

6MBP25VDA120-50

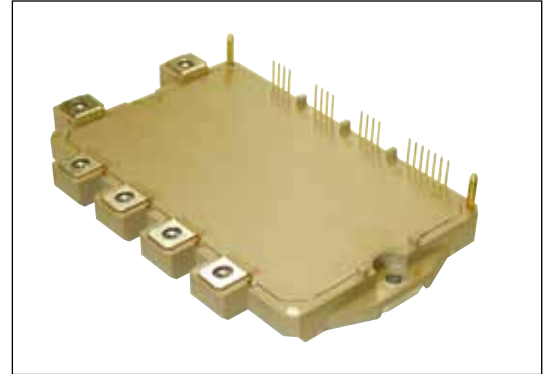
IGBT Modules

IGBT MODULE (V series)

1200V / 25A / 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°C, V_{cc}=15V 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	-	25	A
		1ms	I _{cp}	-	50	A
		Duty=100% (*2)	-I _c	-	25	A
Collector Power Dissipation		1 device (*3)	P _c	-	187	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	-	-
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	Terminal (M4)	-	-	1.7	Nm	
	Mounting (M4)	-	-	-	-	

Note *1: V_{CEs} shall be applied to the input voltage between terminal P-(U,V, W) and (U,V, W, B)-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 (Inverter & Brake)

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, 15~18 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±1sec. 1time.

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

● Electrical Characteristics ($T_J=25^\circ\text{C}$, $V_{CC}=15\text{V}$ unless otherwise specified)

Items	Symbol	Conditions	Min.	Typ.	Max.	Units		
Inverter	Collector Current at off signal input	I_{CES}	$V_{CE}=1200\text{V}$	-	-	1.0	mA	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	$I_C=25\text{A}$	Terminal	-	-	2.15	V
				Chip	-	1.70	-	V
	Forward voltage of FWD	V_F	$I_F=25\text{A}$	Terminal	-	-	2.60	V
Chip				-	2.10	-	V	
Brake	Collector Current at off signal input	I_{CES}	-	-	-	mA		
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	-	-	-	V		
			-	-	-	V		
Forward voltage of FWD	V_F	-	-	-	V			
Switching time	t_{on}	$V_{DC}=600\text{V}$, $T_J=125^\circ\text{C}$, $I_C=25\text{A}$	1.1	-	-	μs		
	t_{off}		-	-	2.1	μs		
	t_{rr}	$V_{DC}=600\text{V}$, $I_C=25\text{A}$	-	-	0.3	μs		
Supply current of P-side pre-driver (per one unit)	I_{cop}	Switching Frequency= 0-15kHz $T_C=-20\sim 110^\circ\text{C}$	-	-	10	mA		
Supply current of N-side pre-driver	I_{con}		-	-	33	mA		
Input signal threshold voltage	$V_{in(th)(on)}$	Vin-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 Brake	I_{OC}	$T_J=125^\circ\text{C}$	38	-	-	A	
				-	-	-	A	
Over Current Protection Delay time	t_{dOC}	$T_J=125^\circ\text{C}$	-	5	-	μs		
Short Circuit Protection Delay time	t_{sc}	$T_J=125^\circ\text{C}$	-	2	3	μs		
IGBT Chips Over Heating Protection Temperature Level	$T_{J(OH)}$	Surface of IGBT Chips	150	-	-	$^\circ\text{C}$		
Over Heating Protection Hysteresis	T_{JH}		-	20	-	$^\circ\text{C}$		
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 $T_C=-20\sim 110^\circ\text{C}$	$V_{CC} \geq 10\text{V}$	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 ($T_c = 25^\circ\text{C}$)

Items		Symbol	Min.	Typ.	Max.	Units	
Junction to Case Thermal Resistance (*10)	Inverter	IGBT	$R_{th(j-c)Q}$	-	-	0.67	$^\circ\text{C/W}$
		FWD	$R_{th(j-c)D}$	-	-	1.20	$^\circ\text{C/W}$
	Brake	IGBT	$R_{th(j-c)Q}$	-	-	-	$^\circ\text{C/W}$
		FWD	$R_{th(j-c)D}$	-	-	-	$^\circ\text{C/W}$
Case to Fin Thermal Resistance with Compound		$R_{th(c-f)}$	-	0.05	-	$^\circ\text{C/W}$	

