

6MBP50VBA120-50

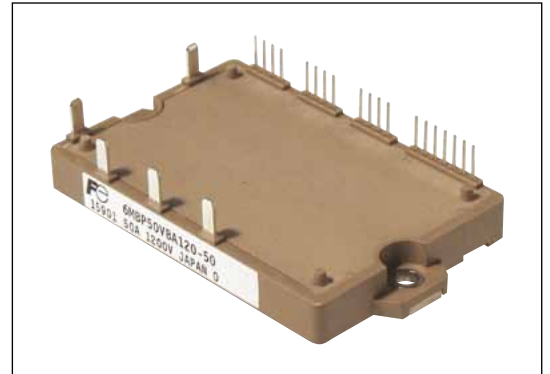
IGBT Modules

IGBT MODULE (V series)

1200V / 50A / IPM

■ Features

- Temperature protection provided by directly detecting the junction temperature of the IGBTs
- Low power loss and soft switching
- Compatible with existing IPM-N series packages
- 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
Collector Current	DC	I_c	50	A
	1ms	I_c pulse	100	A
	Duty=100% (*2)	$-I_c$	50	A
Collector Power Dissipation	1 device (*3)	P_c	255	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	Mounting (M4)	-	1.7	Nm

Note *1: V_{CES} shall be applied to the input voltage between terminal P-(U,V, W) and (U,V, W)-N.

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

Note *3: $P_c=125^\circ\text{C}/R_{th(j-c)}Q$

Note *4: V_{CC} shall be applied to the input voltage between terminal No.4 and 1, 8 and 5, 12 and 9, 14 and 13.

Note *5: V_{in} shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9, 16~18 and 13.

Note *6: V_{ALM} shall be applied to the voltage between terminal No.2 and 1, 6 and 5, 10 and 9, 19 and 13.

Note *7: I_{ALM} shall be applied to the input current to terminal No.2,6,10 and 19.

Note *8: Immersion time 10 ± 1 sec. 1time.

Note *9: Terminal to base, 50/60Hz sine wave 1minute.

● 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	V _{CE(sat)}	I _c =50A	Terminal	-	-	2.30	V
				Chip	-	1.70	-	V
	Forward voltage of FWD	V _F	I _F =50A	Terminal	-	-	2.60	V
Chip				-	2.10	-	V	
Switching time	t _{on}	V _{DC} =600V, T _j =125°C	1.1	-	-	μs		
	t _{off}	I _c =50A	-	-	2.1	μs		
	t _{rr}	V _{DC} =600V I _F =50A	-	-	0.3	μs		
Supply current of P-side pre-driver (per one unit)	I _{ccp}	Switching Frequency= 0-15kHz	-	-	15	mA		
Supply current of N-side pre-driver	I _{ccn}	T _c =-20~110°C	-	-	47	mA		
Input signal threshold voltage	V _{in} (on)	Vin-GND	ON	1.2	1.4	1.6	V	
	V _{in} (off)		OFF	1.5	1.7	1.9	V	
Over Current Protection Level	I _{oc}	T _j =125°C	75	-	-	A		
Over Current Protection Delay time	t _{ΔOC}	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		

● Thermal Characteristics (T_c = 25°C)

Items		Symbol	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance (*10)	Inverter	R _{th(j-c)Q}	-	-	0.49	°C/W
	IGBT	R _{th(j-c)D}	-	-	0.75	°C/W
Case to Fin Thermal Resistance with Compound	FWD	R _{th(c-f)}	-	0.05	-	°C/W

Note *10: 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 minute Judge : no over-current, no miss operating	±2.0	-	-	kV

