

Intelligent Power Module (R-Series)

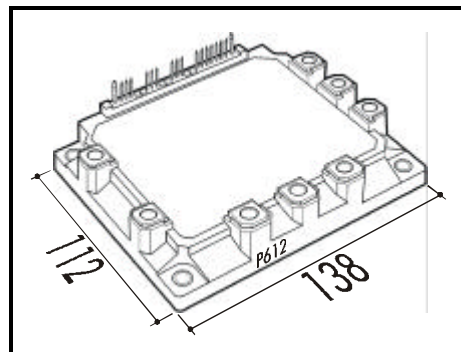
Maximum Ratings and Characteristics

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$)

Items		Symbols	Ratings		Units
			Min.	Max.	
DC Bus Voltage		V_{DC}	0	900	V
DC Bus Voltage (surge)		$V_{DC(Surge)}$	0	1000	
DC Bus Voltage (short operating)		V_{SC}	200	800	
Collector-Emitter Voltage		V_{CES}	0	1200	
Inverter	Continuous	I_C		100	A
Collector	1ms	I_{CP}		200	
Current	Duty=62.6%	$-I_C$		100	
Collector Power Dissipation One Transistor		P_C		735	W
Dynamic Brake	Continuous	I_C		50	A
Collector Current	1ms	I_{CP}		100	
Forward Current of Diode		I_F		50	
Collector Power Dissi. DB One Transistor		P_C		400	W
Voltage of Power Supply for Driver		V_{CC}	0	20	V
Input Signal Voltage		V_{IN}	0	V_Z	
Input Signal Current		I_{IN}		1	mA
Alarm Signal Voltage		V_{ALM}	0	V_{CC}	V
Alarm Signal Current		I_{ALM}		15	mA
Junction Temperature		T_J		150	°C
Operating Temperature		T_{OP}	-20	100	
Storage Temperature		T_{stg}	-40	125	
Isolation Voltage	A.C. 1min.	V_{iso}		2500	V
Screw Torque		Mounting *1		3.5	Nm
		Terminals *1		3.5	

Note: *1: Recommendable Value; 2.5 – 3.0 Nm (M5)

Outline Drawing



Electrical Characteristics of Power Circuit (at $T_J=25^\circ\text{C}$, $V_{CC}=15\text{V}$)

Items		Symbols	Conditions	Min.	Typ.	Max.	Units
INV	Collector Current At Off Signal Input	I_{CES}	$V_{CE}=1200\text{V}$, Input Terminal Open			1.0	mA
	Collector-Emitter Saturation Voltage	$V_{CE}(\text{Sat})$	$I_C=100\text{A}$			2.6	V
	Forward Voltage of FWD	V_F	$-I_C=100\text{A}$			3.0	V
DB	Collector Current At Off Signal Input	I_{CES}	$V_{CE}=1200\text{V}$, Input Terminal Open			1.0	mA
	Collector-Emitter Saturation Voltage	$V_{CE}(\text{Sat})$	$I_C=50\text{A}$			2.6	V
	Forward Voltage of FWD	V_F	$-I_C=50\text{A}$			3.3	V

Electrical Characteristics of Control Circuit (at $T_J=25^\circ\text{C}$, $V_{CC}=15\text{V}$)

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Current of P-Line Side Driver (One Unit)	I_{CCP}	$f_{SW}=0\sim 15\text{kHz}$, $T_C=-20\sim 100^\circ\text{C}$	3		18	mA
Current of N-Line Side Driver (Three Units)	I_{CCN}	$f_{SW}=0\sim 15\text{kHz}$, $T_C=-20\sim 100^\circ\text{C}$	10		65	
Input Signal Threshold Voltage	$V_{IN(th)}$	On	1.00	1.35	1.70	V
		Off	1.70	2.05	2.40	
Input Zener Voltage	V_Z	$R_{IN}=20\text{k}\Omega$		8.0		$^\circ\text{C}$
Over Heating Protection Temperature Level	T_{COH}	$V_{DC}=0\text{V}$, $I_C=0\text{A}$, Case Temp.	110		125	
Hysteresis	T_{CH}			20		
IGBT Chips Over Heating Protec. Temp. Level	T_{JOH}	Surface Of IGBT Chip	150			
Hysteresis	T_{JH}			20		A
Inverter Collector Current Protection Level	I_{OC}	$T_J=125^\circ\text{C}$	150			
DB Collector Current Protection Level	I_{OC}	$T_J=125^\circ\text{C}$	75			μs
Over Current Detecting Time	t_{DOC}	$T_J=25^\circ\text{C}$		10		
Alarm Signal Hold Time	t_{ALM}		1.5	2		ms
Limiting Resistor for Alarm	R_{ALM}		1425	1500	1575	Ω
Under Voltage Protection Level	V_{UV}		11.0		12.5	V
Hysteresis	V_H		0.2			

