

6MBP50VAA060-50

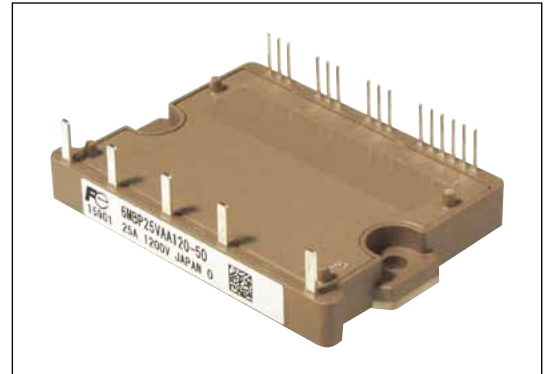
IGBT Modules

IGBT MODULE (V series)

600V / 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°C, V_{cc}=15V unless otherwise specified)

Items	Symbol	Min.	Max.	Units
Collector-Emitter Voltage (*1)	V _{CEs}	0	600	V
Short Circuit Voltage	V _{sc}	200	400	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	192	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	°C
Operating Case Temperature	T _{opr}	-20	110	°C
Storage Temperature	T _{stg}	-40	125	°C
Solder Temperature (*8)	T _{sol}	-	260	°C
Isolating Voltage (*9)	V _{iso}	-	AC2500	V _{rms}
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°C/R_{th(j-c)}D/(I_F×V_F Max.)×100

Note *3: P_c=125°C/R_{th(j-c)}Q

Note *4: V_{cc} shall be applied to the input voltage between terminal No.3 and 1, 6 and 4, 9 and 7, 11 and 10.

Note *5: V_{in} shall be applied to the input voltage between terminal No.2 and 1, 5 and 4, 8 and 7, 12~14 and 10.

Note *6: V_{ALM} shall be applied to the voltage between terminal No.15 and 10.

Note *7: I_{ALM} shall be applied to the input current to terminal No.15.

Note *8: Immersion time 10±1sec. 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} =600V	-	-	1.0	mA	
	Collector-Emitter saturation voltage	V _{CE(sat)}	I _c =50A	Terminal	-	-	2.0	V
				Chip	-	1.4	-	V
	Forward voltage of FWD	V _F	I _F =50A	Terminal	-	-	2.3	V
Chip				-	1.8	-	V	
Switching time	t _{on}	V _{DC} =300V, T _j =125°C	1.1	-	-	μs		
	t _{off}	I _c =50A	-	-	2.1	μs		
	t _{rr}	V _{DC} =300V I _F =50A	-	-	0.3	μs		
Supply current of P-side pre-driver (per one unit)	I _{ccp}	Switching Frequency= 0-15kHz	-	-	10	mA		
Supply current of N-side pre-driver	I _{ccn}	T _c =-20~110°C	-	-	25	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}	-	-	0.65	°C/W
	FWD	R _{th(j-c)D}	-	-	1.30	°C/W
Case to Fin Thermal Resistance with Compound		R _{th(c-f)}	-	0.05	-	°C/W

Note *10: For 1device, the measurement point of the case is just under the chip.

