

IGBT MODULE (F series)

■ Features

- Low Saturation Voltage
- Voltage Drive
- Variety of Power Capacity Series

■ 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

Items	Symbols	Ratings	Units
Collector-Emitter Voltage	V_{CES}	1200	V
Gate-Emitter Voltage	V_{GES}	± 20	V
Collector Current	Continuous	I_C	300
	1ms	I_C pulse	600
	Continuous	$-I_C$	300
	1ms	$-I_C$ pulse	600
Max. Power Dissipation	P_C	1800	W
Operating Temperature	T_j	+150	°C
Storage Temperature	T_{stg}	-40 to +125	°C
Net. Weight		415	g
Isolation Voltage	AC, 1min.	V_{isol}	2500
Screw Torque	Mounting *1	3.5 [35]	N · m { kg · cm }
	Terminals *2	4.5 [45]	
	Terminals *3	1.7 [17]	

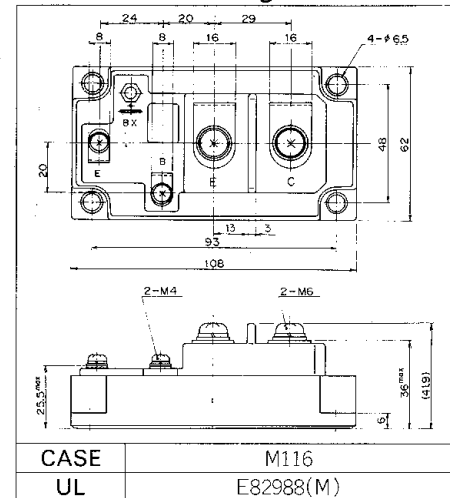
● Electrical Characteristics ($T_c=25^\circ\text{C}$)

Items	Symbols	Test Conditions	Min.	Typ.	Max.	Units
Zero Gate Voltage Collector Current	I_{CES}	$V_{GE}=0V$ $V_{CE}=1200V$ $T_j=25^\circ\text{C}$			4.0	mA
		$V_{GE}=0V$ $V_{CE}=1200V$ $T_j=125^\circ\text{C}$			—	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V$ $V_{GE}=\pm 20V$			400	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE}=20V$ $I_C=300mA$	3.0		6.0	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V$ $I_C=300A$			2.5	V
Input Capacitance	C_{ies}	$V_{GE}=0V$		54000		pF
Output Capacitance	C_{oes}	$V_{CE}=10V$		—		
Reverse Transfer Capacitance	C_{res}	$f=1MHz$		—		
Turn-on Time	t_{on}	$V_{CC}=600V$ $I_C=300A$	Resistive load		0.8	μs
	t_r				0.6	
Turn-off Time	t_{off}	$V_{GE}=\pm 15V$ $R_G=2.7\Omega$	Inductive load		1.5	
	t_f				1.0	
Diode Forward On-Voltage	V_F	$I_F=300A$, $V_{GE}=0V$			2.5	V
Reverse Recovery Time	t_{rr}	$I_F=300A$, $-di/dt=900A/\mu s$ $V_{GE}=-10V$			350	ns

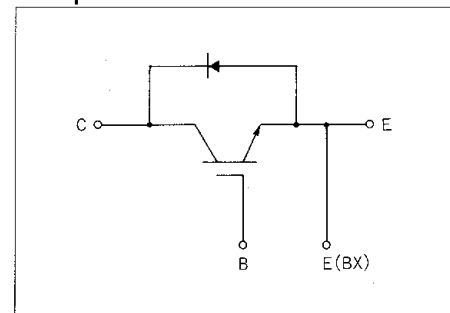
● Thermal Characteristics

Items	Symbols	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance	$R_{th(j-c)}$	IGBT			0.069	°C/W
	$R_{th(j-c)}$	Diode			0.111	
	$R_{th(c-f)}$	With Thermal compound		0.0125		