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

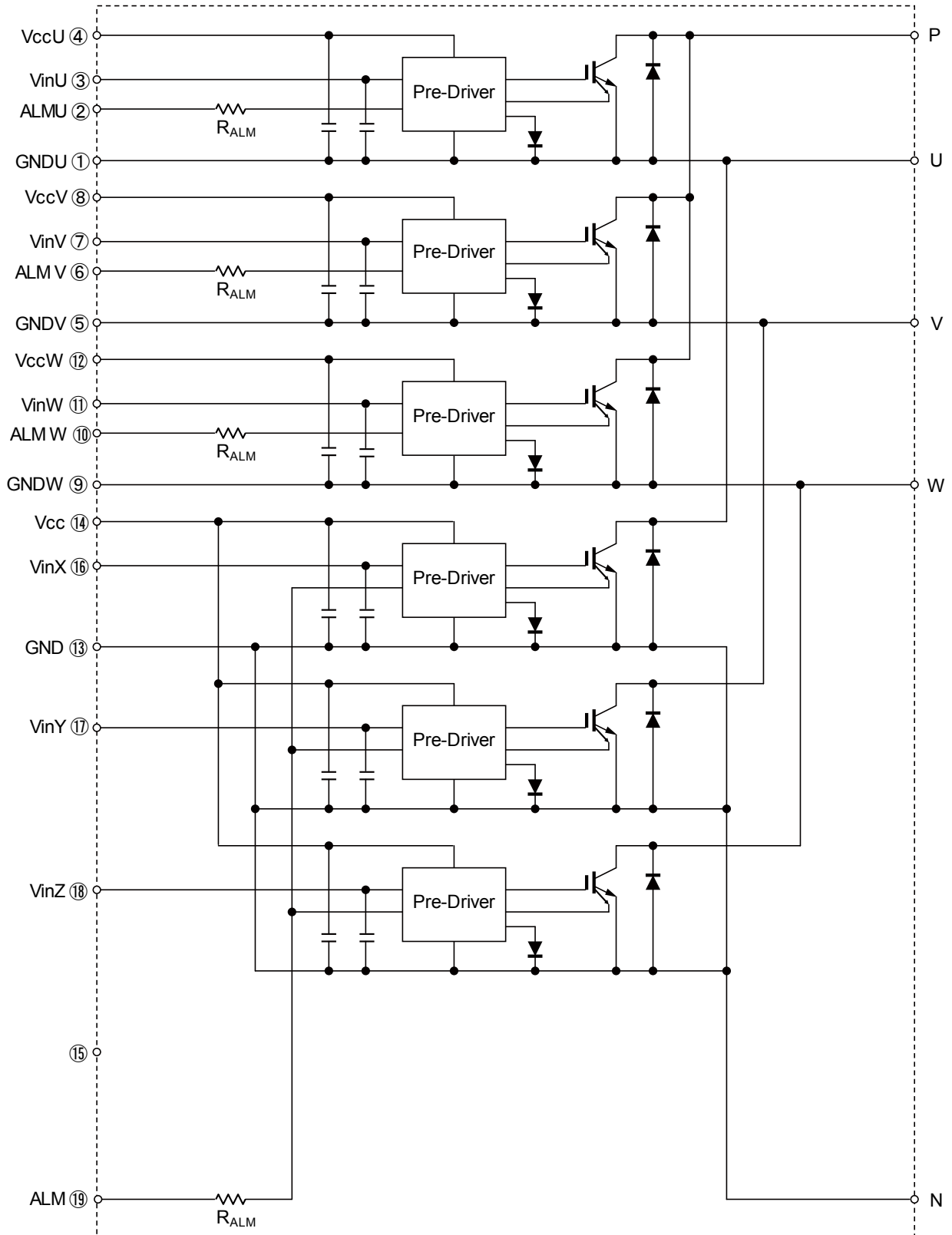
● Noise Immunity ($V_{DC}=600\text{V}$, $V_{CC}=15\text{V}$)

Items	Conditions	Min.	Typ.	Max.	Units
Common mode rectangular noise	Pulse width $1\mu\text{s}$, polarity \pm , 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