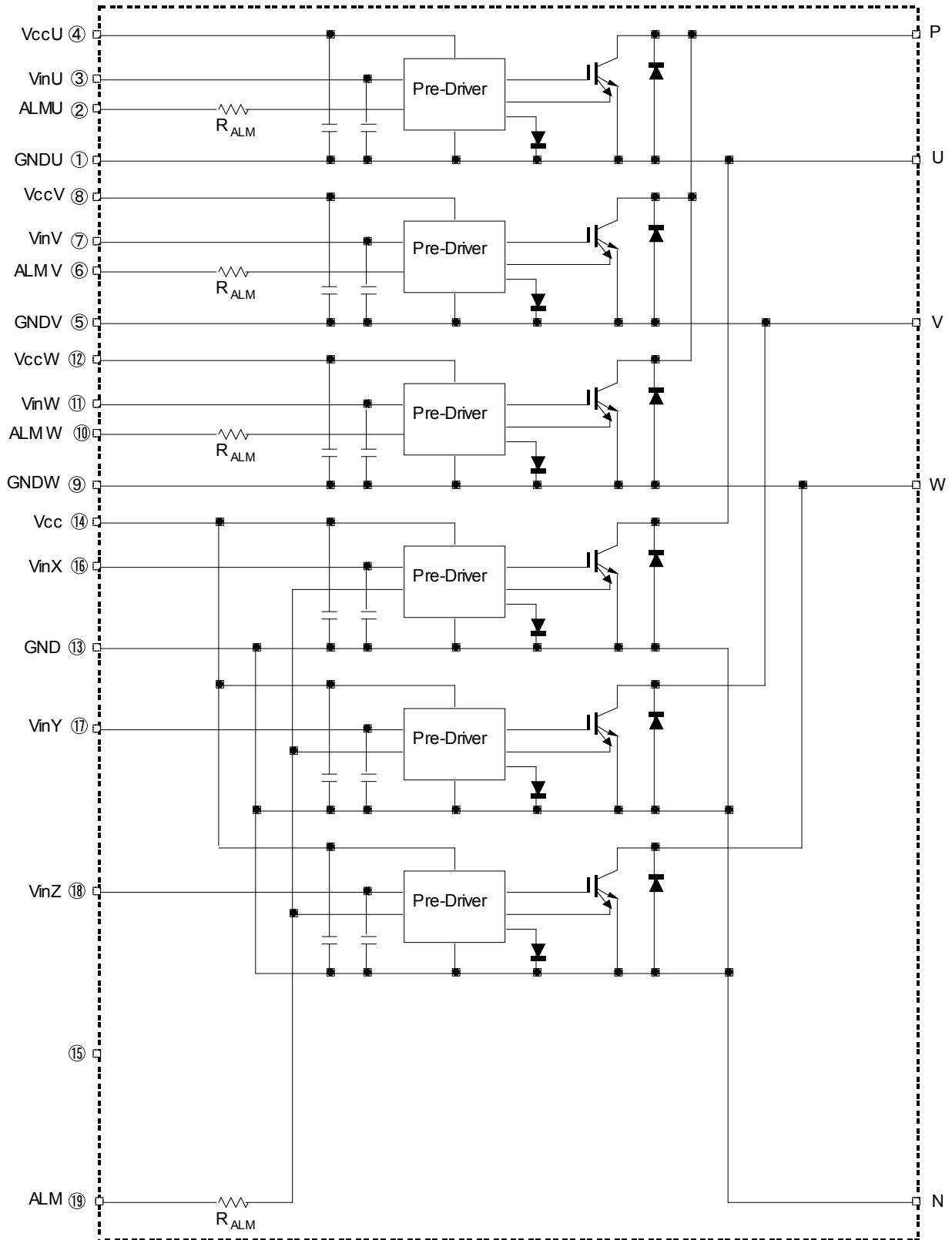
● Recommended Operating Conditions

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 (M4)	-	1.3	-	1.7	Nm

● Weight

Items	Symbol	Min.	Typ.	Max.	Units
Weight	W _i	-	100	-	g

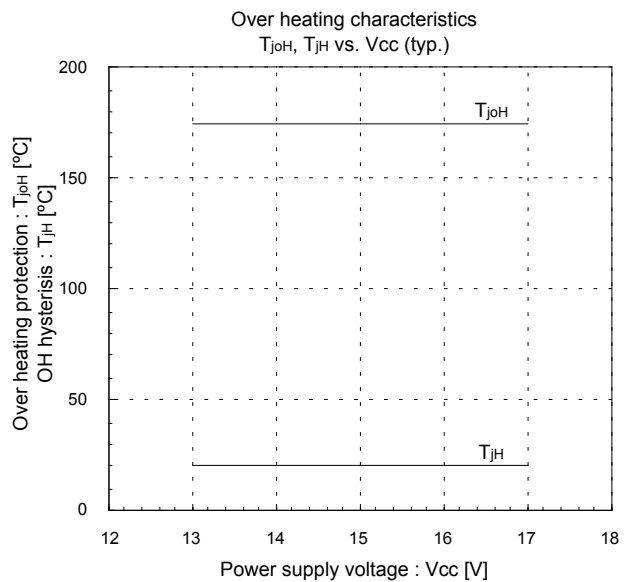