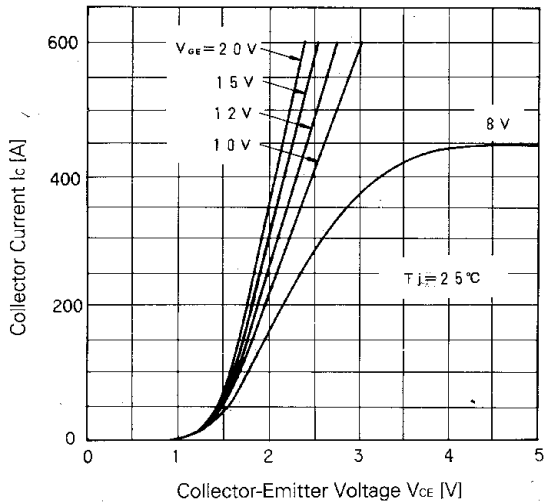
■ Outline Drawings



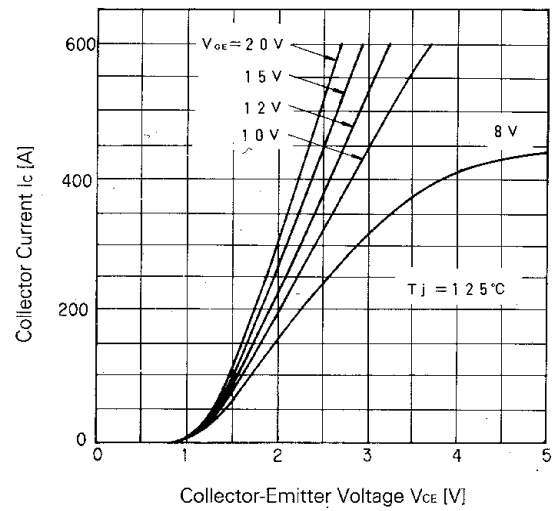
■ Equivalent Circuit Schematic



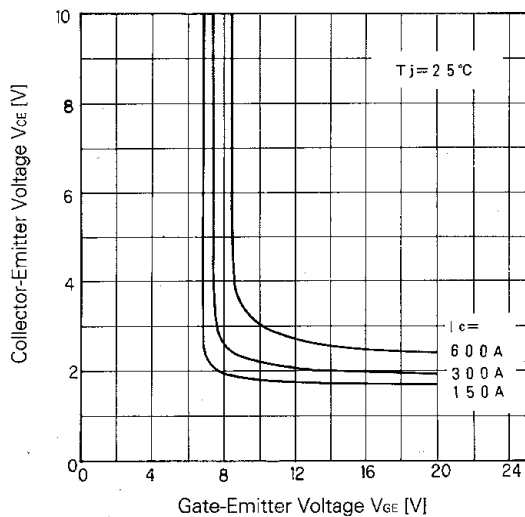
- *1 Recommendable Value 2.5 to 3.5 N·m
25 to 35 kg·cm (M5)
- *2 Recommendable Value 3.5 to 4.5 N·m
35 to 45 kg·cm (M6)
- *3 Recommendable Value 1.3 to 1.7 N·m
13 to 17 kg·cm (M4)



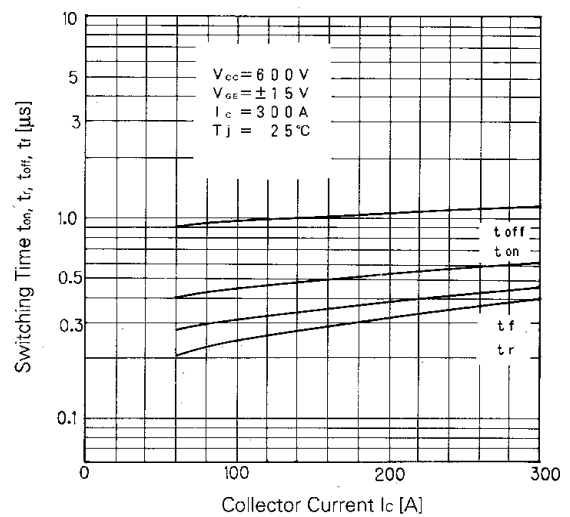
Collector Current vs. Collector-Emitter Voltage