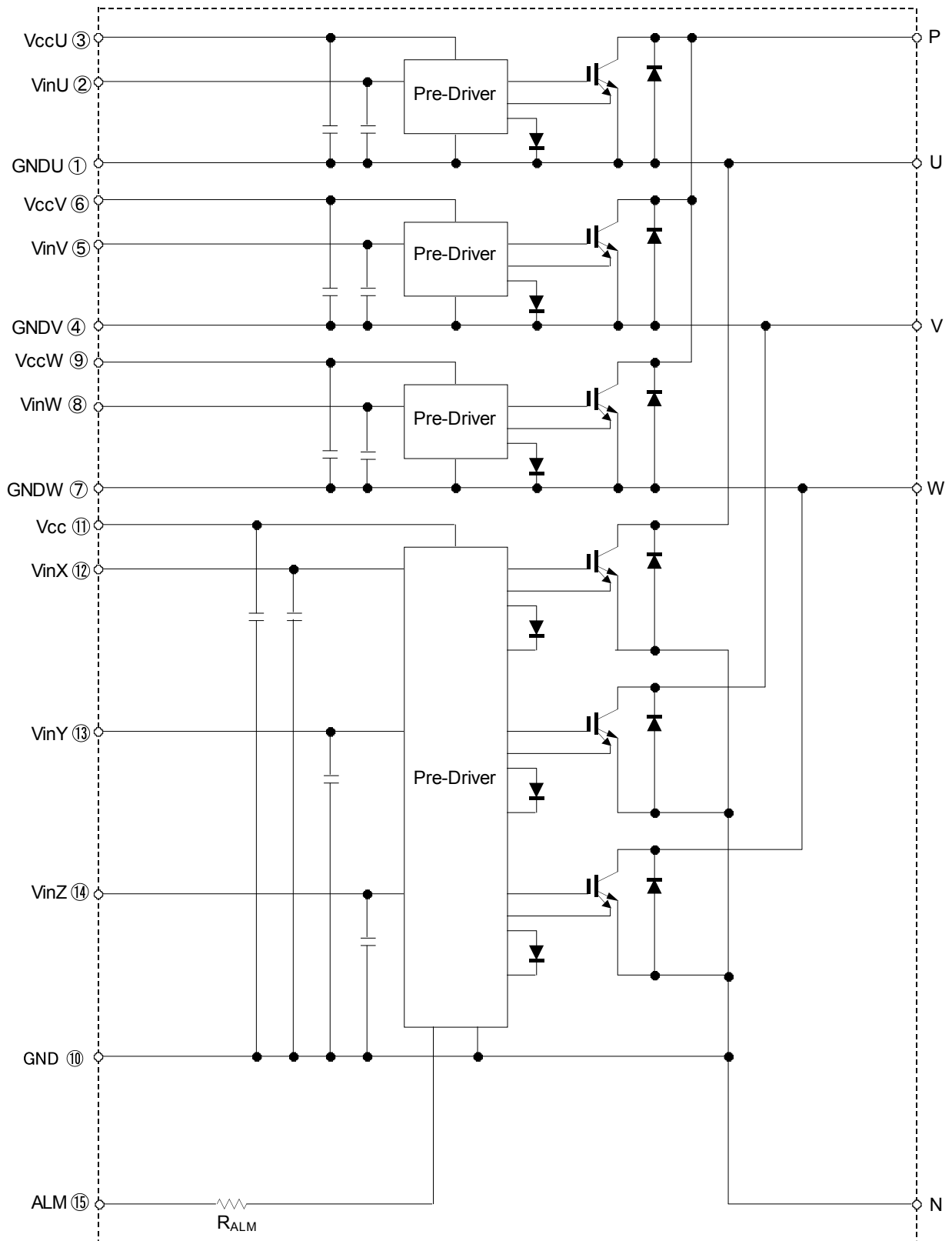
● Noise Immunity (V_{DC}=300V, V_{CC}=15V)

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}	-	-	400	V
Power Supply Voltage of Pre-Driver	V _{CC}	13.5	15.0	16.5	V
Arm shoot through blocking time for IPM's input signal	t _{dead}	1.0	-	-	μs
Screw Torque (M4)	-	1.3	-	1.7	Nm