■ Block Diagram

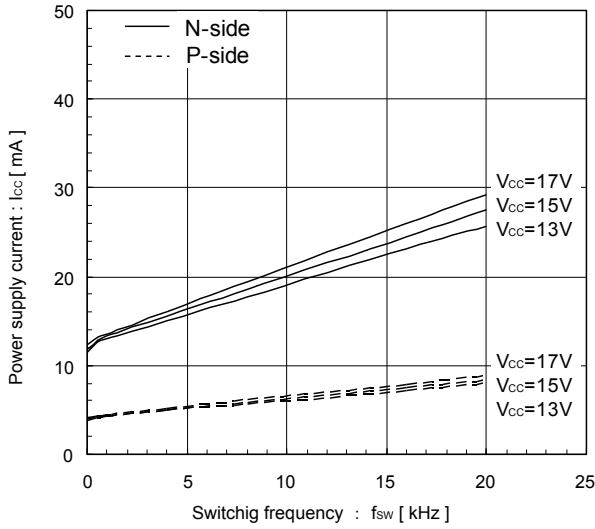


Pre-drivers include following functions

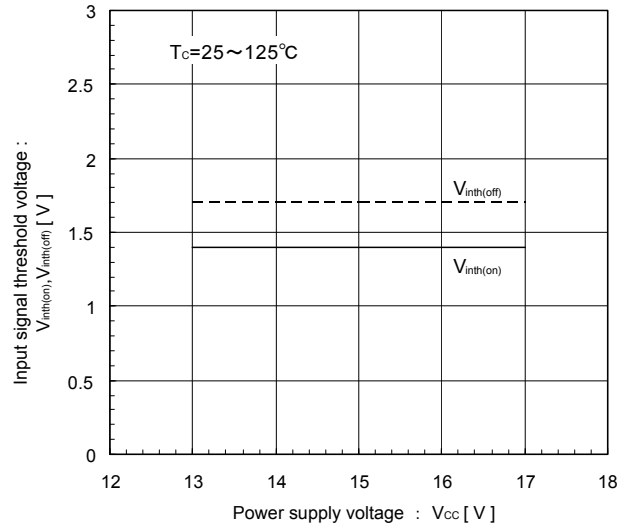
1. Amplifier for driver
2. Short circuit protection
3. Under voltage lockout circuit
4. Over current protection
5. IGBT chip over heating protection

■ Characteristics (Representative)

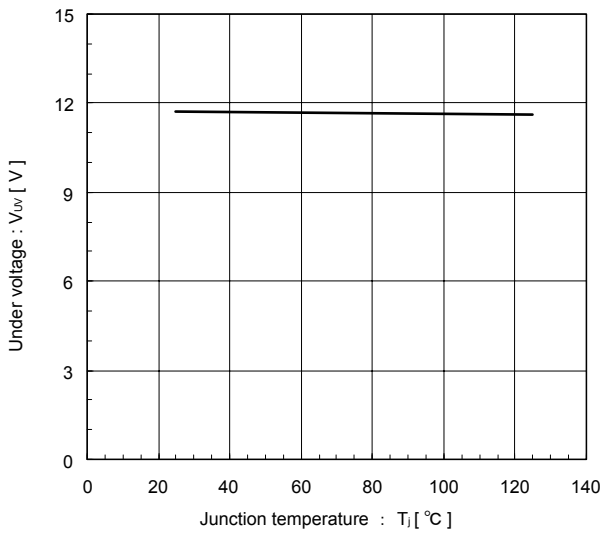
Power supply current vs. Switching frequency
 $T_j = 25^\circ\text{C}(\text{typ.})$



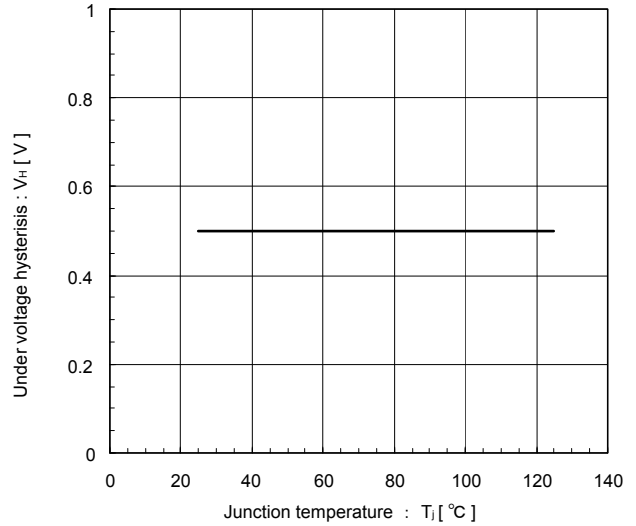
Input signal threshold voltage vs. Power supply voltage (typ.)
 $T_c = 25 \sim 125^\circ\text{C}$



