

6MBP100VEA120-50

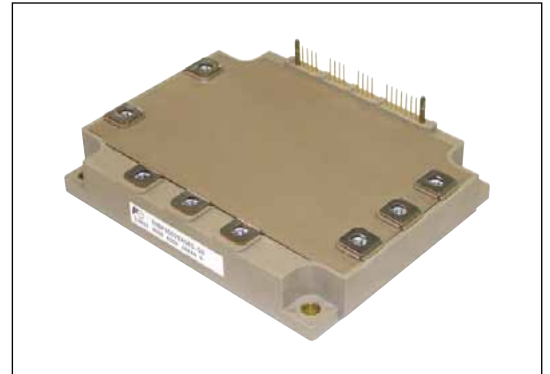
IGBT Modules

IGBT MODULE (V series)

1200V / 100A / IPM

■ Features

- Temperature protection provided by directly detecting the junction temperature of the IGBTs
- Low power loss and soft switching
- High performance and high reliability IGBT with overheating protection
- Higher reliability because of a big decrease in number of parts in built-in control circuit



■ Maximum Ratings and Characteristics

● Absolute Maximum Ratings ($T_c=25^\circ\text{C}$, $V_{cc}=15\text{V}$ unless otherwise specified)

Items		Symbol	Min.	Max.	Units	
Collector-Emitter Voltage (*1)		V_{CES}	0	1200	V	
Short Circuit Voltage		V_{SC}	400	800	V	
Inverter	Collector Current	DC	I_C	-	100	A
		1ms	I_{CP}	-	200	A
		Duty=100% (*2)	$-I_C$	-	100	A
Collector Power Dissipation	1 device (*3)	P_C	-	581	W	
Brake	Collector Current	DC	I_C	-	-	A
		1ms	I_{CP}	-	-	A
	Forward Current of Diode		I_F	-	-	A
	Collector Power Dissipation	1 device (*3)	P_C	-	-	W
Supply Voltage of Pre-Driver (*4)		V_{CC}	-0.5	20	V	
Input Signal Voltage (*5)		V_{in}	-0.5	$V_{CC}+0.5$	V	
Alarm Signal Voltage (*6)		V_{ALM}	-0.5	V_{CC}	V	
Alarm Signal Current (*7)		I_{ALM}	-	20	mA	
Junction Temperature		T_J	-	150	$^\circ\text{C}$	
Operating Case Temperature		T_{opr}	-20	110	$^\circ\text{C}$	
Storage Temperature		T_{stg}	-40	125	$^\circ\text{C}$	
Solder Temperature (*8)		T_{sol}	-	260	$^\circ\text{C}$	
Isolating Voltage (*9)		V_{iso}	-	AC2500	Vrms	
Screw Torque	Terminal (M5)	-	-	3.5	Nm	
	Mounting (M5)	-	-	3.5	Nm	

Note *1: V_{CES} shall be applied to the input voltage between all Collector and Emitter.

[P1-(U,V,W,B), P2-(U,V,W,B), (U,V,W,B)-N1, (U,V,W,B)-N2]

Note *2: Duty= $125^\circ\text{C}/R_{th(j-c)/D}/(I_F \times V_F \text{ Max.}) \times 100$

Note *3: $P_C=125^\circ\text{C}/R_{th(j-c)}$ (Inverter & Brake)

Note *4: V_{CC} shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9, 14 and 13.

Note *5: V_{in} shall be applied to the input voltage between terminal No.2 and 1, 6 and 5, 10 and 9, 15~18 and 13.

Note *6: V_{ALM} shall be applied to the voltage between terminal No.4 and 1, 8 and 5, 12 and 9, 19 and 13.

Note *7: I_{ALM} shall be applied to the input current to terminal No.4, 8, 12 and 19.

Note *8: Immersion time $10 \pm 1 \text{ sec. 1 time}$

Note *9: Terminal to base, 50/60Hz sine wave 1min. All terminals should be connected together during the test.

● Electrical Characteristics (T_J=25°C, V_{cc}=15V unless otherwise specified)