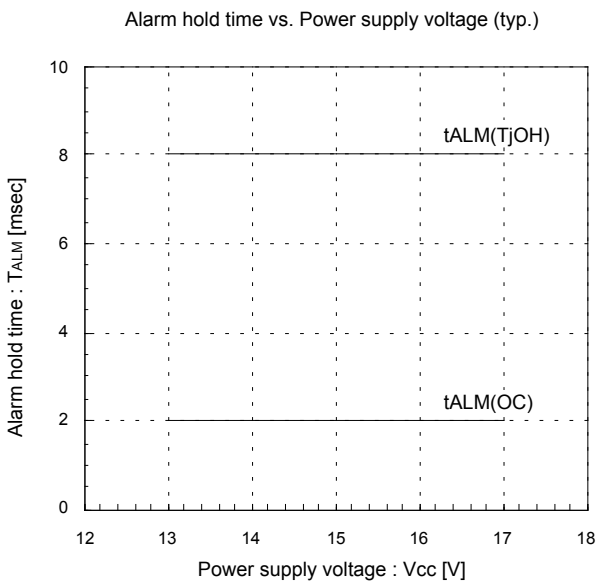
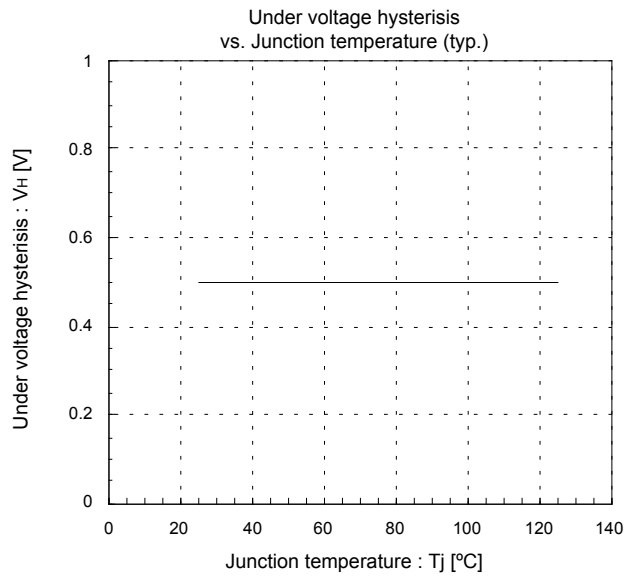
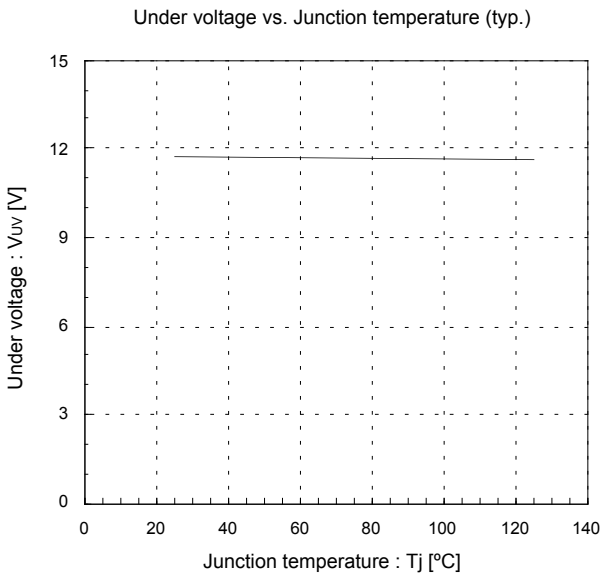
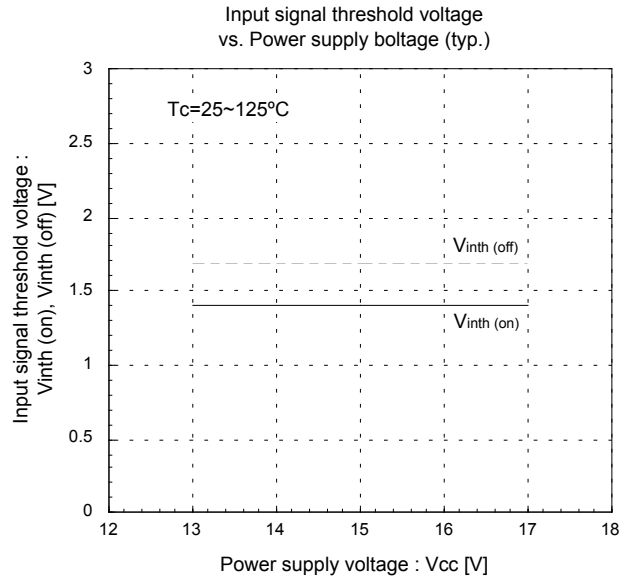
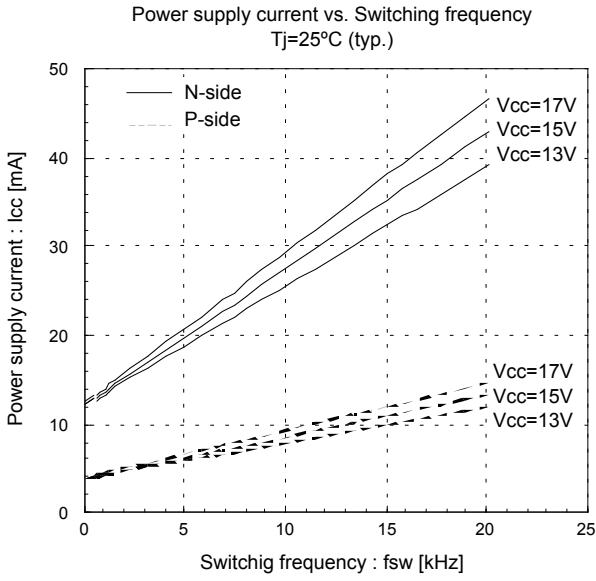
■ Block Diagram