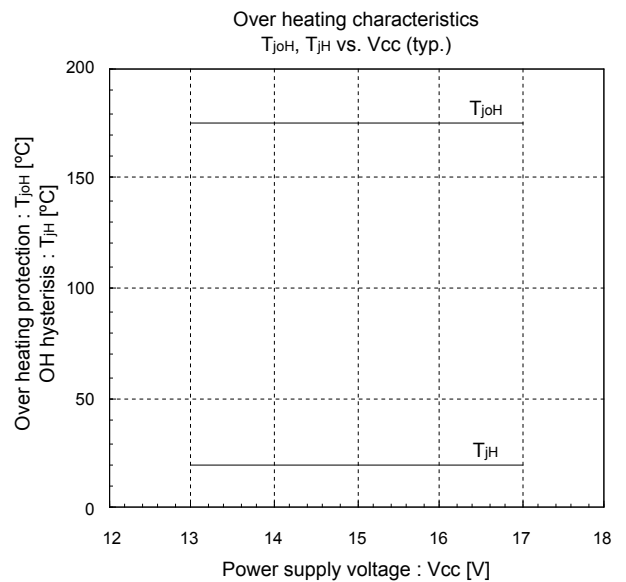
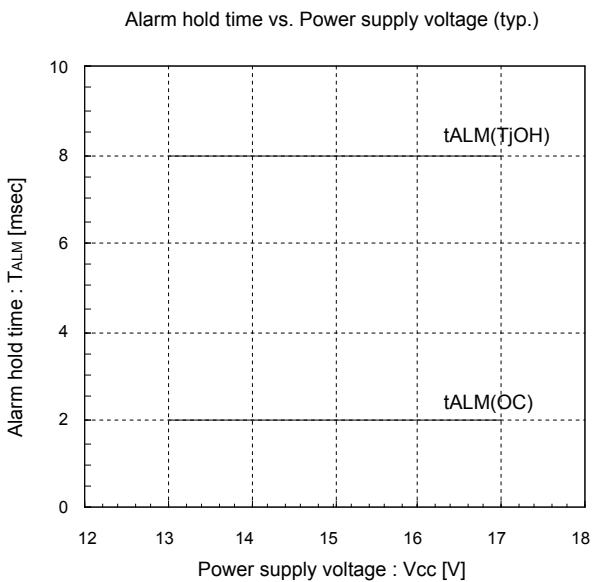
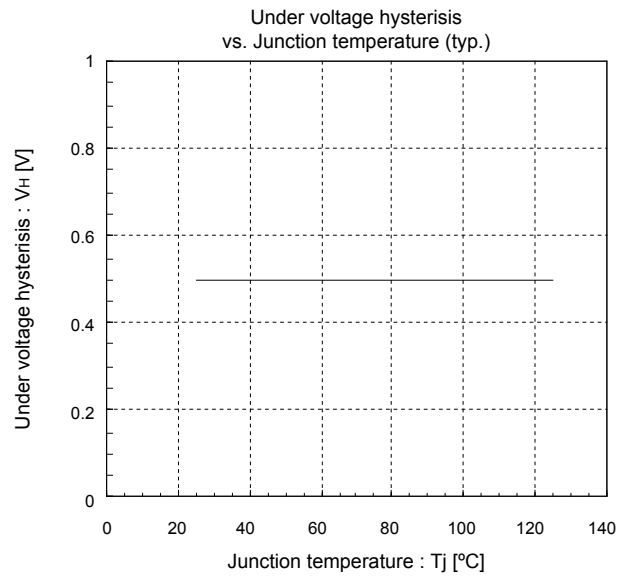
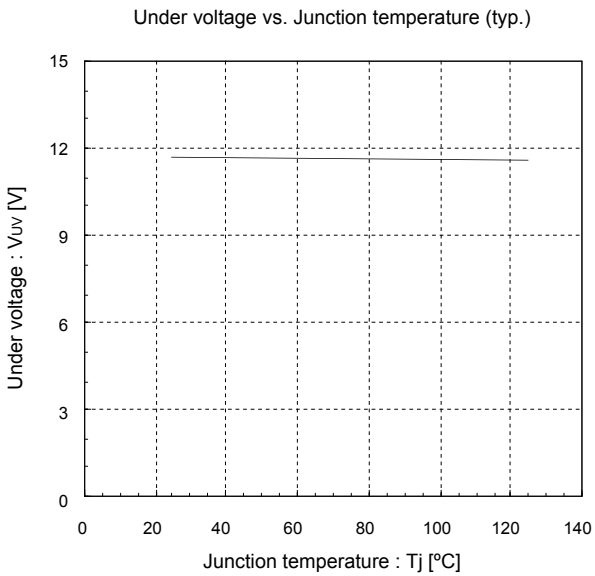
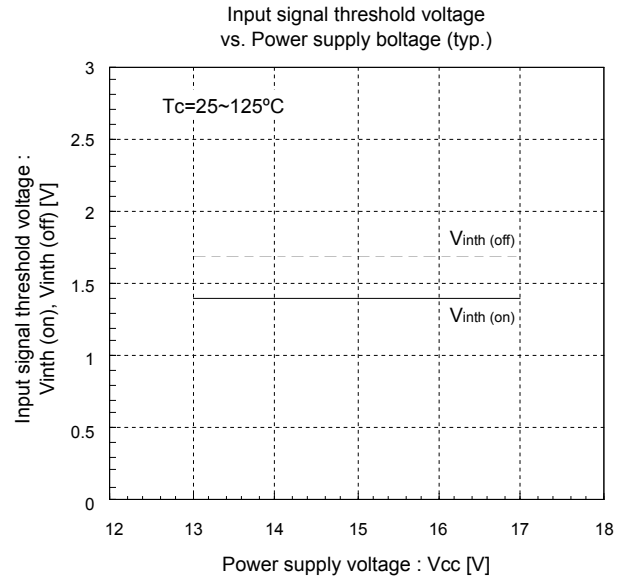
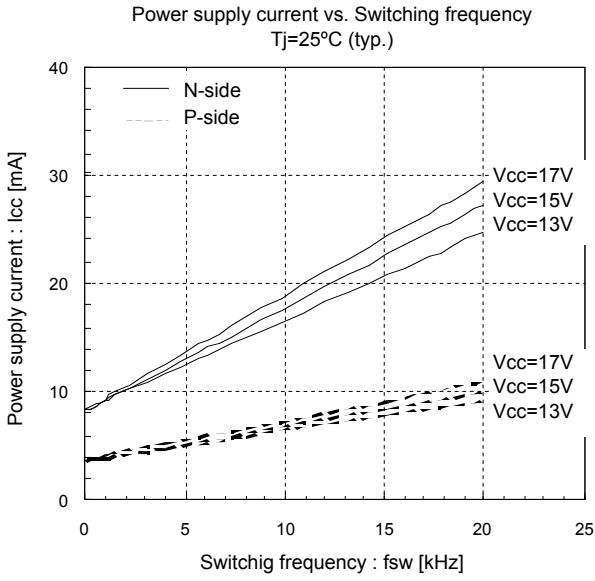
■ Block Diagram