Items		Symbol	Conditions	Min.	Typ.	Max.	Units	
Inverter	Collector Current at off signal input	I _{CES}	V _{CE} =1200V	-	-	1.0	mA	
	Collector-Emitter saturation voltage (*10)	V _{CE(sat)}	I _C =100A	Terminal	-	-	2.20	V
				Chip	-	1.70	-	V
	Forward voltage of FWD (*10)	V _F	I _F =100A	Terminal	-	-	2.65	V
Chip				-	2.10	-	V	
Brake	Collector Current at off signal input	I _{CES}	-	-	-	-	mA	
	Collector-Emitter saturation voltage (*10)	V _{CE(sat)}	-	-	-	-	V	
				-	-	-	V	
Forward voltage of FWD (*10)	V _F	-	-	-	-	V		
			-	-	-	V		
Switching time	t _{on}	V _{DC} =600V, T _J =125°C, I _C =100A		1.1	-	-	μs	
	t _{off}			-	-	2.1	μs	
	t _{rr}			V _{DC} =600V, I _F =100A	-	-	0.3	μs
Supply current of P-side pre-driver (per one unit)		I _{ccp}	Switching Frequency= 0-15kHz T _C =-20~110°C	-	-	26	mA	
Supply current of N-side pre-driver		I _{ccn}		-	-	78	mA	
Input signal threshold voltage		V _{in(th)(on)}	V _{in} -GND	ON	1.2	1.4	1.6	V
		V _{in(th)(off)}		OFF	1.5	1.7	1.9	V
Over Current Protection Level	Inverter	I _{OC}	T _J =125°C	150	-	-	A	
	Brake			-	-	-	A	
Over Current Protection Delay time		t _{dOC}	T _J =125°C	-	5	-	μs	
Short Circuit Protection Delay time		t _{sc}	T _J =125°C	-	2	3	μs	
IGBT Chips Over Heating Protection Temperature Level		T _{JOH}	Surface of IGBT Chips	150	-	-	°C	
Over Heating Protection Hysteresis		T _{JH}		-	20	-	°C	
Under Voltage Protection Level		V _{UV}		11.0	-	12.5	V	
Under Voltage Protection Hysteresis		V _H		0.2	0.5	-	V	
Alarm Signal Hold Time		t _{ALM(OC)}	ALM-GND T _C =-20~110°C	V _{CC} ≥10V	1.0	2.0	2.4	ms
		t _{ALM(UV)}			2.5	4.0	4.9	ms
		t _{ALM(TJOH)}			5.0	8.0	11.0	ms
Resistance for current limit		R _{ALM}		960	1265	1570	Ω	

Note *10: The Max value is a case where it measures from P2-(U,V,W,B) , (U,V,W,B)-N2.

● Thermal Characteristics (T_c = 25°C)

Items			Symbol	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance (*11)	Inverter	IGBT	R _{th(j-c)Q}	-	-	0.215	°C/W
		FWD	R _{th(j-c)D}	-	-	0.325	°C/W
	Brake	IGBT	R _{th(j-c)Q}	-	-	-	°C/W
		FWD	R _{th(j-c)D}	-	-	-	°C/W
Case to Fin Thermal Resistance with Compound			R _{th(c-f)}	-	0.05	-	°C/W

Note *11: For 1device, the measurement point of the case is just under the chip.

● Noise Immunity (V_{DC}=600V, V_{CC}=15V)

Items	Conditions	Min.	Typ.	Max.	Units
Common mode rectangular noise	Pulse width 1μs, polarity ±10 min. Judge : no over-current, no miss operating	±2.0	-	-	kV