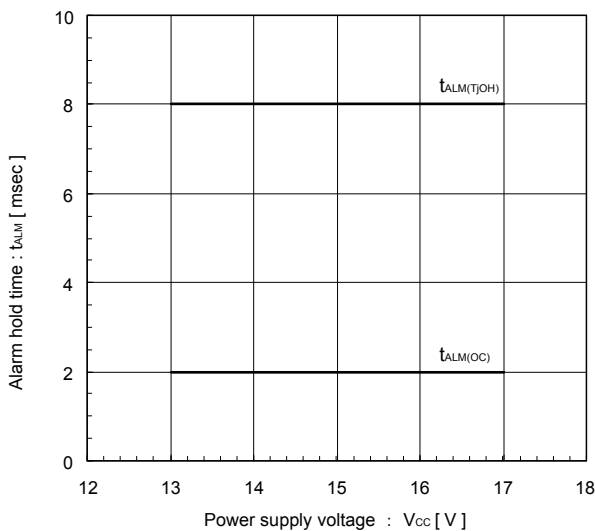
Under voltage vs. Junction temperature (typ.)



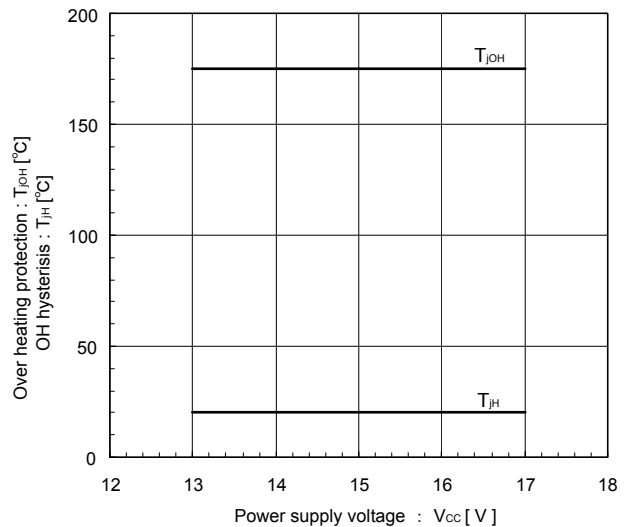
Under voltage hysteresis vs. Junction temperature (typ.)



Alarm hold time vs. Power supply voltage (typ.)

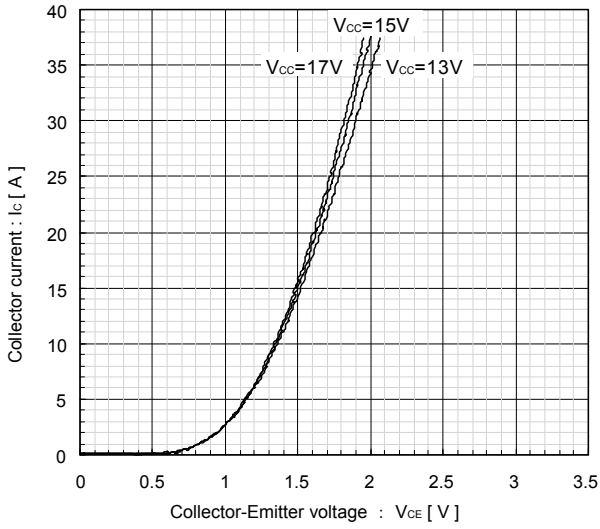


Over heating characteristics
 T_{jOH}, T_{jH} vs. V_{cc} (typ.)