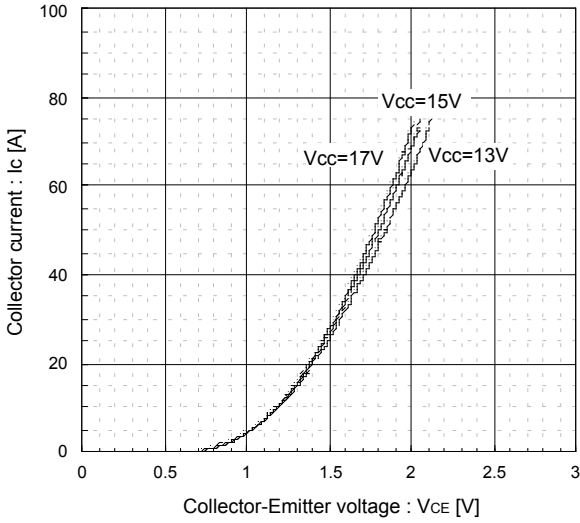
Pre-drivers include following functions

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

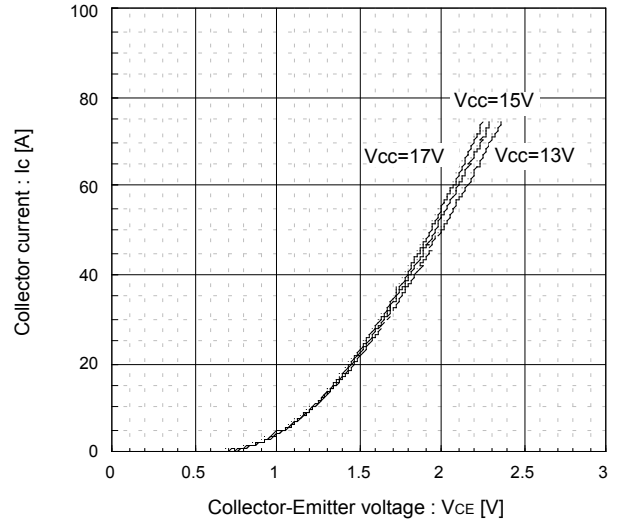
■ Characteristics (Representative)



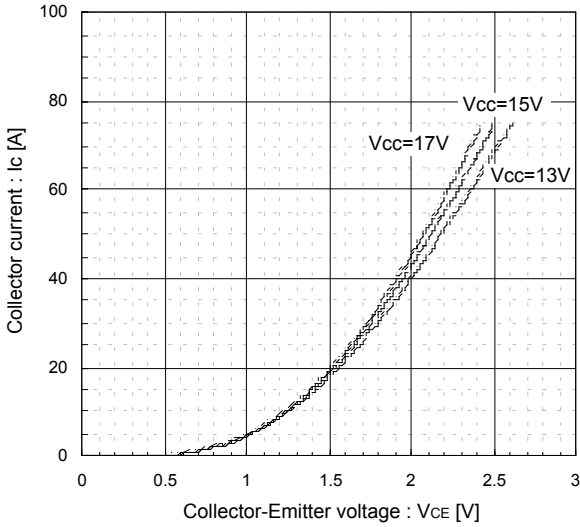
Collector current vs. collector-Emitter voltage
T_j=25°C [Chip] (typ.)