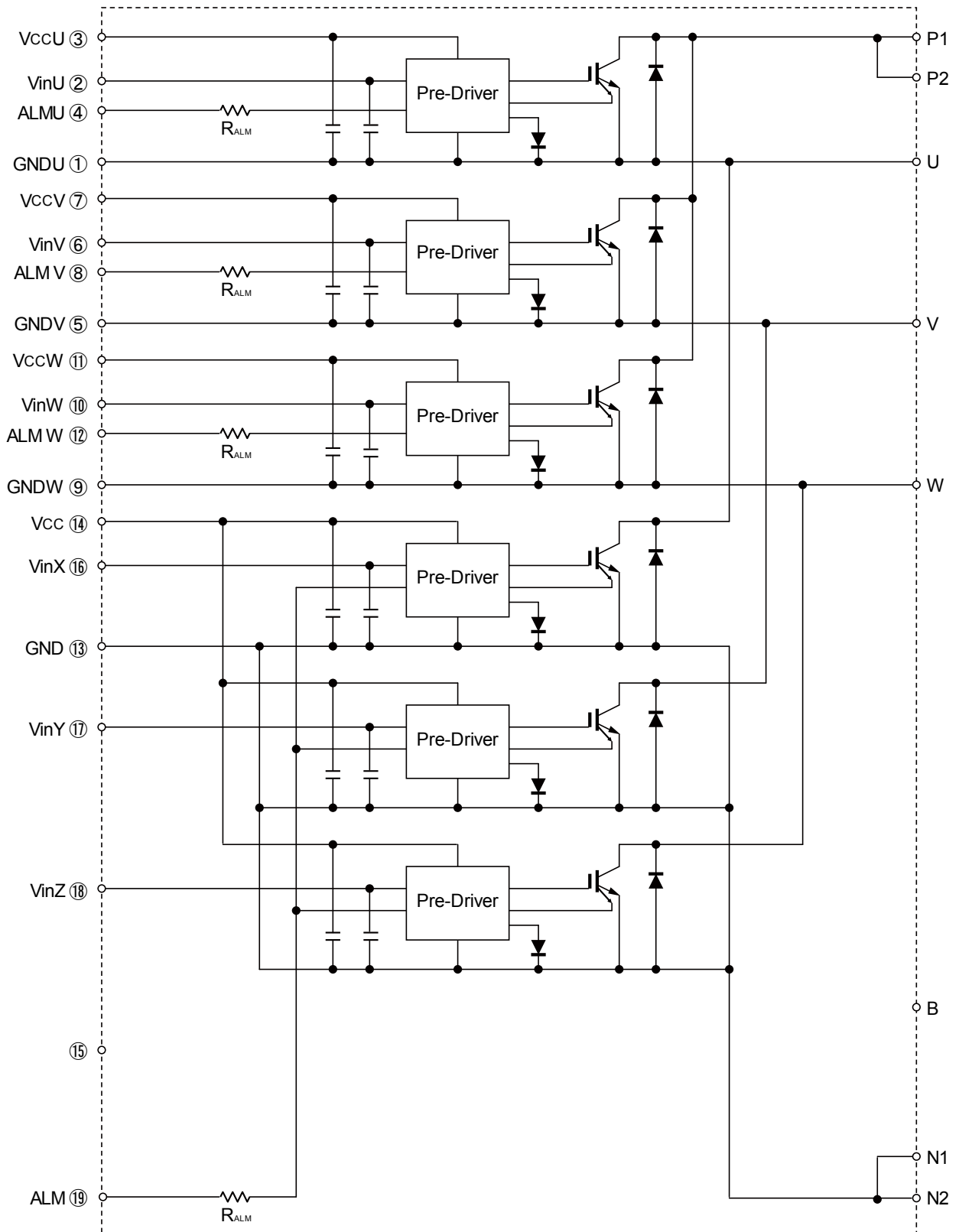
● Recommended Operating Conditions

Items	Symbol	Min.	Typ.	Max.	Units
DC Bus Voltage	V _{DC}	-	-	800	V
Power Supply Voltage of Pre-Driver	V _{CC}	13.5	15.0	16.5	V
Switching frequency of IPM	f _{SW}	-	-	20	kHz
Arm shoot through blocking time for IPM's input signal	t _{dead}	1.0	-	-	μs
Screw Torque (M5)	-	2.5	-	3.5	Nm

