

6MBP300RA060

IGBT-IPM R series

600V / 300A 6 in one-package

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(at $T_c=25^{\circ}\text{C}$ unless otherwise specified)

Item			Symbol	Rating		Unit
				Min.	Max.	
DC bus voltage			V _{DC}	0	450	V
DC bus voltage (surge)			V _{DC(surge)}	0	500	V
DC bus voltage (short operating)			V _{SC}	200	400	V
Collector-Emitter voltage			V _{CES}	0	600	V
INV	Collector current	DC	I _C	-	300	A
		1ms	I _{CP}	-	600	A
		Duty=55.5%	-I _C	-	300	A
	Collector power dissipation	One transistor	P _C	-	1040	W
Junction temperature			T _j	-	150	°C
Input voltage of power supply for Pre-Driver			V _{CC} *1	0	20	V
Input signal voltage			V _{in} *2	0	V _Z	V
Input signal current			I _{in}	-	1	mA
Alarm signal voltage			V _{ALM} *3	0	V _{CC}	V
Alarm signal current			I _{ALM} *4	-	15	mA
Storage temperature			T _{stg}	-40	125	°C
Operating case temperature			T _{op}	-20	100	°C
Isolating voltage (Case-Terminal)			V _{iso} *5	-	AC2.5	kV
Screw torque		Mounting (M5)		-	3.5 *6	N·m
		Terminal (M5)		-	3.5 *6	N·m

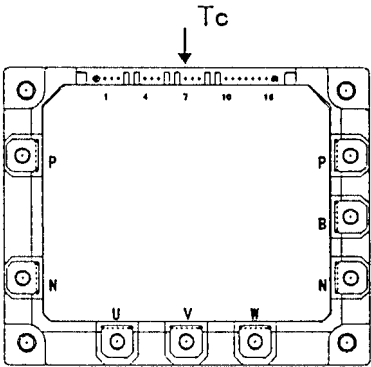


Fig.1 Measurement of case temperature

^{*1} Apply V_{CC} between terminal No. 3 and 1, 6 and 4, 9 and 7, 11 and 10.
^{*2} Apply V_{in} between terminal No. 2 and 1, 5 and 4, 8 and 7, 13,14,15 and 10.
^{*3} Apply V_{ALM} between terminal No. 16 and 10.
^{*4} Apply I_{ALM} to terminal No. 16.
^{*5} 50Hz/60Hz sine wave 1 minute.
^{*6} Recommendable Value : 2.5 to 3.0 N·m

- Electrical characteristics of power circuit (at $T_c=T_j=25^{\circ}\text{C}$, $V_{CC}=15\text{V}$)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
INV	Collector current at off signal input	I_{CES}	$V_{CE}=600\text{V}$ input terminal open	-	-	1.0	mA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$	$I_C=300\text{A}$	-	-	2.8	V
	Forward voltage of FWD	V_F	$-I_C=300\text{A}$	-	-	3.0	V

● **Electrical characteristics of control circuit**(at $T_c=T_j=25^\circ\text{C}$, $V_{cc}=15\text{V}$)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply current of P-line side Pre-driver(one unit)	I_{ccp}	$f_{sw}=0$ to 15kHz $T_c=-20$ to 100°C *7	6	-	32	mA
Power supply current of N-line side three Pre-driver	I_{ccN}	$f_{sw}=0$ to 15kHz $T_c=-20$ to 100°C *7	18	-	96	mA
Input signal threshold voltage (on/off)	$V_{in(th)}$	ON	1.00	1.35	1.70	V
		OFF	1.70	2.05	2.40	V
Input zener voltage	V_z	$R_{in}=20k\ \Omega$	-	8.0	-	V
Over heating protection temperature level	T_{COH}	$V_{DC}=0\text{V}$, $I_c=0\text{A}$, Case temperature, Fig.1	110	-	125	$^\circ\text{C}$
Hysteresis	T_{CH}		-	20	-	$^\circ\text{C}$
IGBT chips over heating protection temperature level	T_{jOH}	surface of IGBT chips	150	-	-	$^\circ\text{C}$
Hysteresis	T_{jH}		-	20	-	$^\circ\text{C}$
Collector current protection level	INV	I_{oc}	450	-	-	A
Over current protection delay time		t_{DOC}	-	10	-	μs
Under voltage protection level		V_{UV}	11.0	-	12.5	V
Hysteresis		V_H	0.2	-	-	V
Alarm signal hold time		t_{ALM}	1.5	2	-	ms
SC protection delay time		t_{SC}	-	-	12	μs
Limiting resistor for alarm		R_{ALM}	1425	1500	1575	Ω