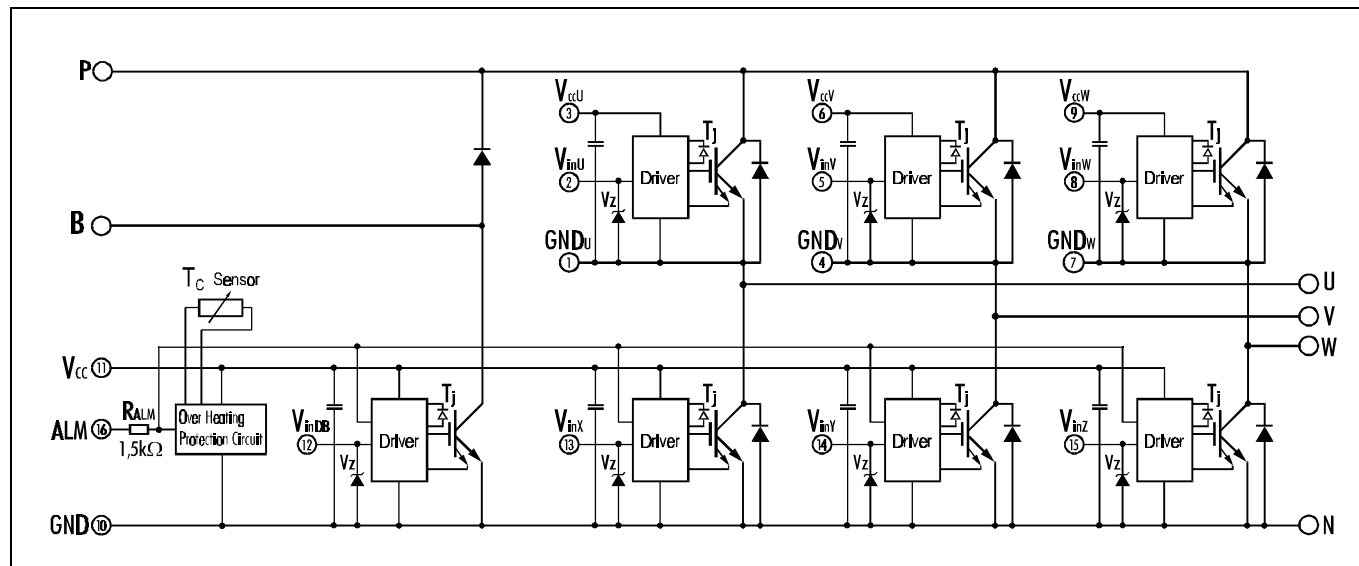
Dynamic Characteristics (at $T_C=T_J=125^\circ\text{C}$, $V_{CC}=15\text{V}$)

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Switching Time	t_{ON}	$I_C=100\text{A}$, $V_{DC}=600\text{V}$	0.3			μs
	t_{OFF}				3.6	
	t_{RR}	$I_F=100\text{A}$, $V_{DC}=600\text{V}$			0.4	

• Thermal Characteristics

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT			0.17	°C/W
	$R_{th(j-c)}$	Diode			0.36	
	$R_{th(j-c)}$	DB IGBT			0.31	
	$R_{th(c-f)}$	With Thermal Compound		0.05		