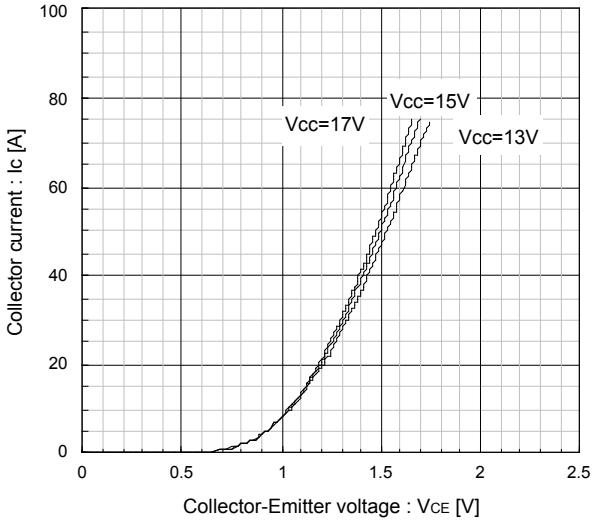
Pre-drivers include following functions

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

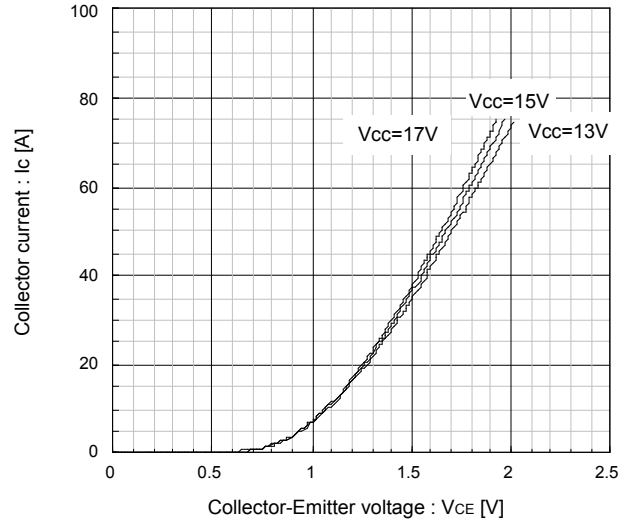
■ Characteristics (Representative)



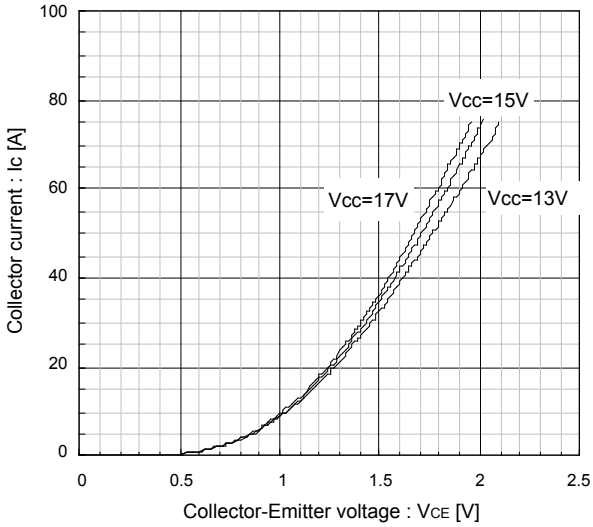
Collector current vs. collector-Emitter voltage
Tj=25°C [Chip] (typ.)