● Weight

Items	Symbol	Min.	Typ.	Max.	Units
Weight	W _t	-	940	-	g

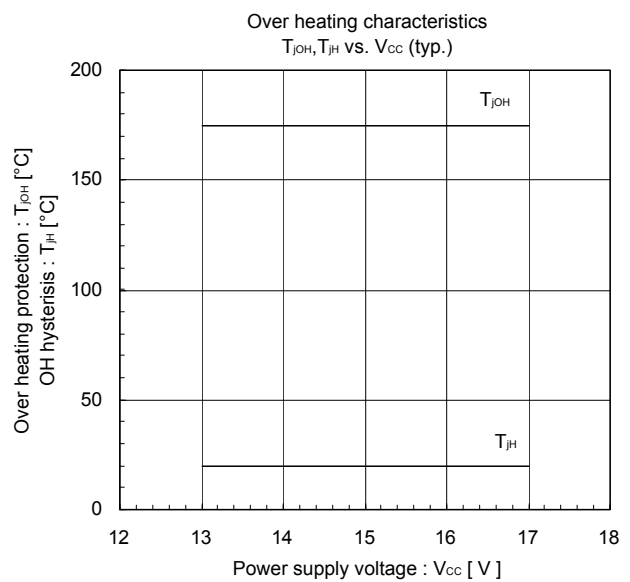
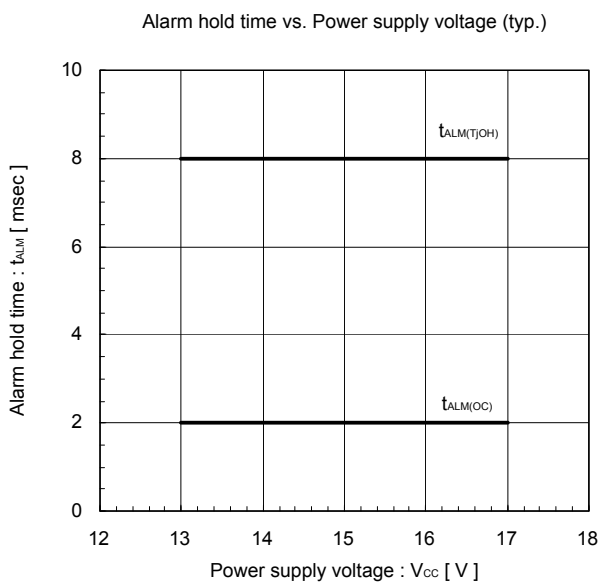
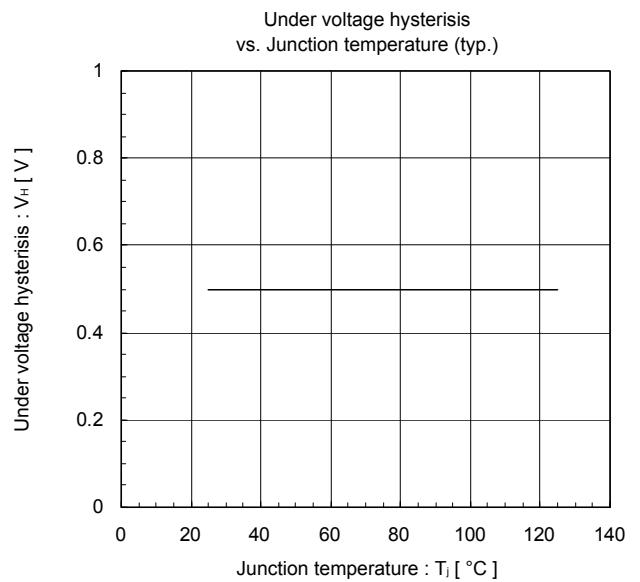
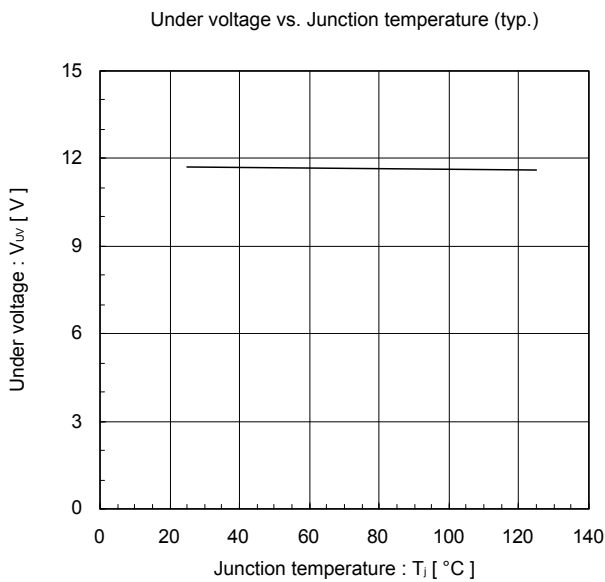
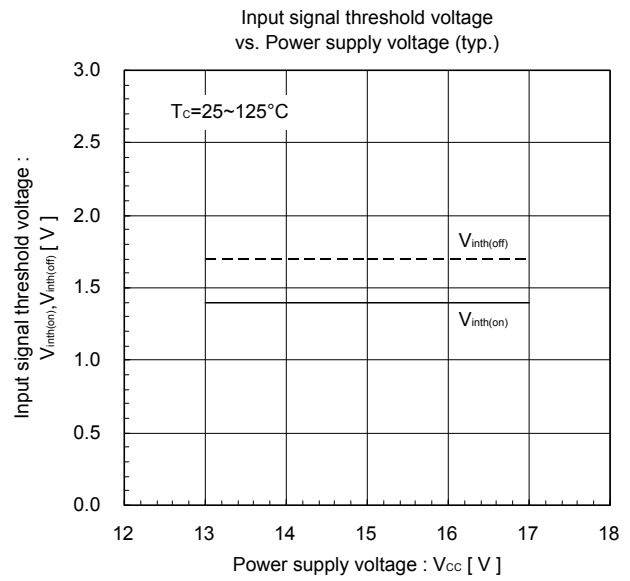
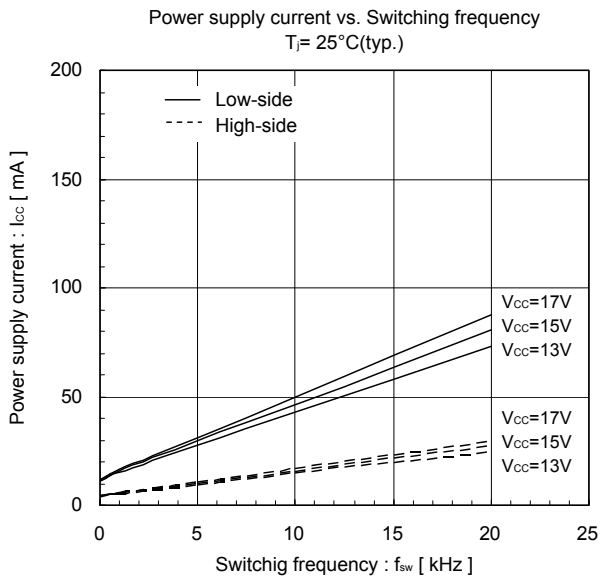
■ Block Diagram



Pre-drivers include following functions

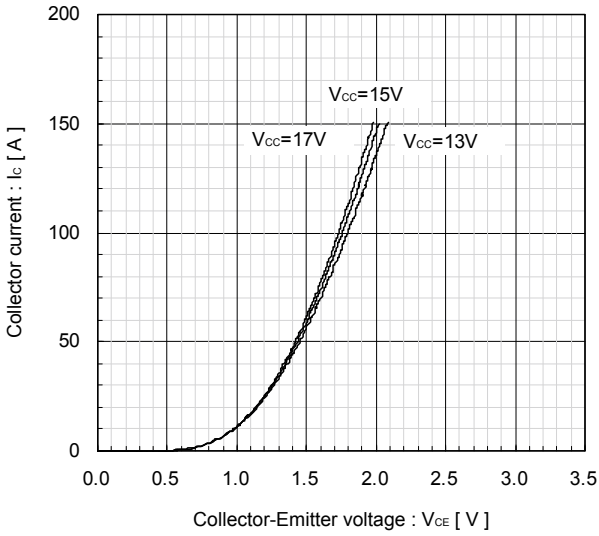
1. Amplifier for driver
2. Short circuit protection
3. Under voltage lockout circuit
4. Over current protection
5. IGBT chip over heating protection