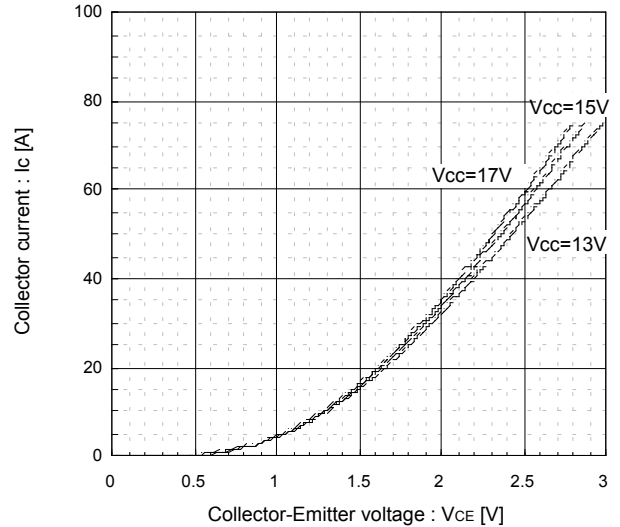
Collector current vs. collector-Emitter voltage
T_j=25°C [Terminal] (typ.)



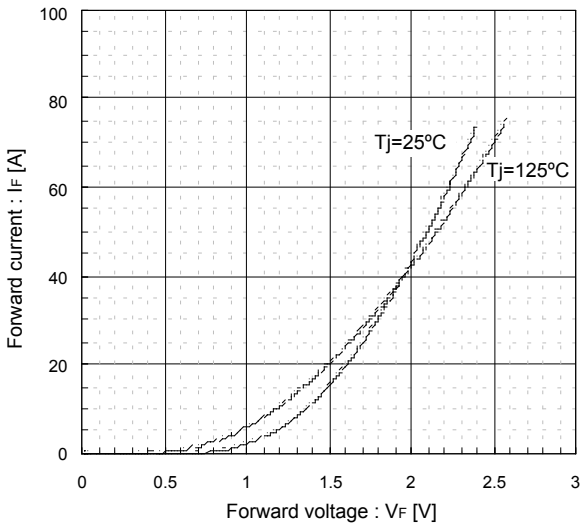
Collector current vs. collector-Emitter voltage
T_j=125°C [Chip] (typ.)



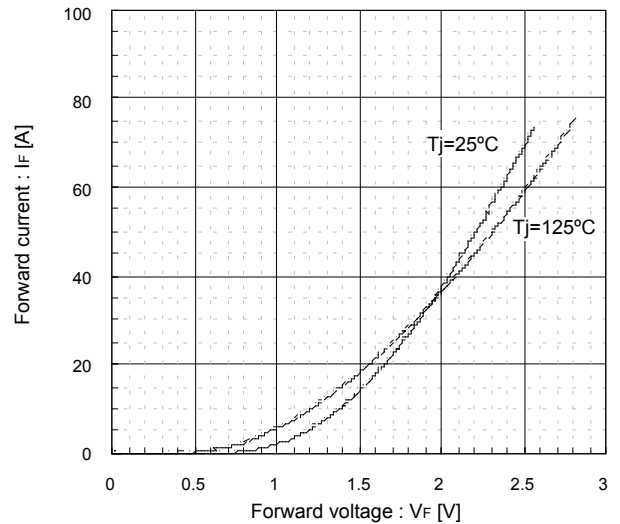
Collector current vs. collector-Emitter voltage
T_j=125°C [Terminal] (typ.)