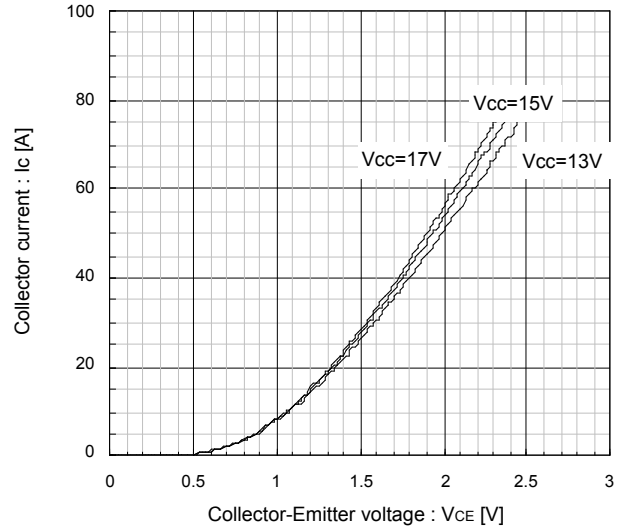
Collector current vs. collector-Emitter voltage
Tj=25°C [Terminal] (typ.)



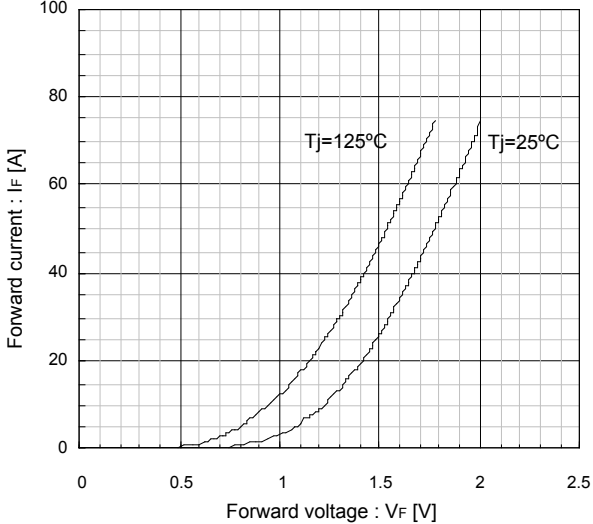
Collector current vs. collector-Emitter voltage
Tj=125°C [Chip] (typ.)



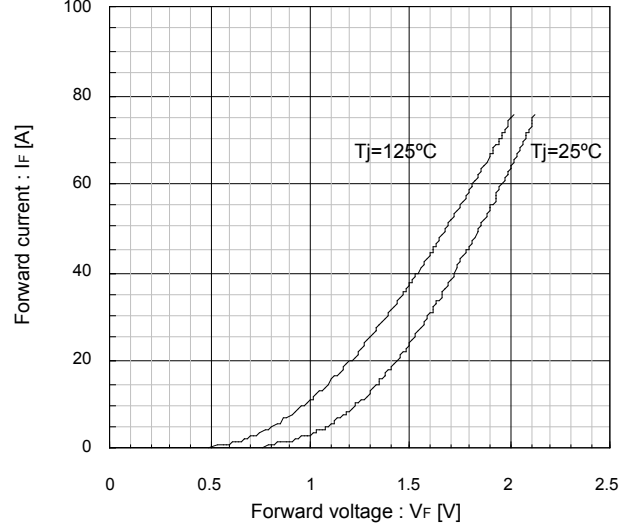
Collector current vs. collector-Emitter voltage
Tj=125°C [Terminal] (typ.)



