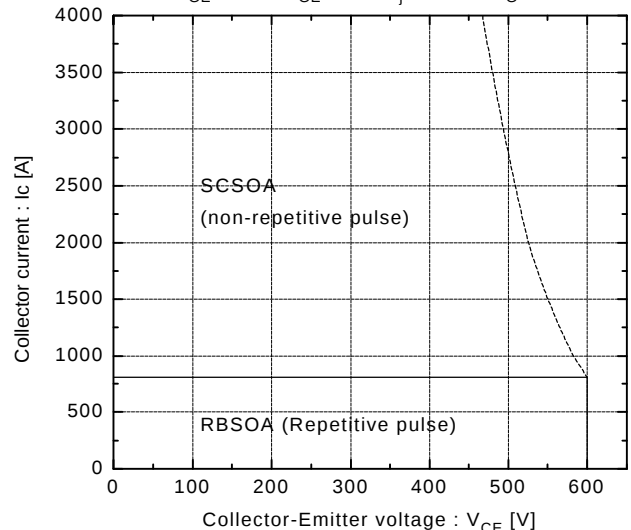


Transient thermal resistance

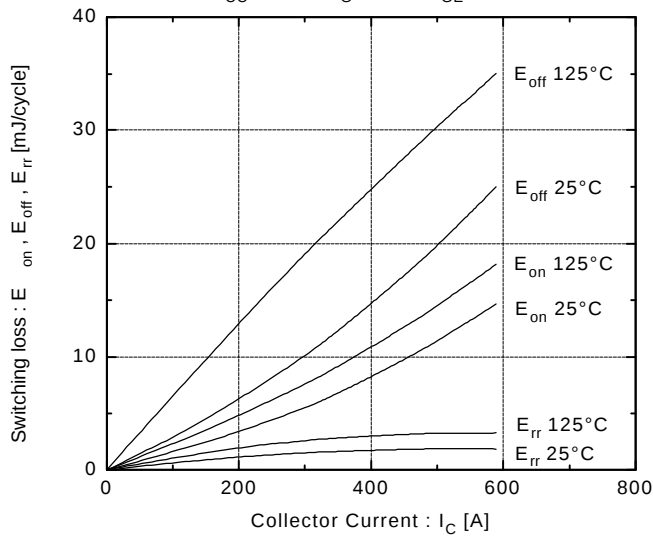


Reversed biased safe operating area

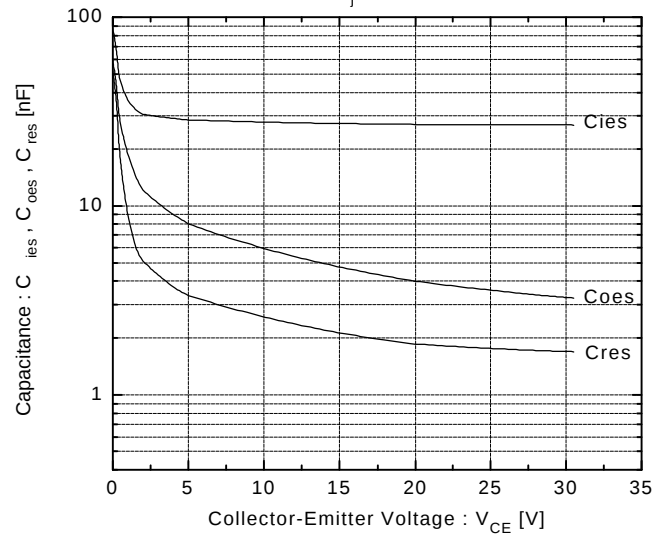
$+V_{GE}=15V$, $-V_{GE}\leq 15V$, $T_J\leq 125^\circ C$, $R_G\geq 4.7\Omega$



Switching loss vs. Collector current

 $V_{CC}=300V, R_G=4.7\Omega, V_{GE}=\pm 15V$


Capacitance vs. Collector-Emitter voltage

 $T_j=25^\circ C$

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