*7 Switching frequency of IPM

● **Dynamic characteristics**(at $T_c=T_j=125^\circ\text{C}$, $V_{cc}=15\text{V}$)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Switching time (IGBT)	t_{on}	$I_C=300\text{A}$, $V_{DC}=300\text{V}$	0.3	-	-	μs
	t_{off}		-	-	3.6	μs
Switching time (FWD)	t_{rr}	$I_F=300\text{A}$, $V_{DC}=300\text{V}$	-	-	0.4	μs

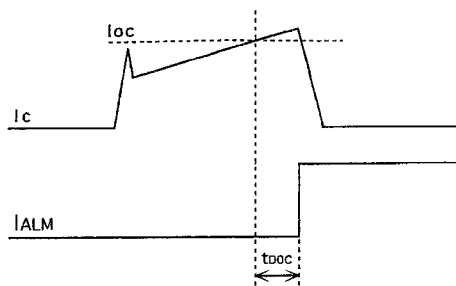


Fig.2 Definition of OC delay time

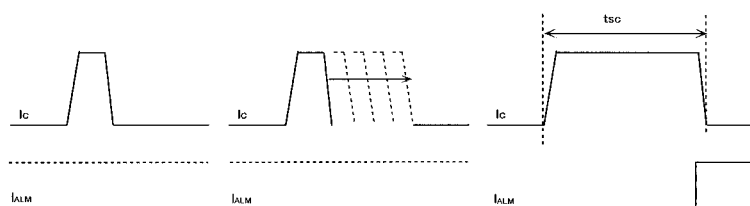


Fig.3 Definition of tsc

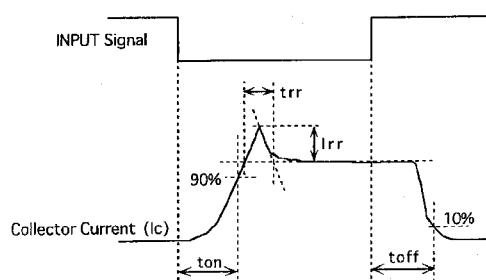


Fig.4 Definition of switching time

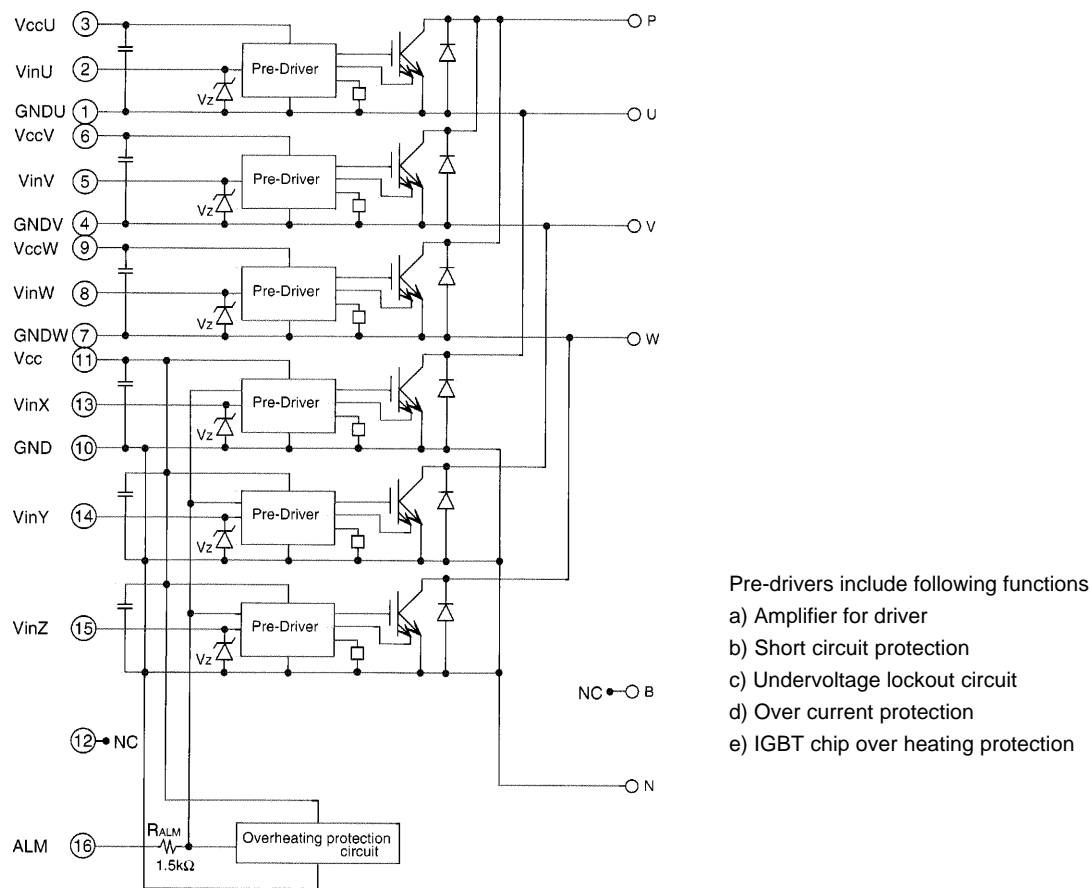
● **Thermal characteristics**($T_c=25^\circ\text{C}$)