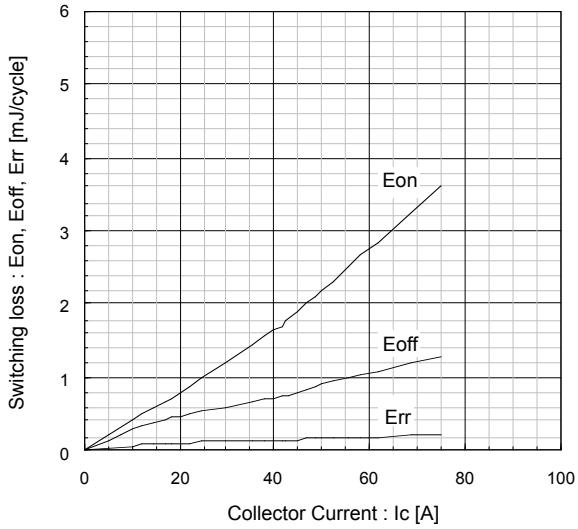
Forward current vs. Forward voltage
[Chip] (typ.)



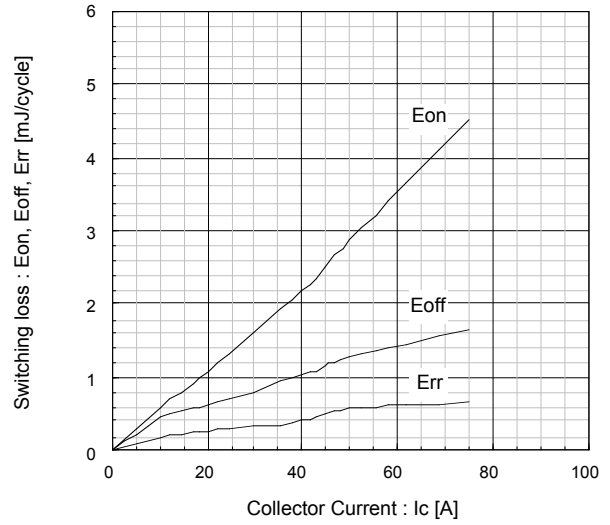
Forward current vs. Forward voltage
[Terminal] (typ.)



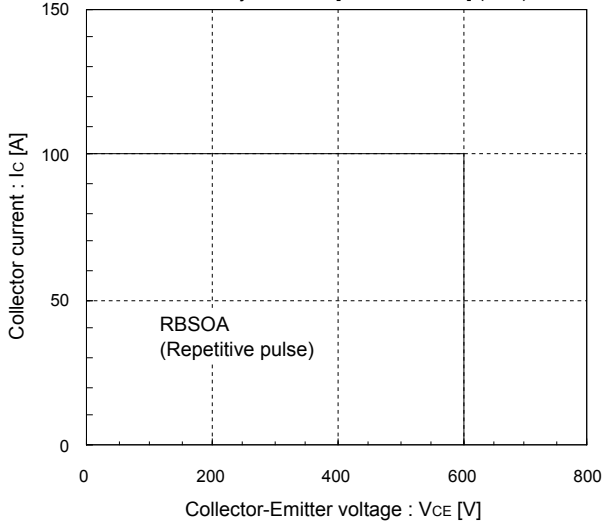
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=300V, V_{CC}=15V, T_j=25^\circ C$



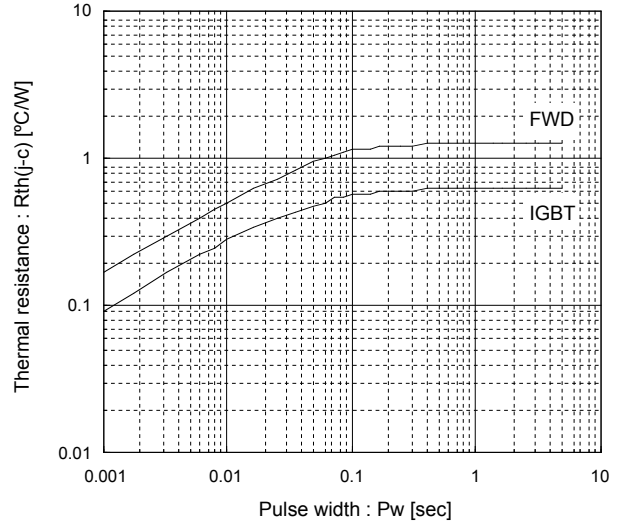
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=300V, V_{CC}=15V, T_j=125^\circ C$