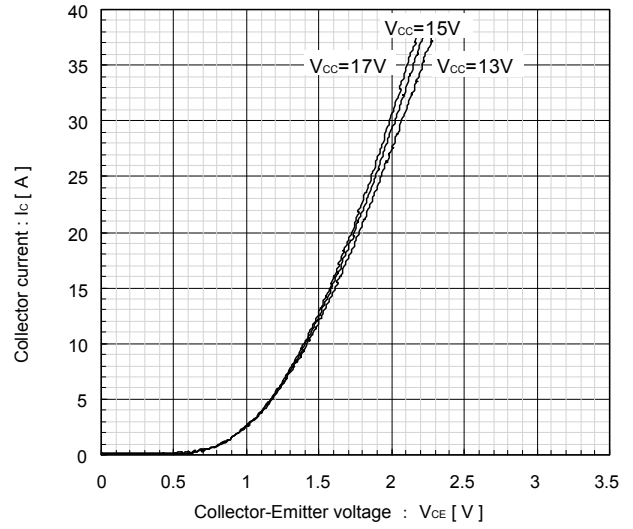


Inverter

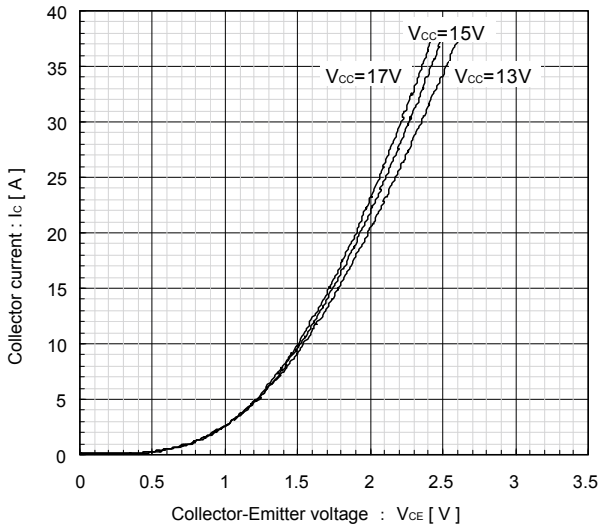
Collector current vs. Collector-Emitter voltage
 $T_j=25^\circ\text{C}$ [Chip] (typ.)



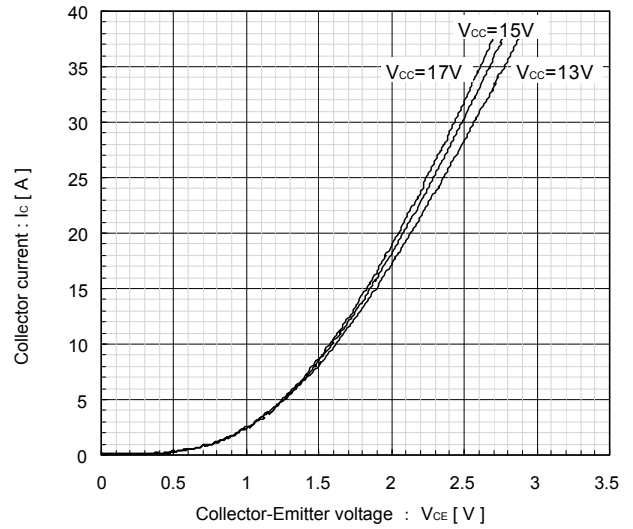
Collector current vs. Collector-Emitter voltage
 $T_j=25^\circ\text{C}$ [Terminal] (typ.)



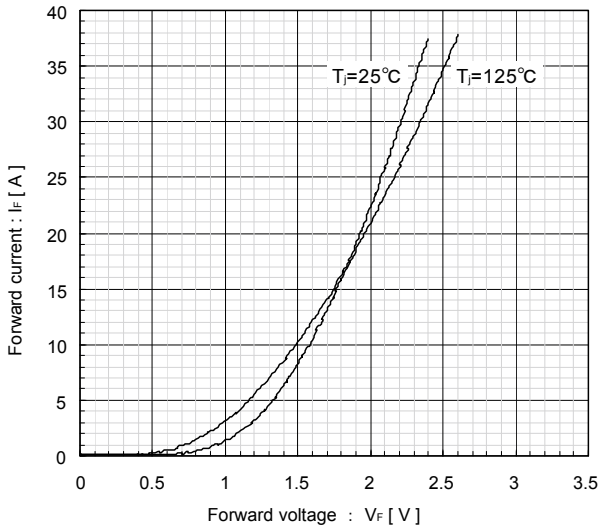
Collector current vs. Collector-Emitter voltage
 $T_j=125^\circ\text{C}$ [Chip] (typ.)



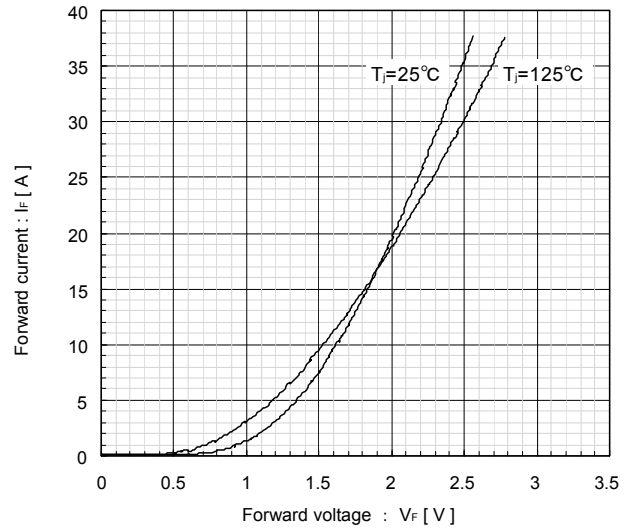
Collector current vs. Collector-Emitter voltage
 $T_j=125^\circ\text{C}$ [Terminal] (typ.)