Item			Symbol	Typ.	Max.	Unit
Junction to Case thermal resistance	INV	IGBT	$R_{th(j-c)}$	-	0.12	$^\circ\text{C/W}$
		FWD	$R_{th(j-c)}$	-	0.25	$^\circ\text{C/W}$
Case to fin thermal resistance with compound			$R_{th(c-f)}$	0.05	-	$^\circ\text{C/W}$

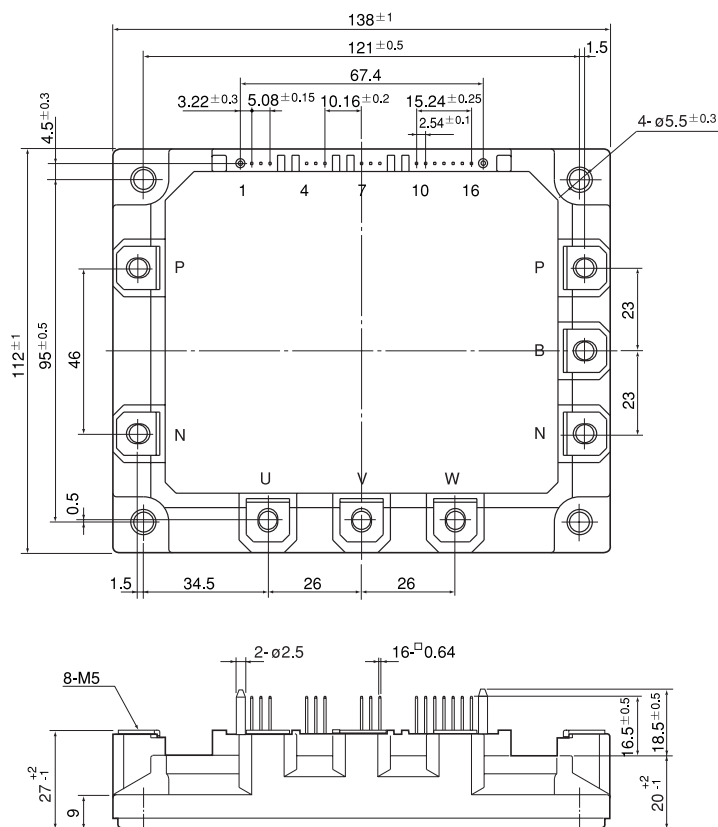
● **Recommendable value**

Item	Symbol	Min.	Typ.	Max.	Unit
DC bus voltage	V_{DC}	200	-	400	V
Operating power supply voltage range of Pre-driver	V_{CC}	13.5	15	16.5	V
Switching frequency of IPM	f_{sw}	1	-	20	kHz
Screw torque	Mounting (M5)	-	2.5	-	N·m
	Terminal (M5)	-	2.5	-	N·m