■ Equivalent Circuit

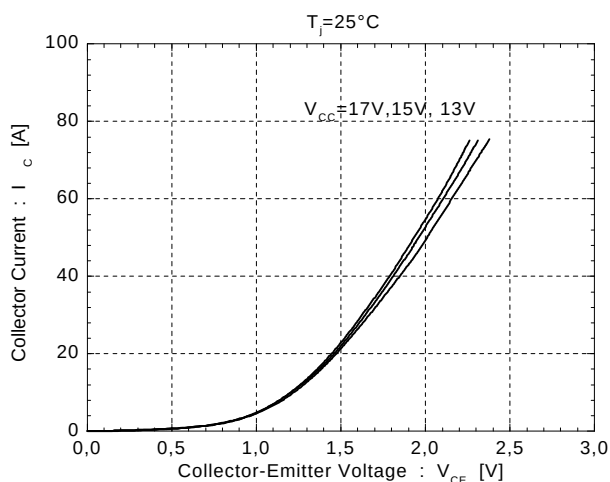


Drivers include following functions

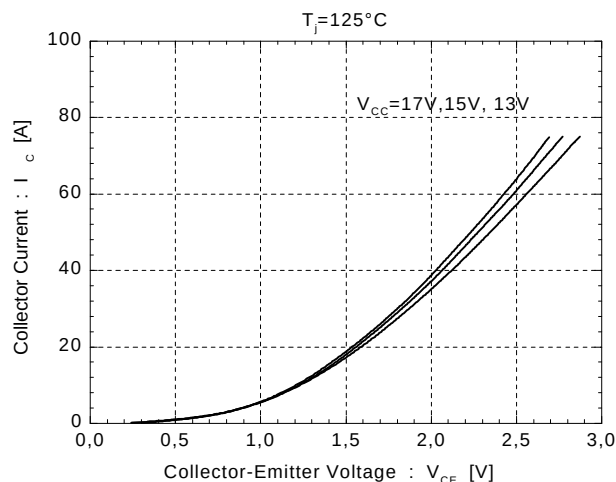
- Short circuit protection circuit
- Amplifier for driver
- Undervoltage protection circuit
- Overcurrent protection circuit
- IGBT Chip overheating protection

Dynamic Brake

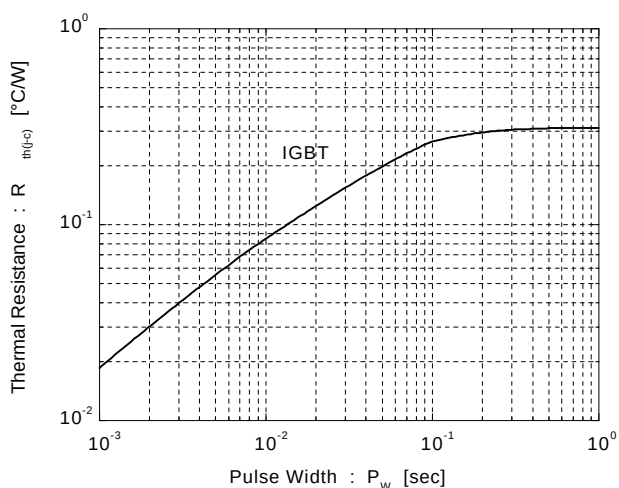
Collector Current vs. Collector-Emitter Voltage



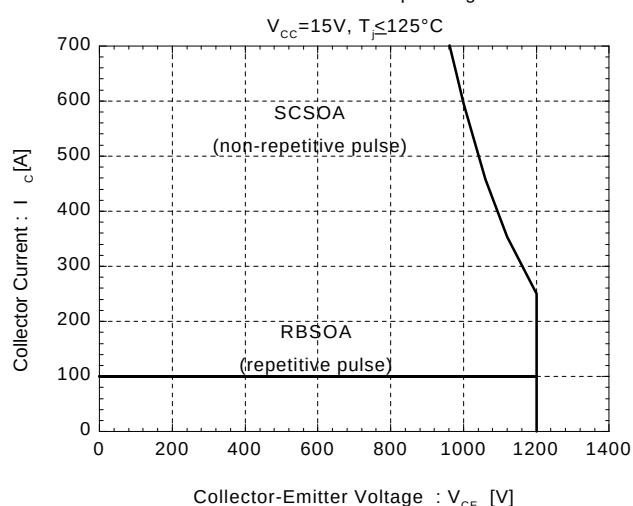
Collector Current vs. Collector-Emitter Voltage



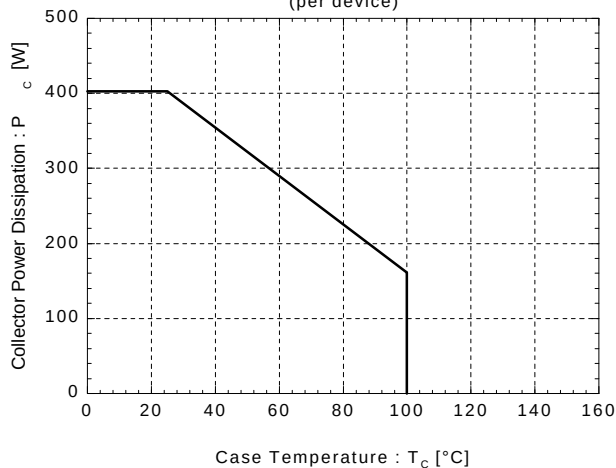
Transient Thermal Resistance



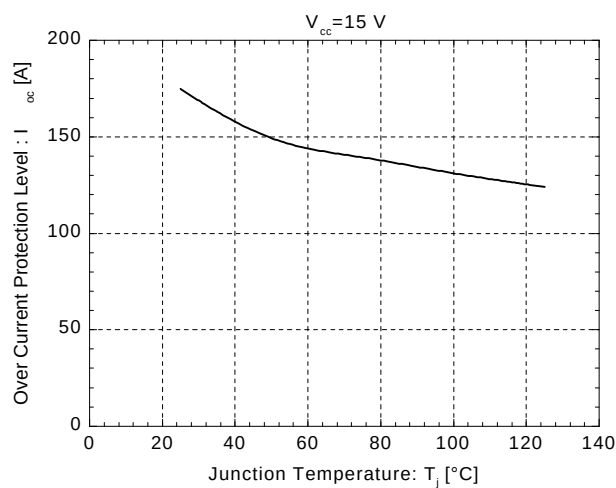
Reverse Biased Safe Operating Area



Power Derating For IGBT
(per device)