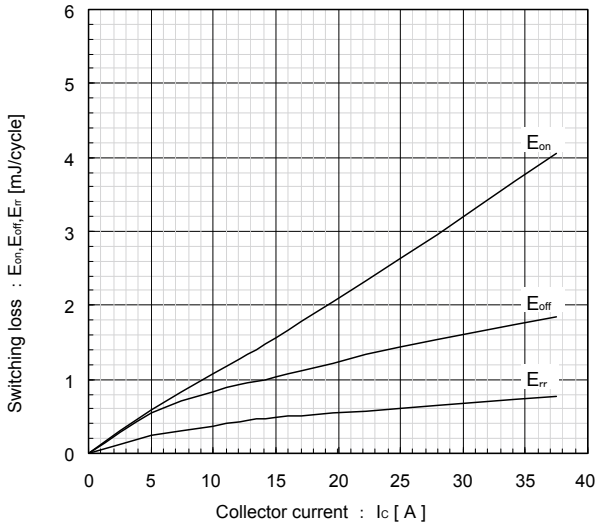
Forward current vs. Forward voltage
 [Chip] (typ.)



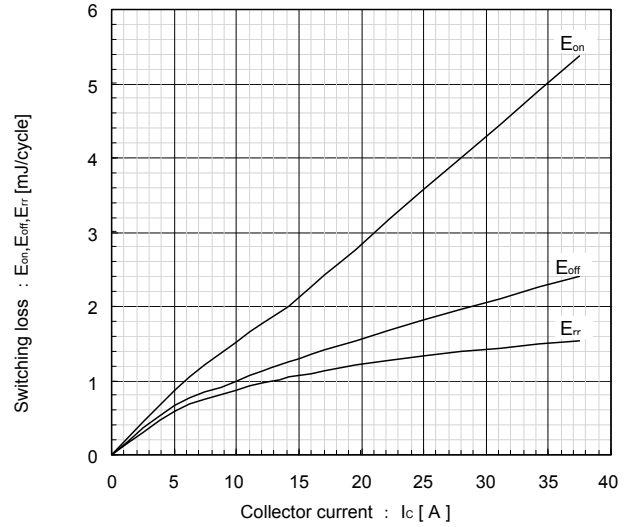
Forward current vs. Forward voltage
 [Terminal] (typ.)



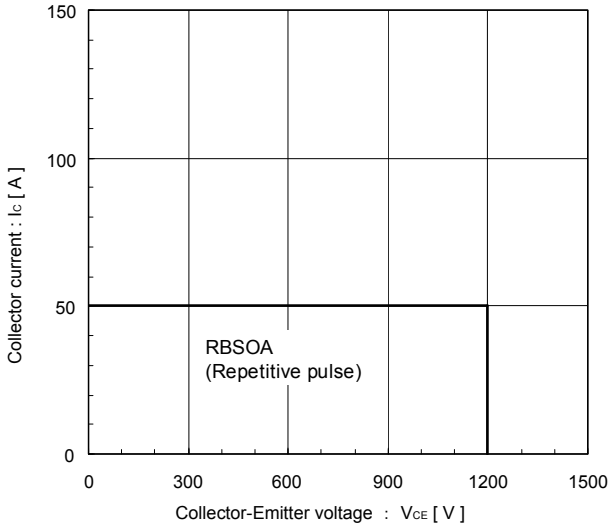
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_J=25^{\circ}C$



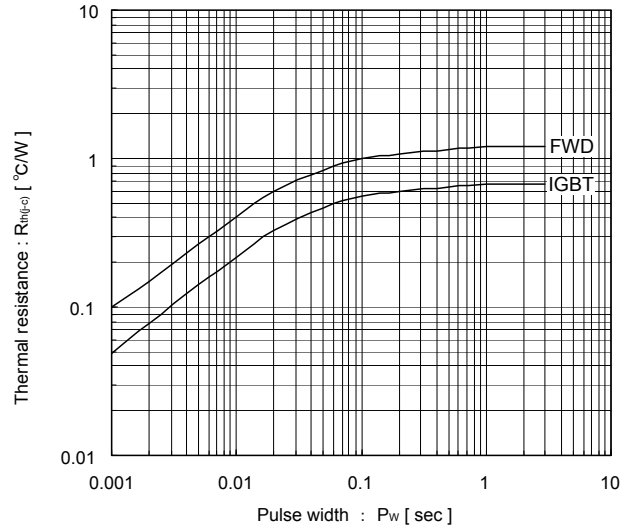
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_J=125^{\circ}C$