Block diagram



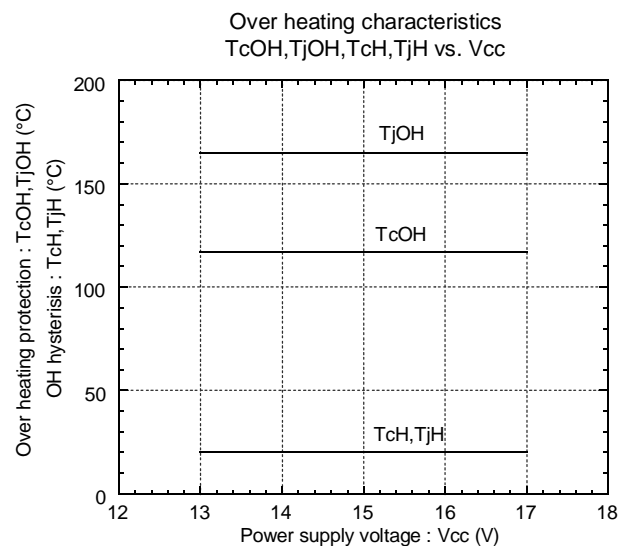
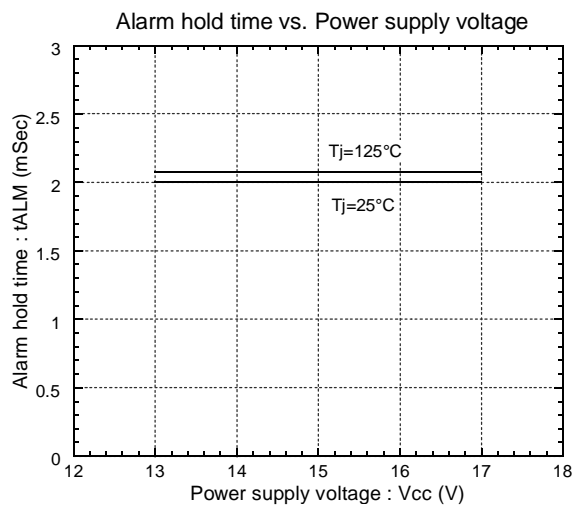
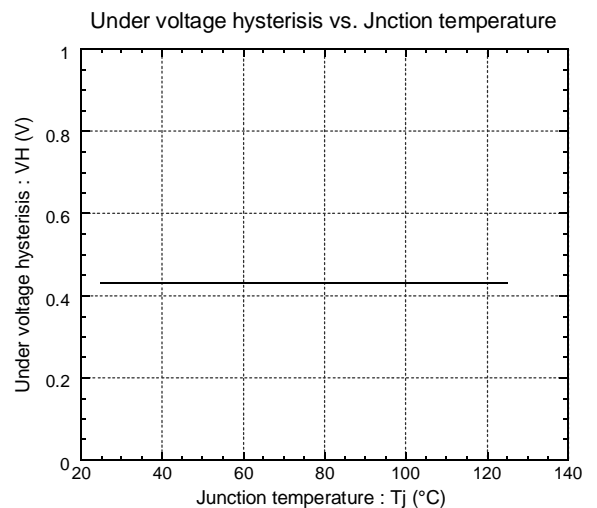