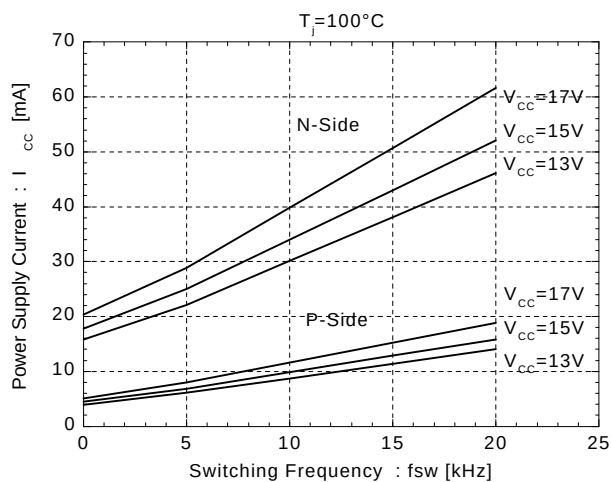


Over Current Protection vs. Junction Temperature

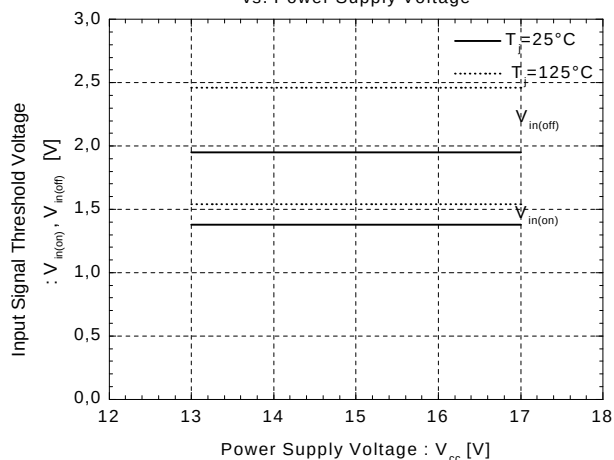


Control Circuit

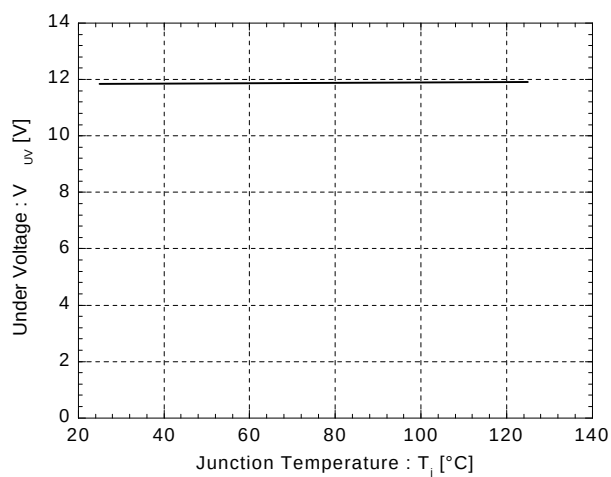
Power Supply Current vs. Switching Frequency



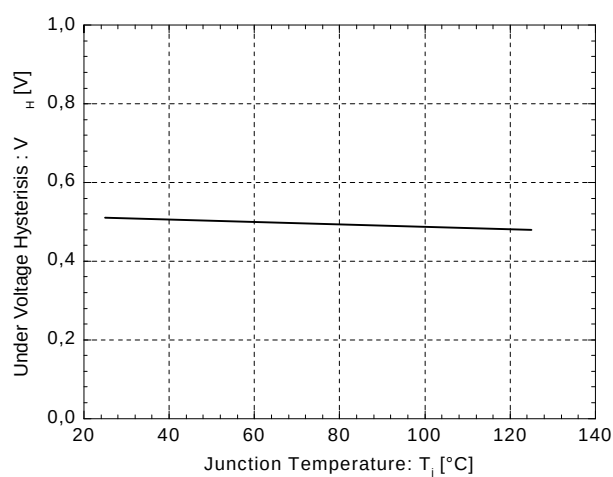
Input Signal Threshold Voltage
vs. Power Supply Voltage