■ Characteristics (Representative)

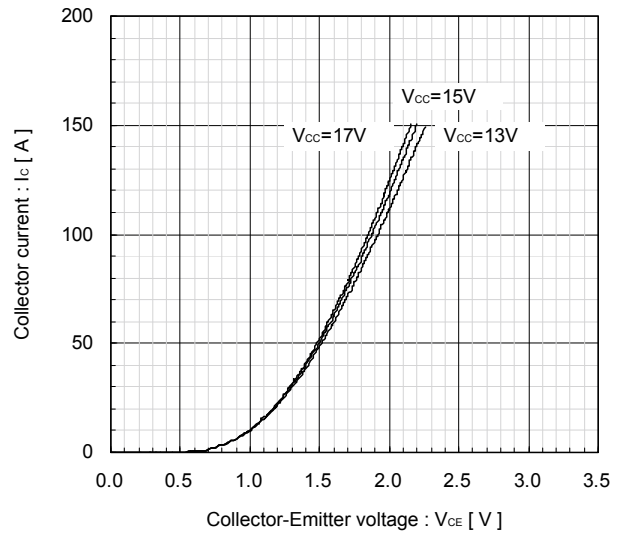


Inverter

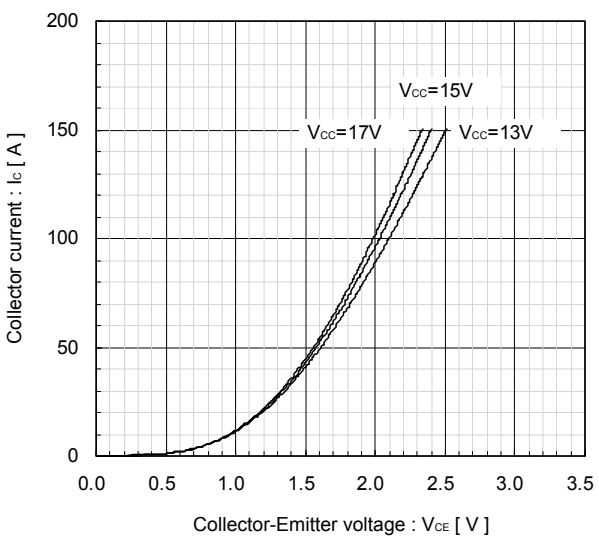
Collector current vs. Collector-Emitter voltage
 $T_J=25^\circ\text{C}$ [Chip] (typ.)



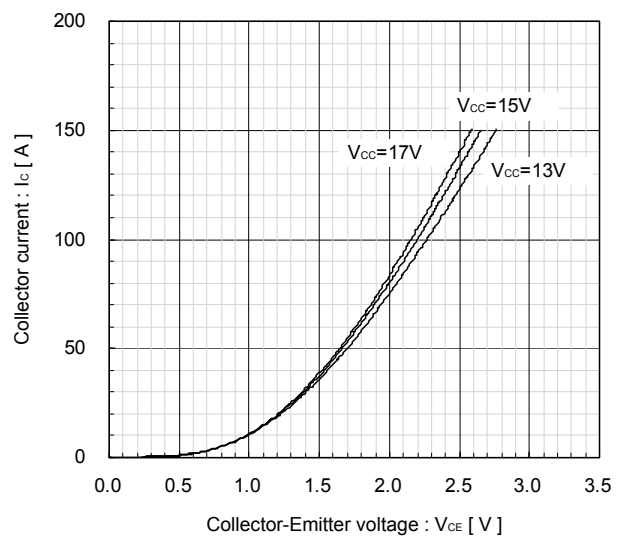
Collector current vs. Collector-Emitter voltage
 $T_J=25^\circ\text{C}$ [Terminal] (typ.)



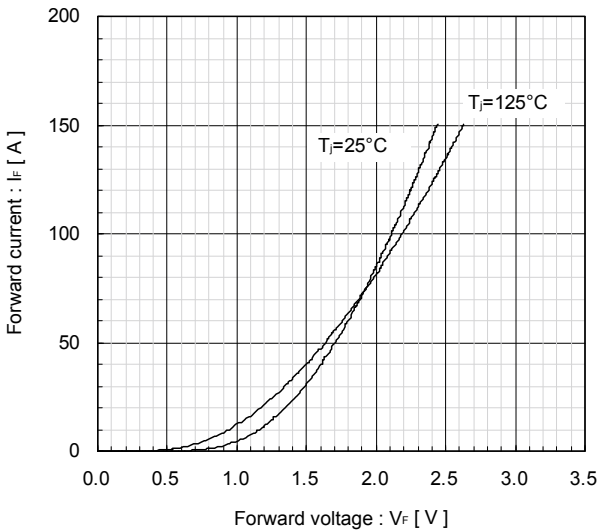
Collector current vs. Collector-Emitter voltage
 $T_J=125^\circ\text{C}$ [Chip] (typ.)