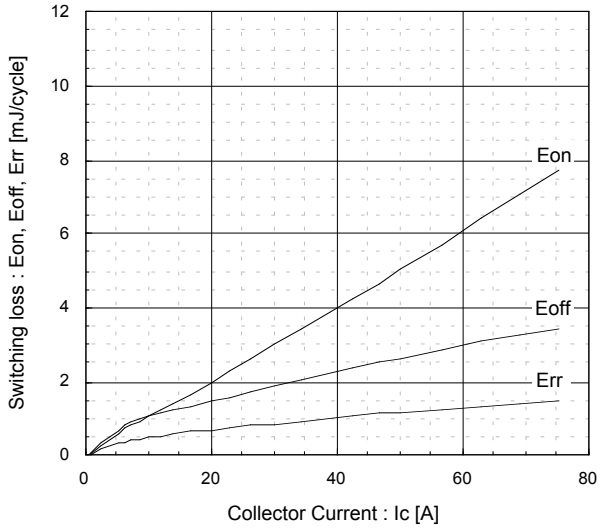
Forward current vs. Forward voltage
[Chip] (typ.)



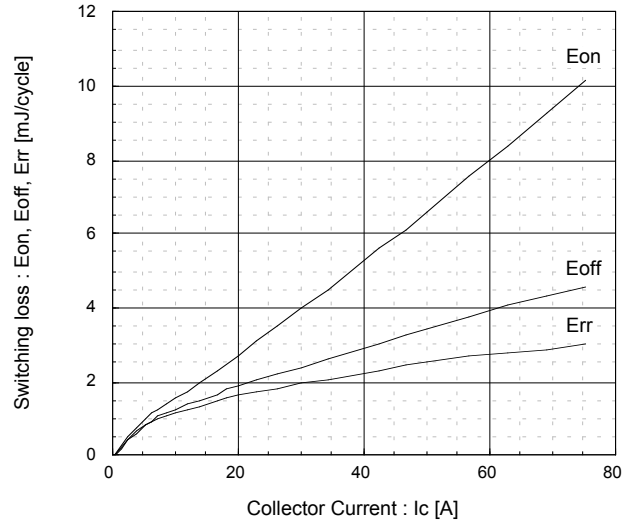
Forward current vs. Forward voltage
[Terminal] (typ.)



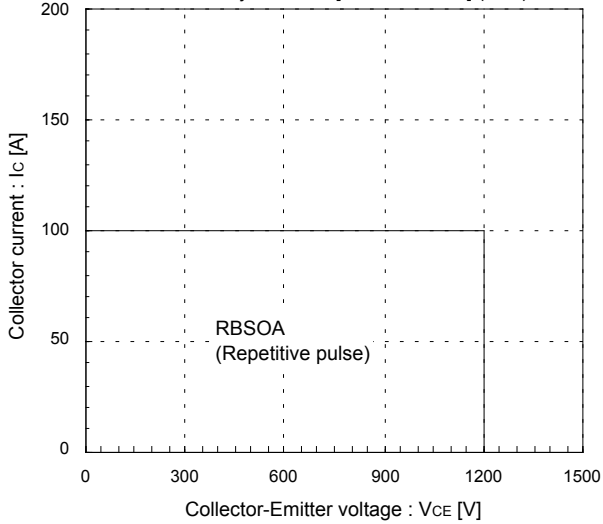
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_j=25^{\circ}C$



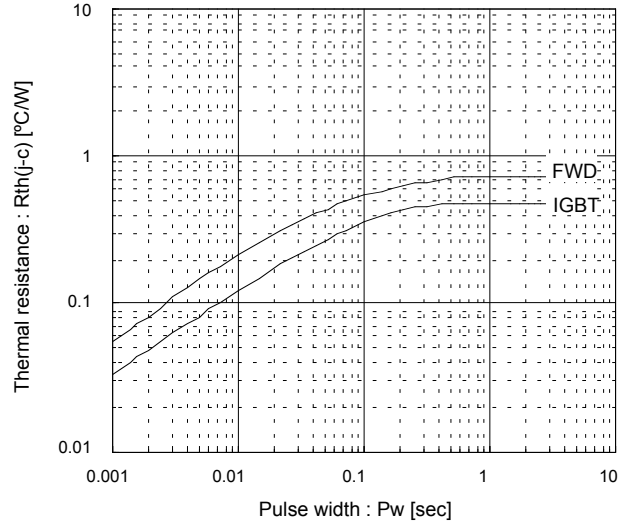
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_j=125^{\circ}C$