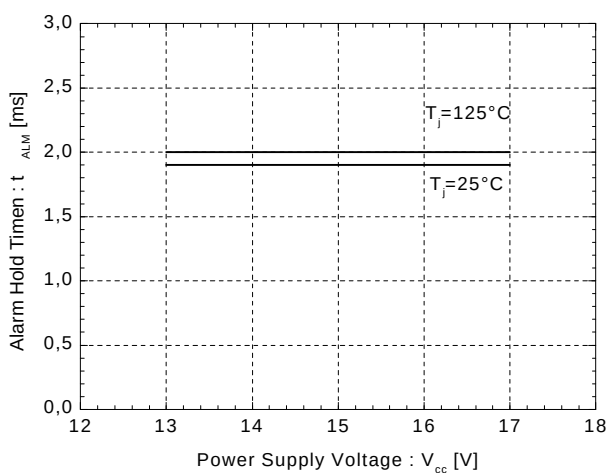
Under Voltage vs. Junction Temperature



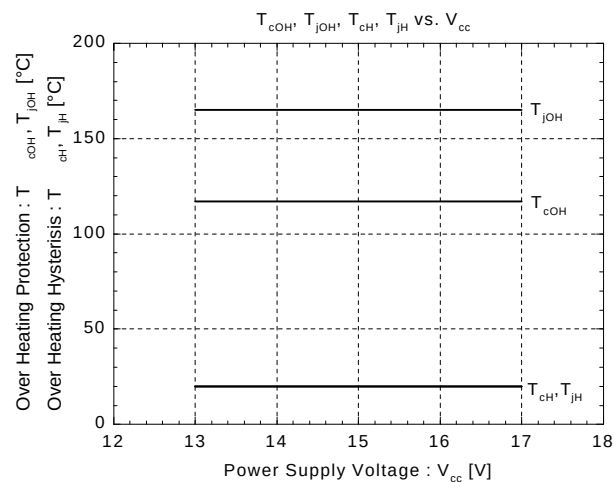
Under Voltage Hysteresis vs. Junction Temperature