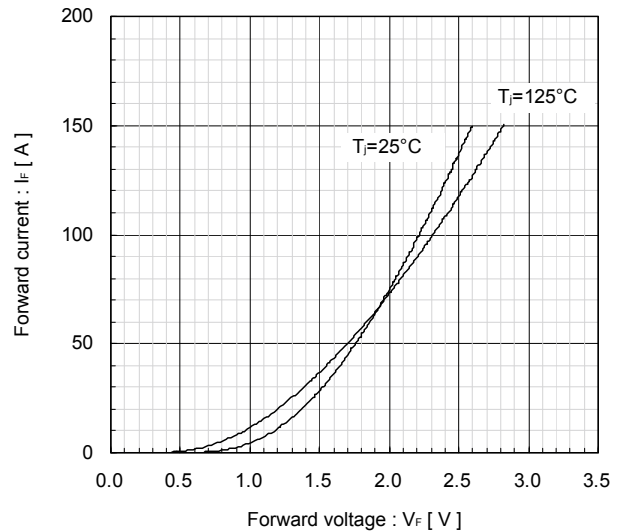
Collector current vs. Collector-Emitter voltage
 $T_J=125^\circ\text{C}$ [Terminal] (typ.)



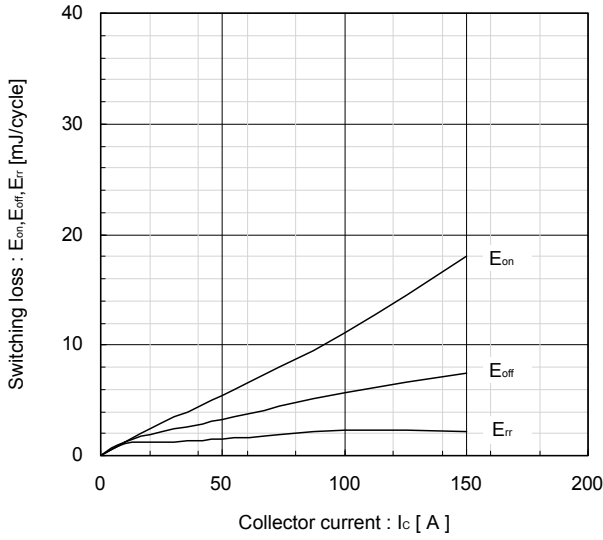
Forward current vs. Forward voltage
 [Chip] (typ.)



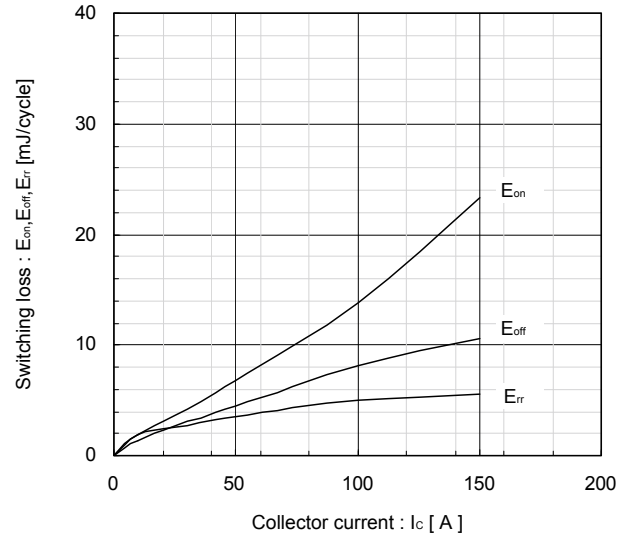
Forward current vs. Forward voltage
 [Terminal] (typ.)



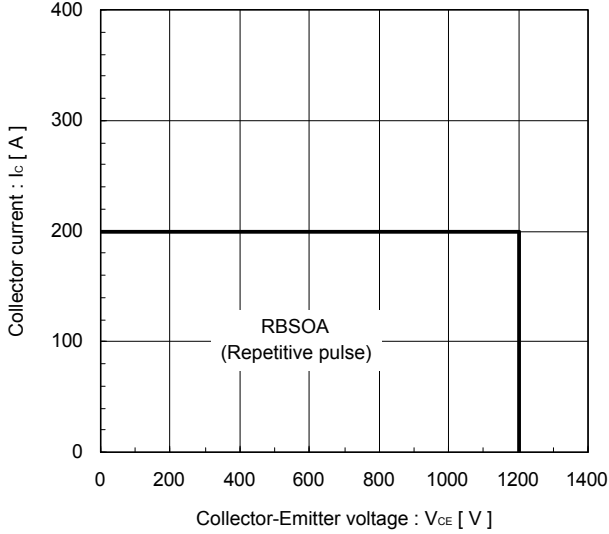
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_j=25^\circ C$