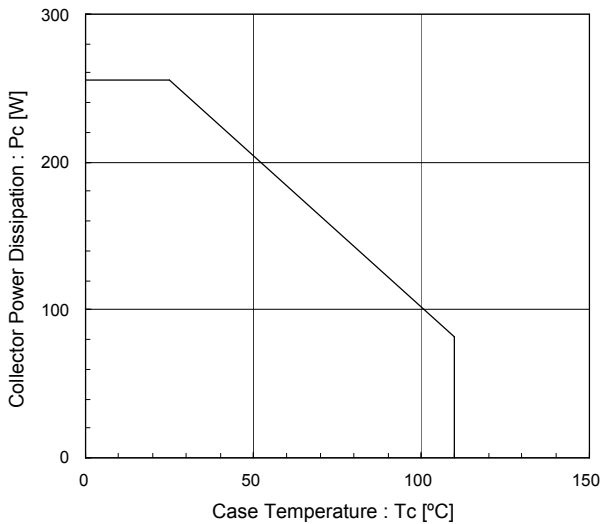
Reversed biased safe operating area
 $V_{CC}=15V, T_j \leq 125^{\circ}C$ [Main Terminal] (min.)



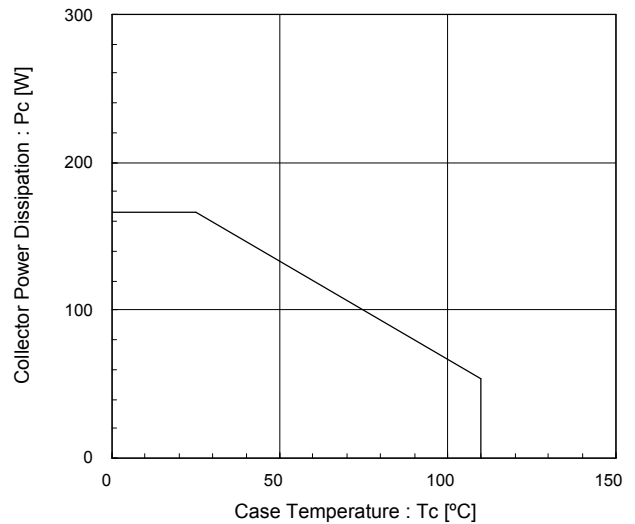
Transient thermal resistance (max.)