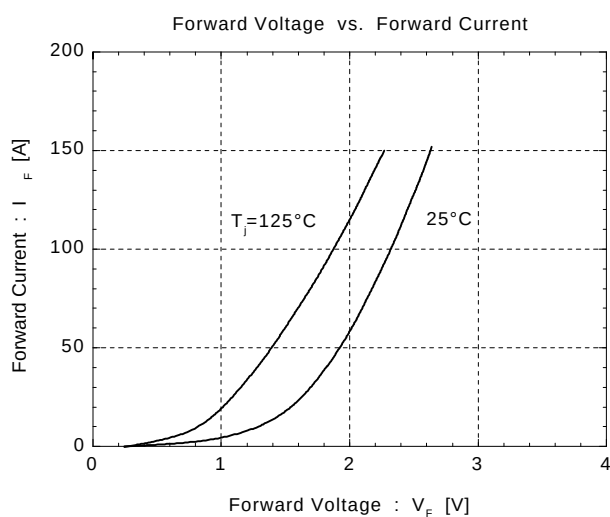
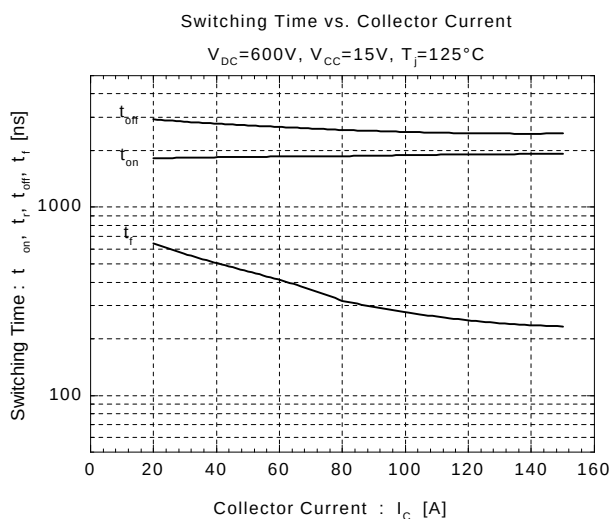
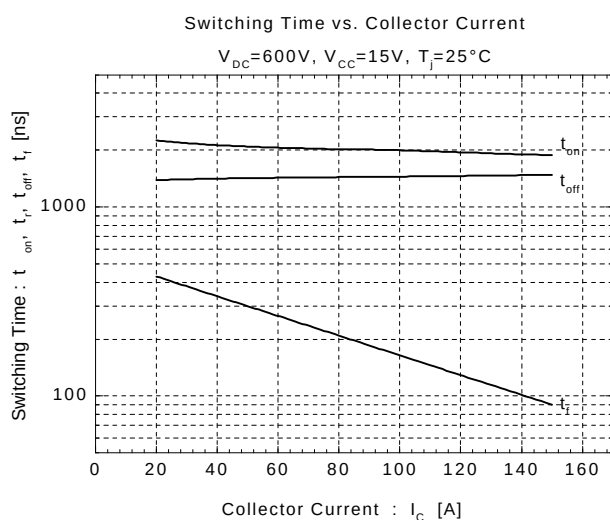
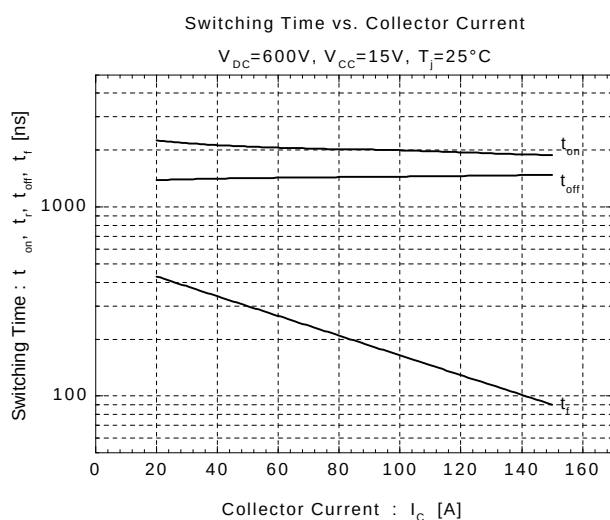
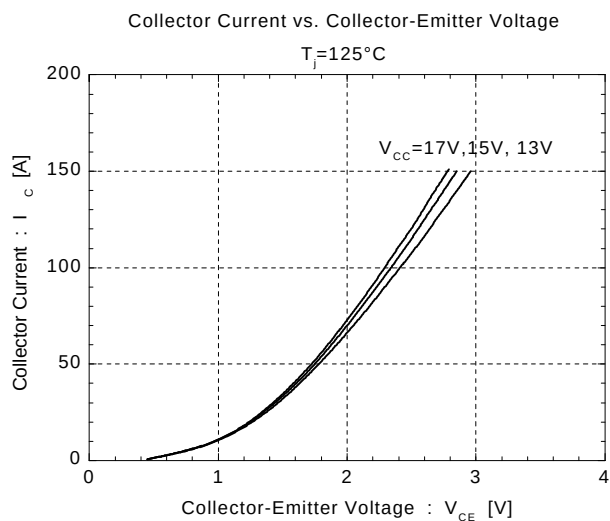
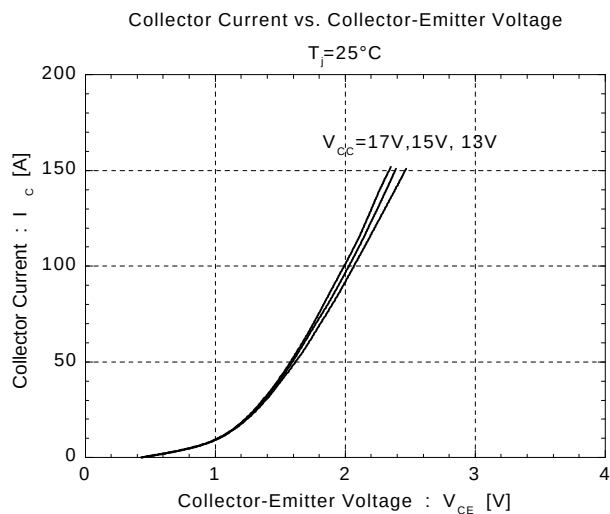
Alarm Hold Time vs. Power Supply Voltage