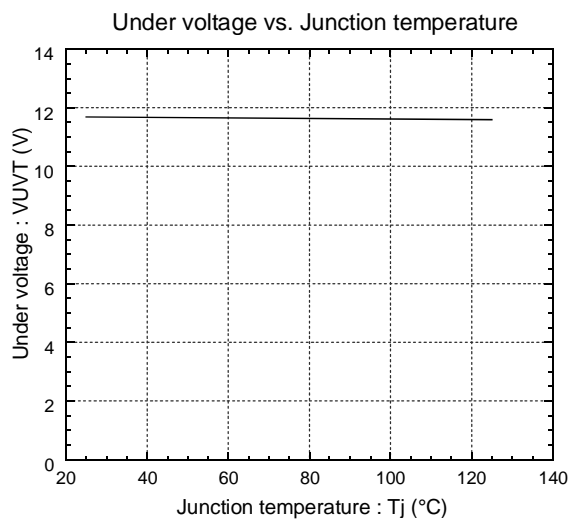
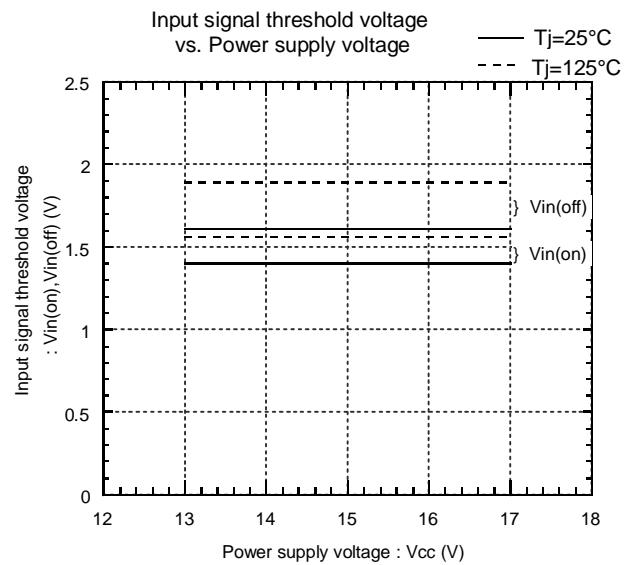
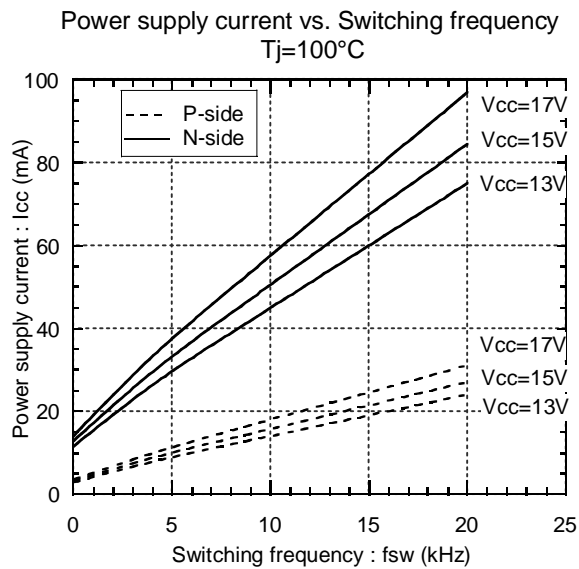
Outline drawings, mm