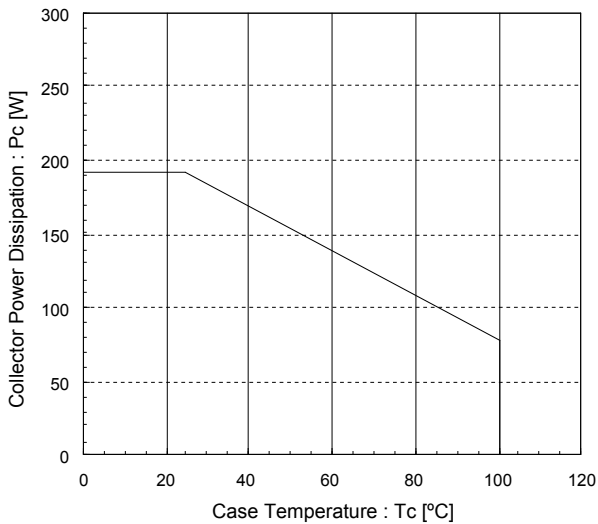
Reversed biased safe operating area
 $V_{CC}=15V, T_j \le 125^\circ C$ [Main Terminal] (min.)



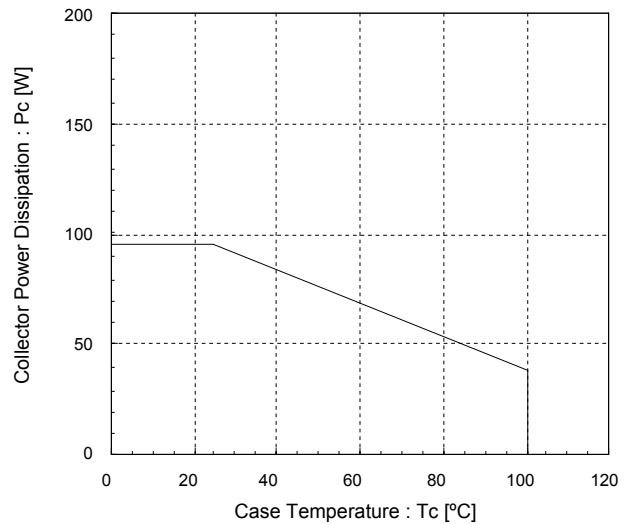
Transient thermal resistance (max.)