Over Heating Characteristics

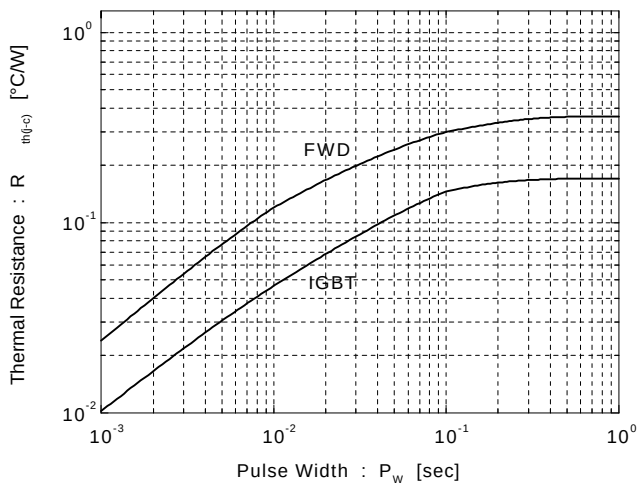


■ Inverter

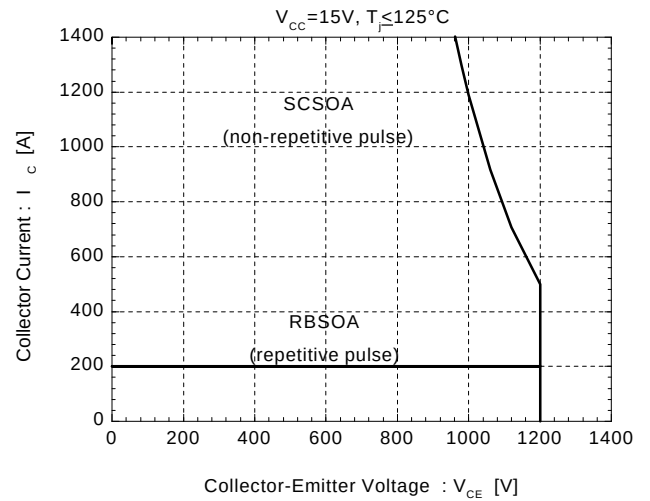


■ Inverter

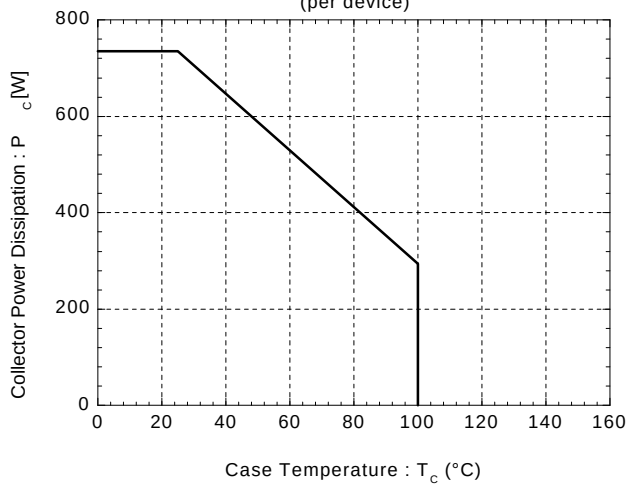
Transient Thermal Resistance



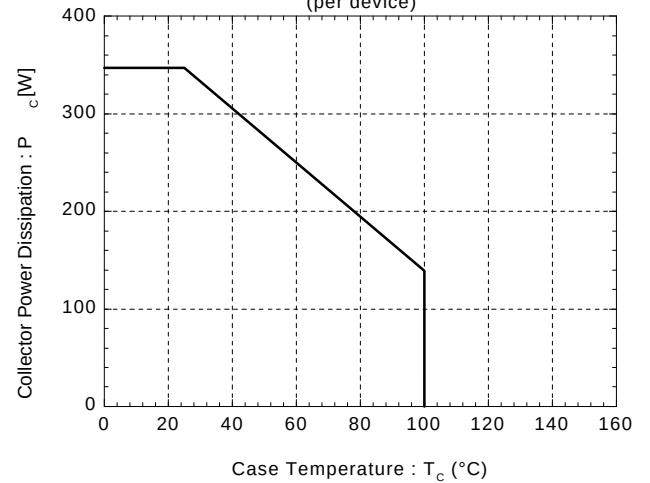
Reverse Biased Safe Operating Area



Power Derating For IGBT
(per device)

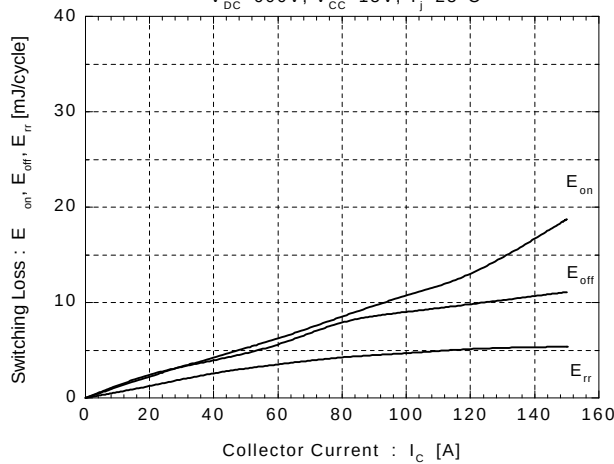


Power Derating For FWD
(per device)