Mass : 920g

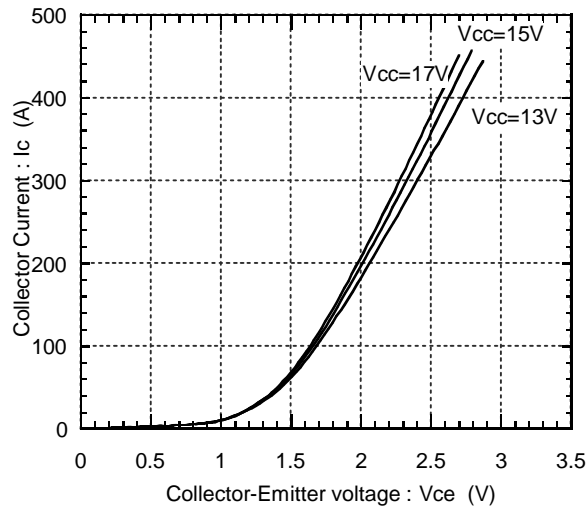
Characteristics (Representative)

Control circuit

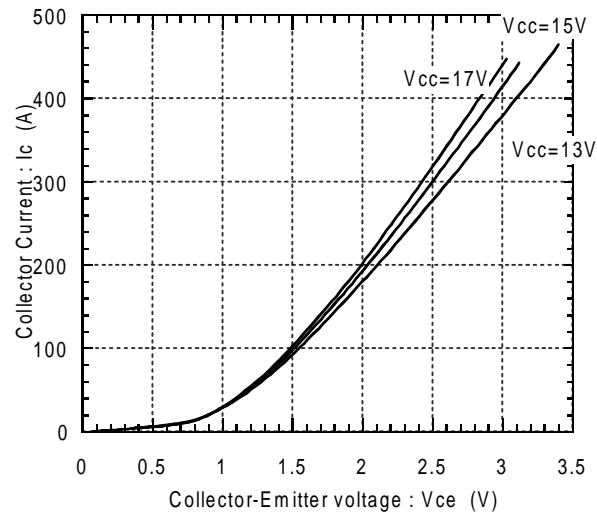


● Inverter

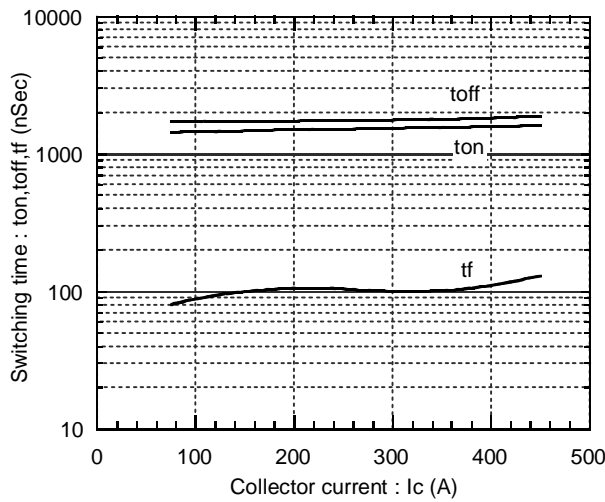
Collector current vs. Collector-Emitter voltage
 $T_j=25^{\circ}\text{C}$



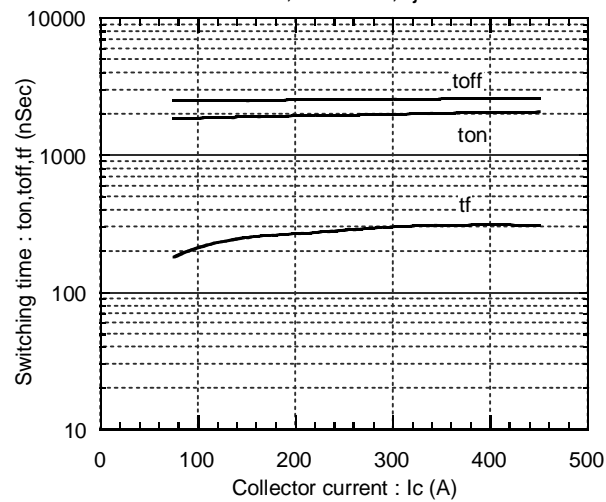
Collector current vs. Collector-Emitter voltage
 $T_j=125^{\circ}\text{C}$



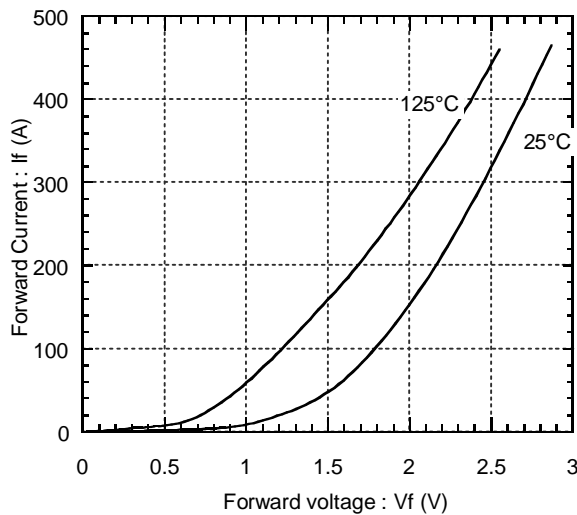
Switching time vs. Collector current
 $E_{dc}=300\text{V}, V_{cc}=15\text{V}, T_j=25^{\circ}\text{C}$



Switching time vs. Collector current
 $E_{dc}=300\text{V}, V_{cc}=15\text{V}, T_j=125^{\circ}\text{C}$



Forward current vs. Forward voltage



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