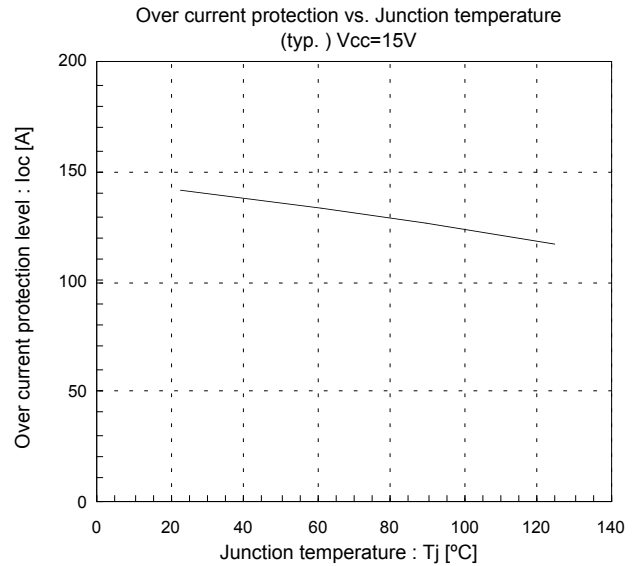
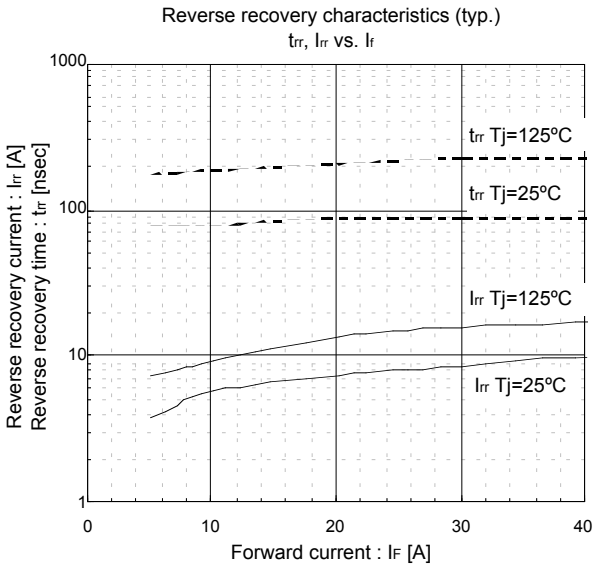
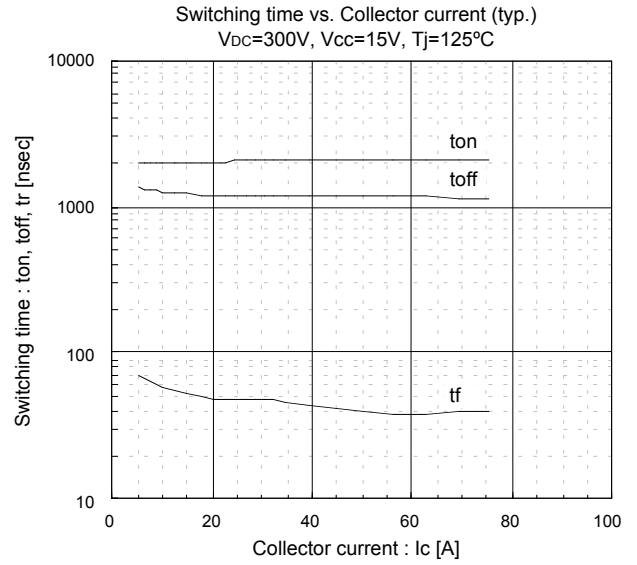
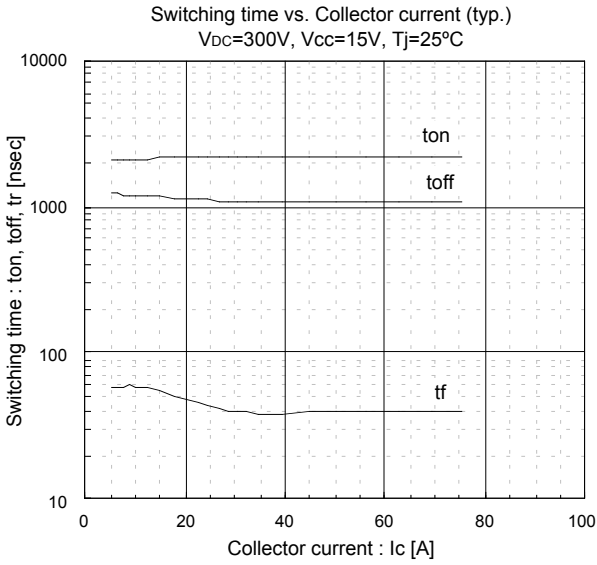


Power derating for IGBT (max.)
 [per device]

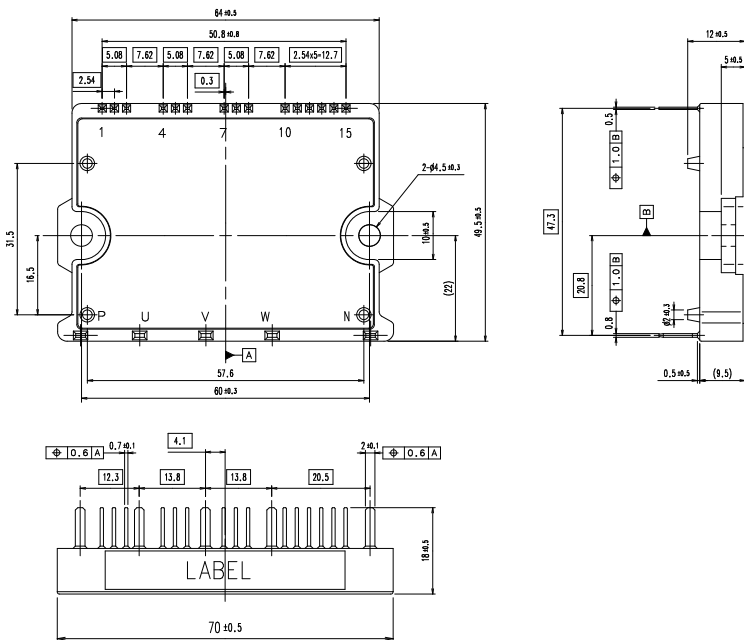


Power derating for FWD(max.)
 [per device]





Outline Drawings, mm



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