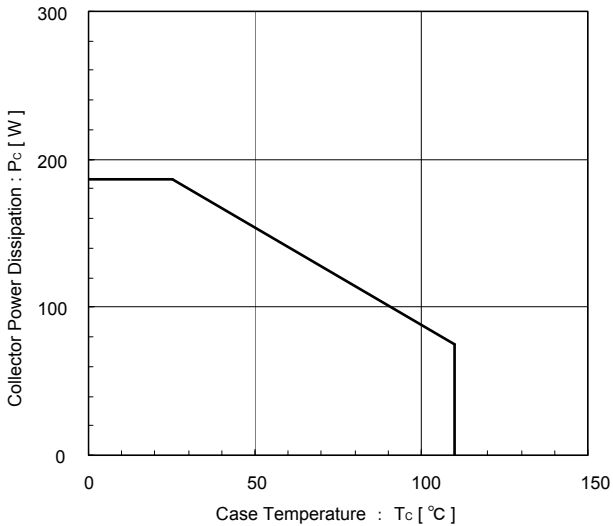
Reversed biased safe operating area
 $V_{CC}=15V, T_J \leq 125^{\circ}C$ [Main Terminal] (min.)



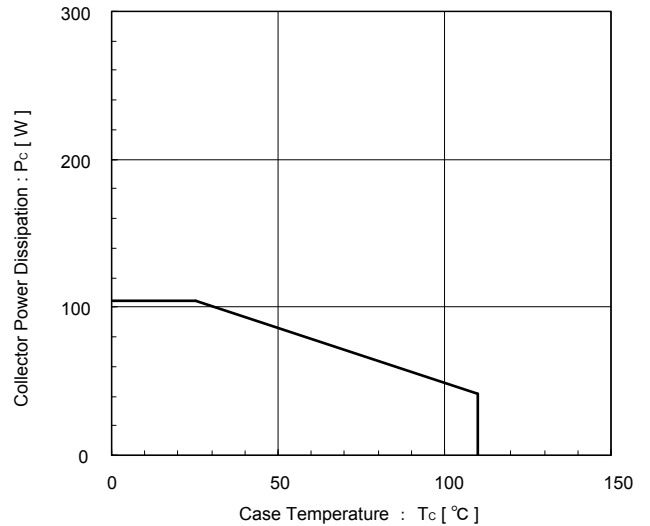
Transient thermal resistance (max.)



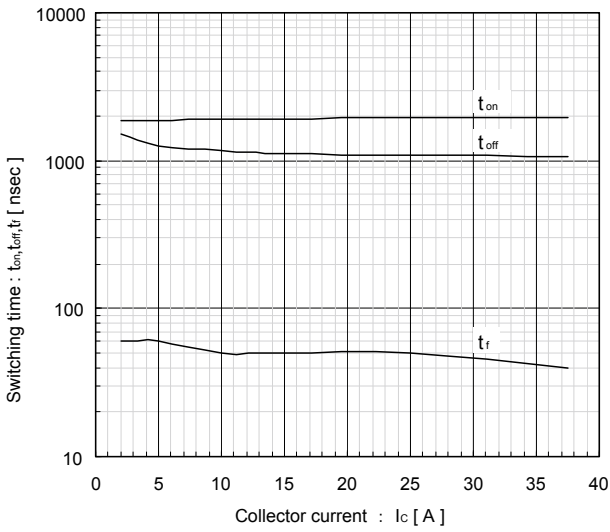
Power derating for IGBT (max.)
 [per device]



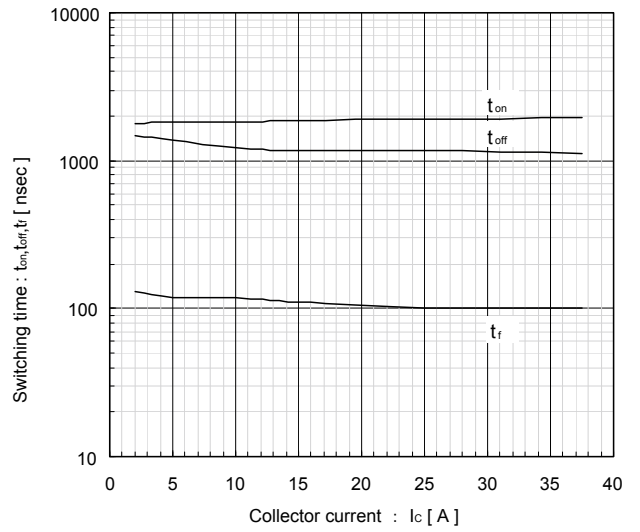
Power derating for FWD (max.)
 [per device]