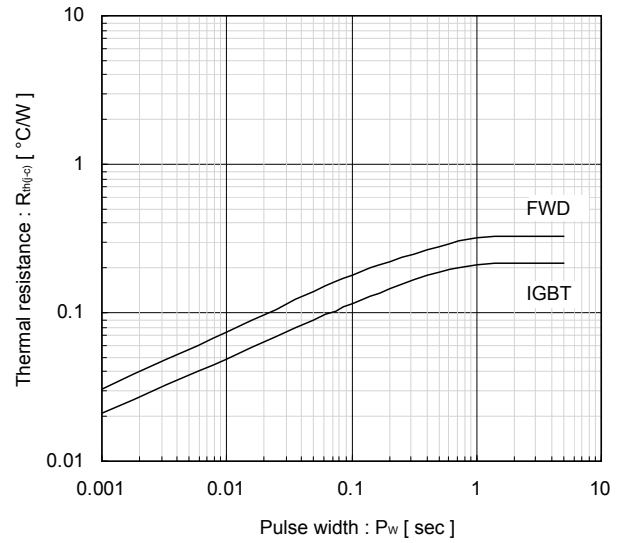
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_j=125^\circ C$



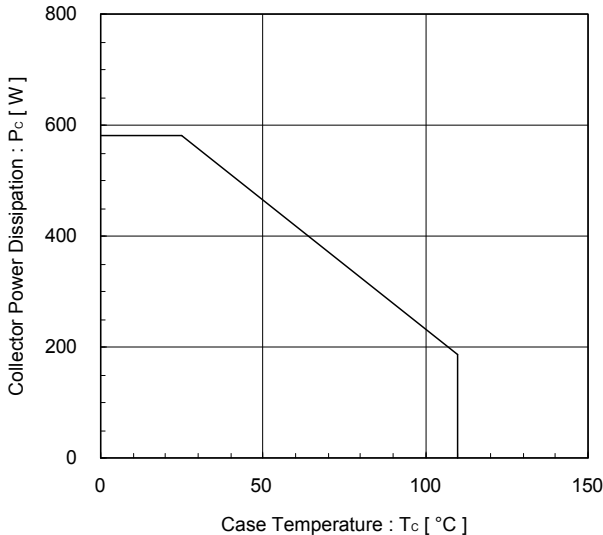
Reversed biased safe operating area
 $V_{CC}=15V, T_j \le 125^\circ C$ [Main Terminal] (min.)



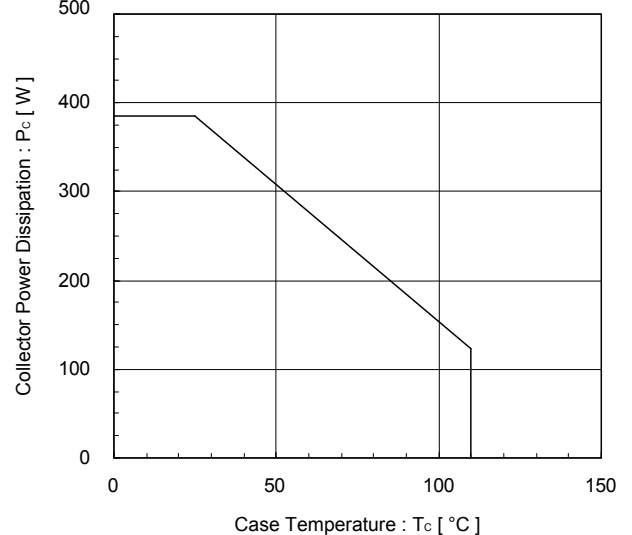
Transient thermal resistance (max.)



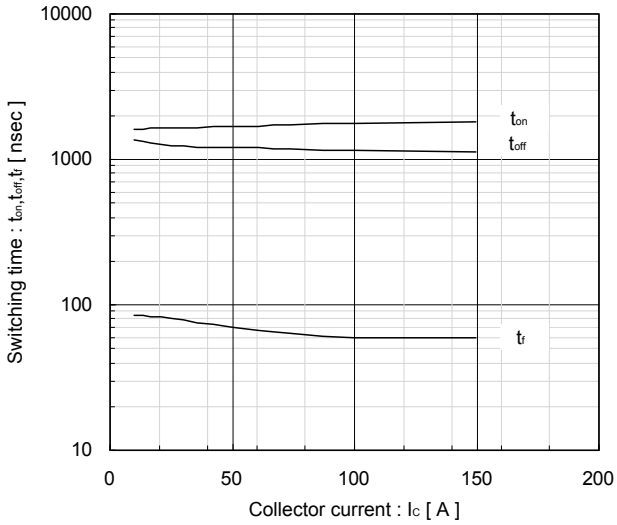
Power derating for IGBT (max.)
 [per device]