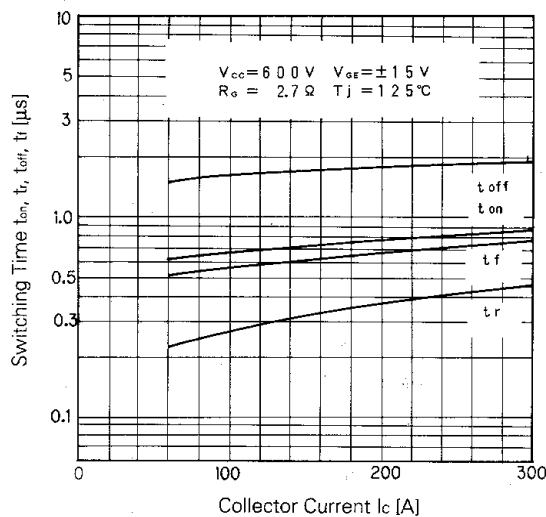
Collector Current vs. Collector-Emitter Voltage



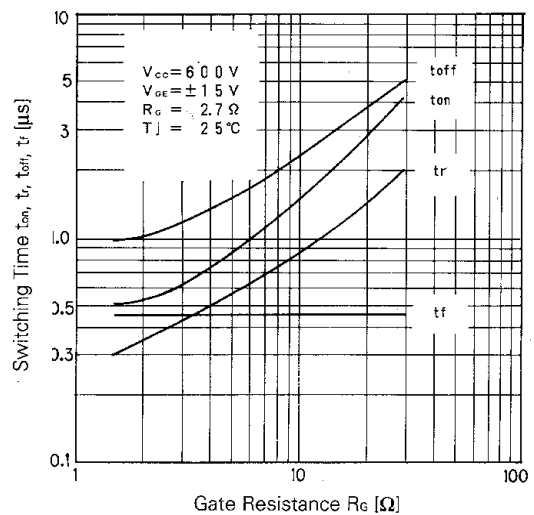
Collector-Emitter Voltage vs. Gate-Emitter Voltage