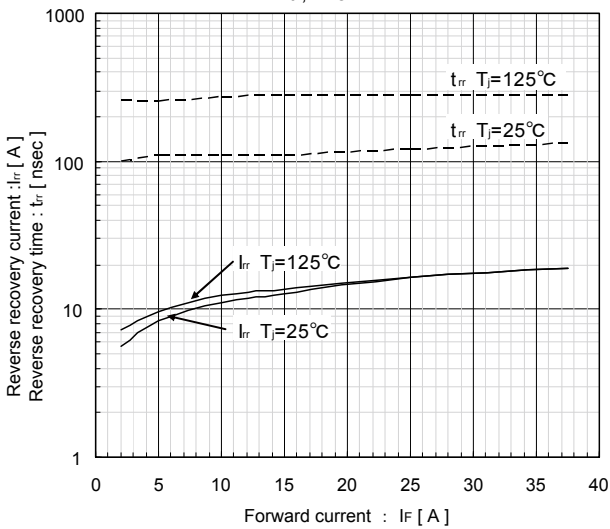
Switching time vs. Collector current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_J=25^\circ C$



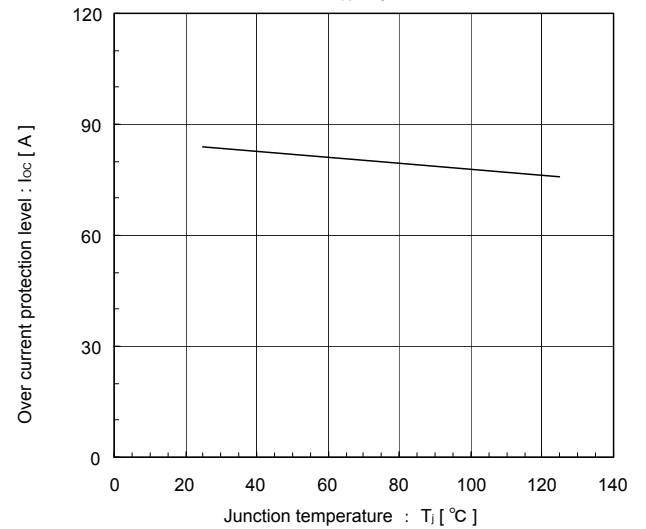
Switching time vs. Collector current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_J=125^\circ C$



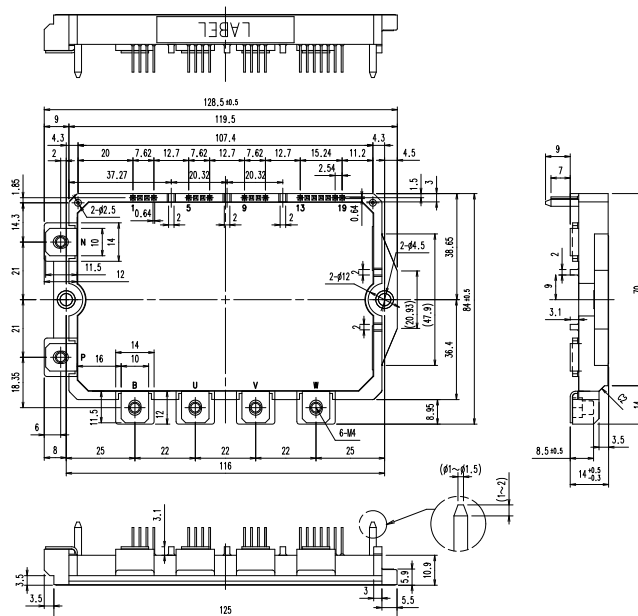
Reverse recovery characteristics (typ.)
 t_{rr}, I_{rr} vs. I_F



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



■ Outline Drawings, mm



WARNING

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 - Measurement equipment
 - Machine tools
 - Audiovisual equipment
 - Electrical home appliances
 - Personal equipment
 - Industrial robots etc.
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