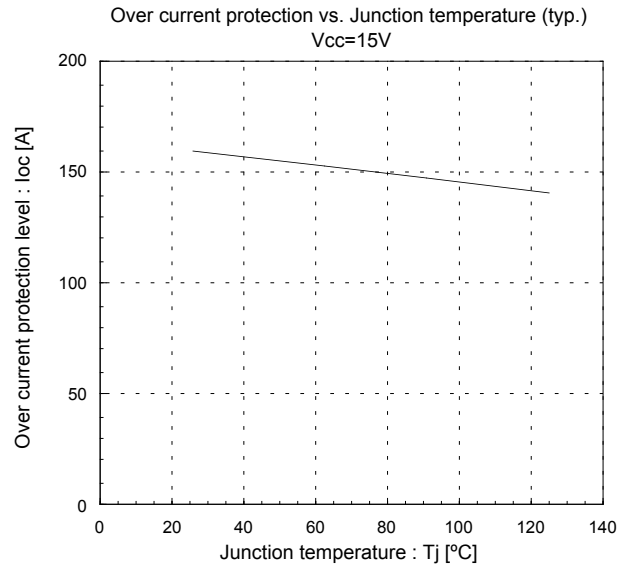
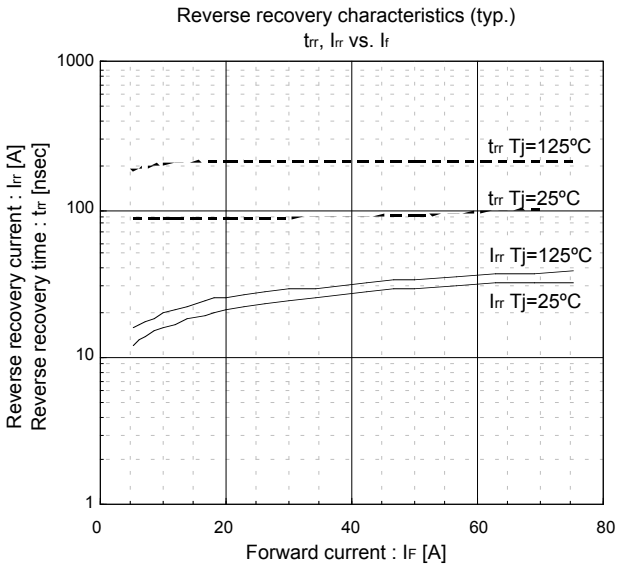
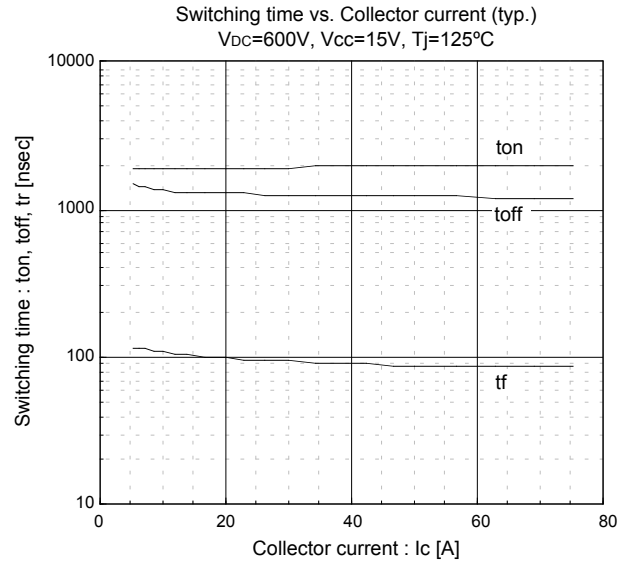
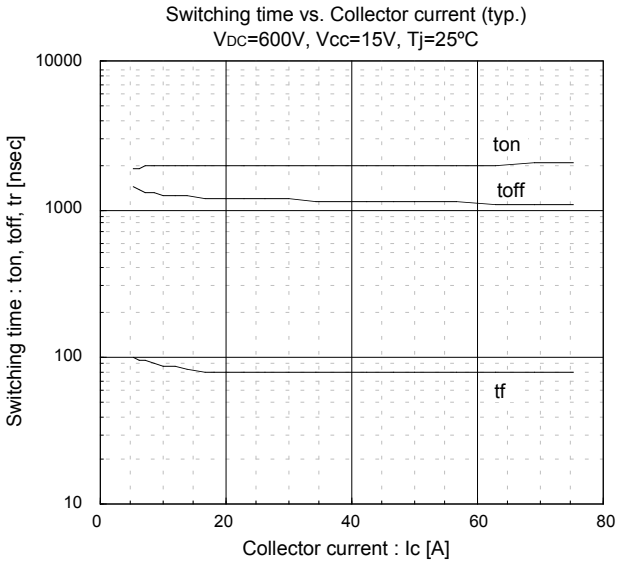


Power derating for IGBT (max.)
 [per device]

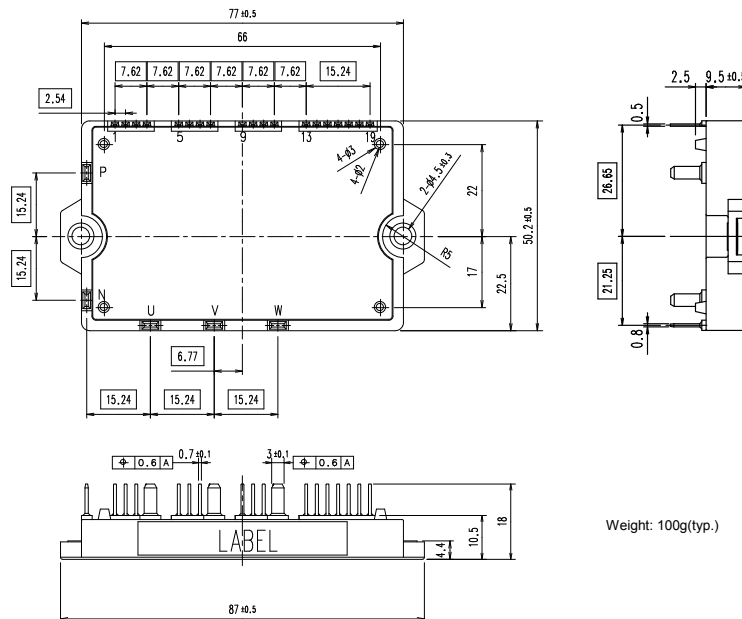


Power derating for FWD(max.)
 [per device]





Outline Drawings, mm



WARNING

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 - Measurement equipment
 - Machine tools
 - Audiovisual equipment
 - Electrical home appliances
 - Personal equipment
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