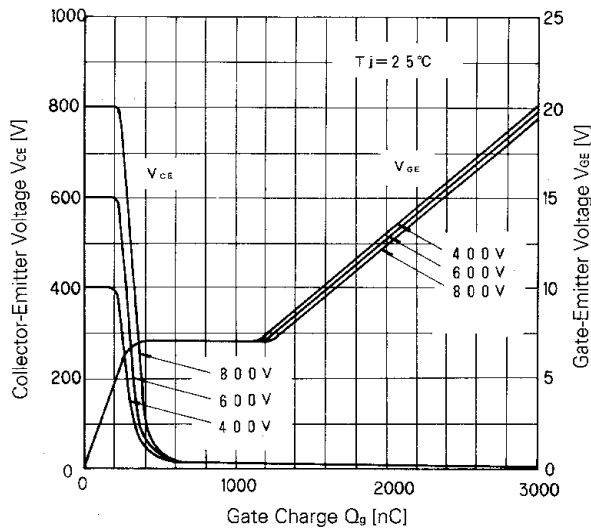
Switching Time



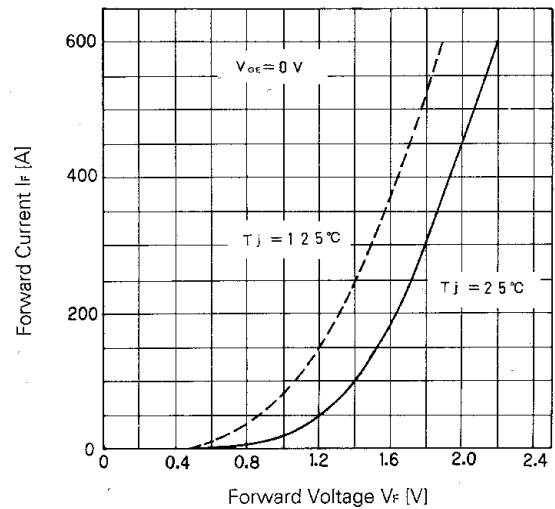
Switching Time



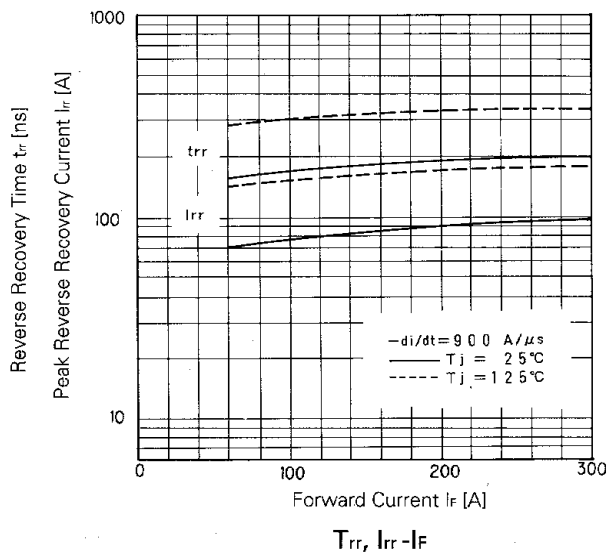
Switching Time-Gate Resistance



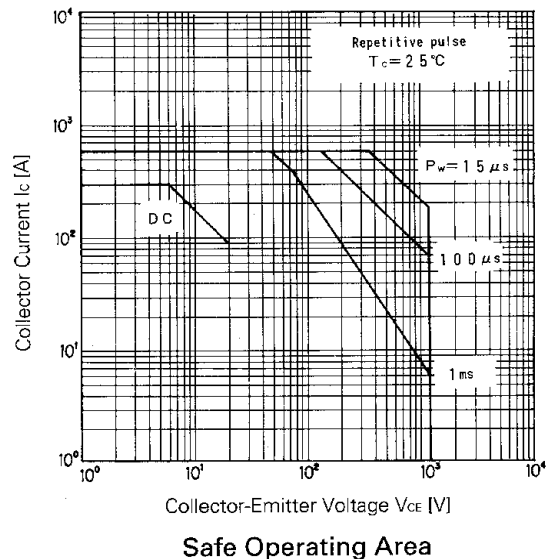
Dynamic Input Characteristic



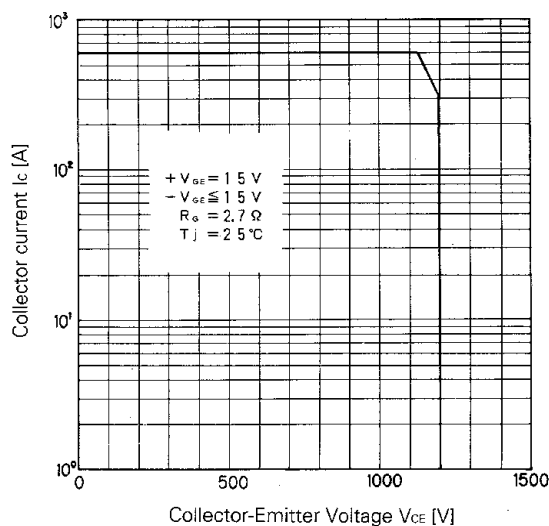
Forward Voltage of Free Wheel Diode



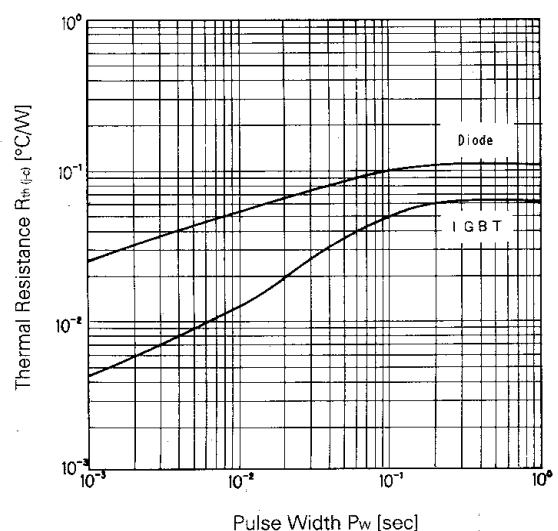
$T_{rr}, I_{rr} - I_f$



Safe Operating Area



Reverse Biased Safe Operating Area



Transient Thermal Resistance