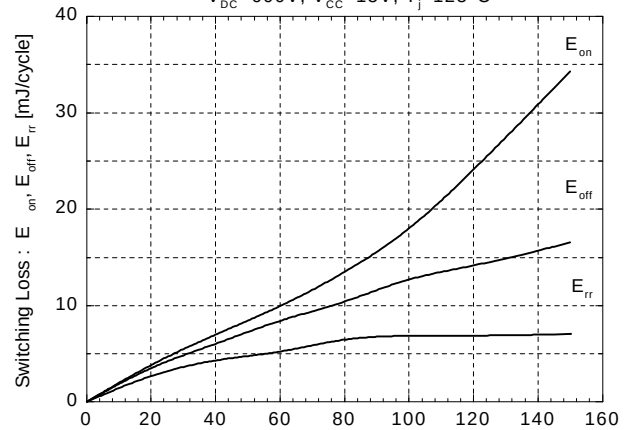
Switching Loss vs. Collector Current

$V_{DC} = 600V, V_{CC} = 15V, T_j = 25^\circ C$

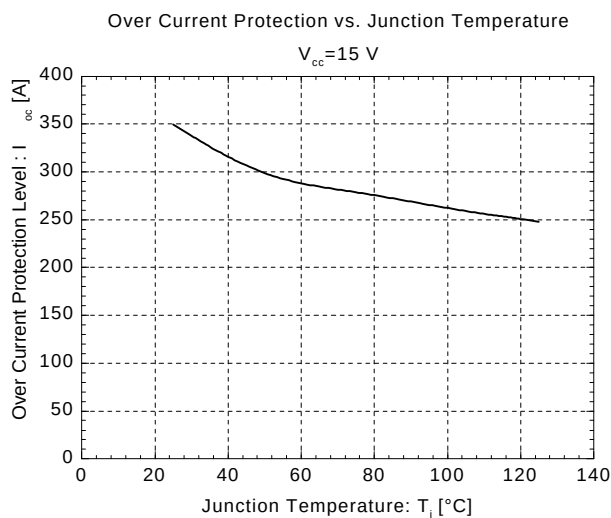


Switching Loss vs. Collector Current

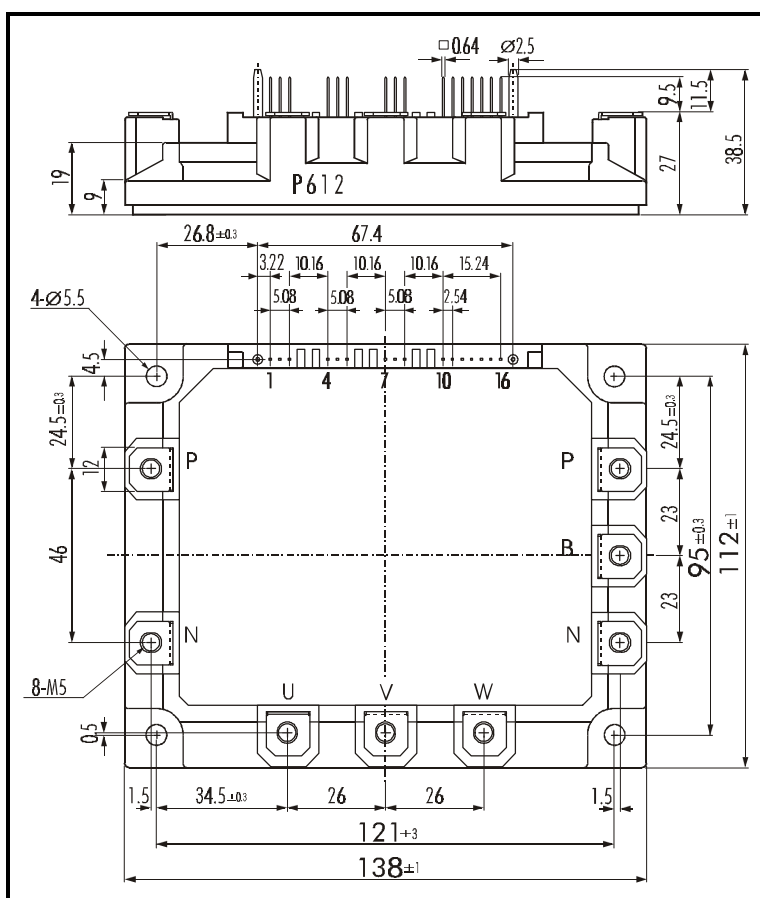
$V_{DC} = 600V, V_{CC} = 15V, T_j = 125^\circ C$



■ Inverter



■ Outline Drawing



Weight: 920g