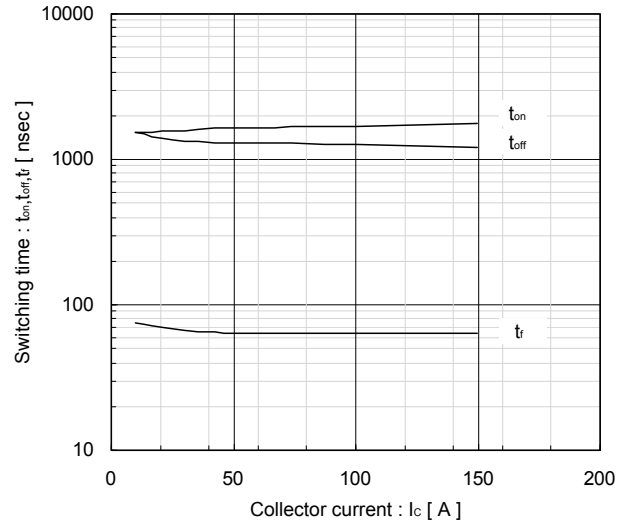
Power derating for FWD (max.)
 [per device]



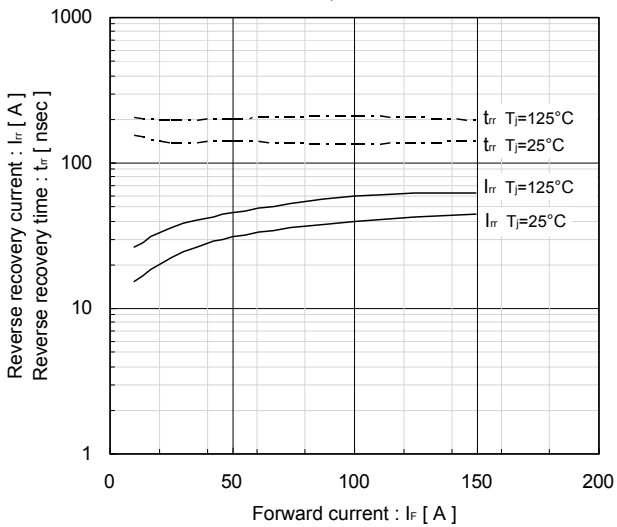
Switching time vs. Collector current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_J=25^\circ C$



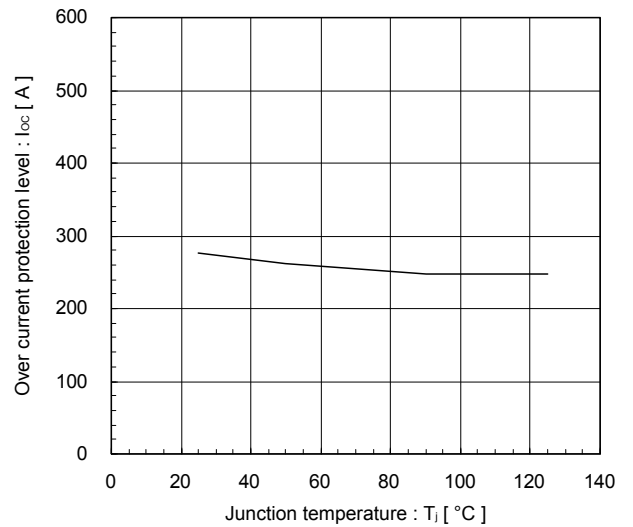
Switching time vs. Collector current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_J=125^\circ C$



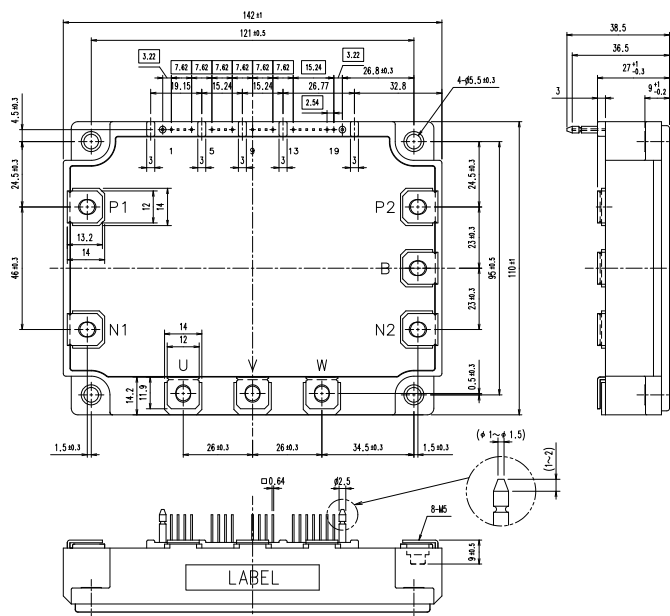
Reverse recovery characteristics (typ.)
 t_{rr}, I_{rr} vs. I_F



Over current protection vs. Junction temperature (typ.)
 $V_{CC}=15V$



■ Outline Drawings, mm



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IGBT Modules

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