

6MBP15RH060

IGBT Modules

IGBT-IPM R series

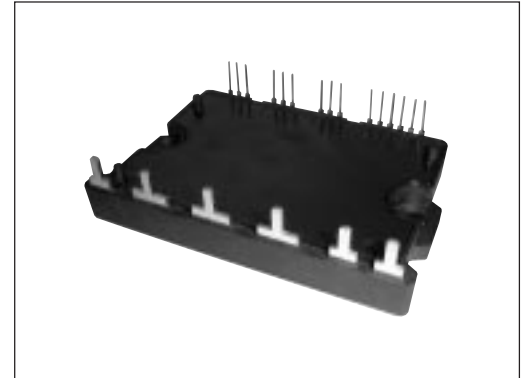
600V / 15A / 6 in one-package

■ Features

- 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

■ Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- UPS (Uninterruptible power supply)



■ Maximum ratings and characteristics

● Absolute maximum ratings ($T_c=25^\circ\text{C}$ unless otherwise specified)

Item	Symbol	Rating	Unit	
DC bus voltage	V_{DC}	450	V	
DC bus voltage (Surge)	$V_{DC (surge)}$	500	V	
DC bus voltage (Short operating)	V_{SC}	400	V	
Collector-Emitter voltage	V_{CES}	600	V	
Collector current	DC	I_c	15	A
	1ms	I_{CP}	30	A
	Duty=44.1%	$-I_c$	15	A
Collector power dissipation	One transistor	P_c	40	W
Junction temperature	T_j	150	$^\circ\text{C}$	
Input voltage of power supply for pre-driver	V_{CC}	-0.3 to 20	V	
Input signal voltage	V_{in}	V_z	V	
Input signal current	I_{in}	1	mA	
Alarm signal voltage	V_{ALM}	V_{CC}	V	
Alarm signal current	I_{ALM}	15	mA	
Storage temperature	T_{stg}	-40 to 125	$^\circ\text{C}$	
Operating case temperature	T_{cop}	-20 to 100	$^\circ\text{C}$	
Isolating voltage (Terminal to base, 50/60Hz sine wave 1min.)	V_{iso}	AC 2500	V	
Screw torque	Mounting (M4)	2.0	N • m	

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

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Collector current at off signal input	I_{CES}	$V_{CE}=600\text{V}$, V_{in} open	-	-	1.0	mA
Collector-Emitter saturation voltage	$V_{CE (sat)}$	$I_c=15\text{A}$	-	-	2.7	V
Forward voltage of FWD	V_F	$-I_c=15\text{A}$	-	-	3.5	V

● Electrical characteristics of control circuit (Tc=Tj=25°C, Vcc=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply current of P-line pre-driver (one unit)	I _{CCP}	V _{in} =H	–	2.0	5.0	mA
Power supply current of N-line pre-driver	I _{CCN}	V _{in} =H	–	4.0	10.0	mA
Input signal threshold voltage	V _{in (th)}	Turn-on	1.00	1.35	1.70	V
		Turn-off	1.25	1.60	1.95	V
Input zener voltage	V _Z	R _{in} =20kΩ	–	8.0	–	V
IGBT chips overhear protection temperature level	T _{joH}	Surface of IGBT	150	–	–	°C
Hysteresis	T _{jH}		–	20	–	°C
Collector current protection level	I _{oc}	N-side, (N1-N2 open)	21	27	33	A
	V _{oc}	Between N1 and N2	190	200	210	mV
OC detecting resistance value	R _{oc}		–	7.5	–	mΩ
Protection delay time	t _{DOC}	T _j =25°C Fig. 1, Fig. 2	–	5.0	7.0	μs
Undervoltage protection level	V _{UV}		11.0	–	12.5	V
Hysteresis	V _H		0.2	–	0.8	V
Alarm signal hold time	t _{ALM}		1.0	2.0	–	ms

● Switching characteristics (Tc=Tj=25°C, Vcc=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Switching time (IGBT) See Fig. 3	t _{on}	I _c =15A, V _{DC} =300V	0.5	–	–	μs
	t _{off}	Inductive-Load	–	–	3.5	μs
Switching time (FWD)	t _{rr}		–	–	0.5	μs

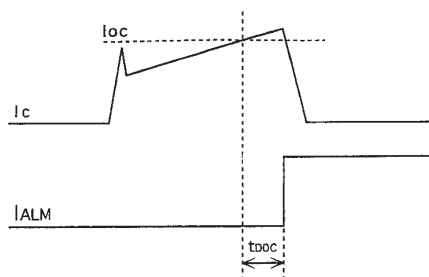


Fig.1 Definition of OC delay time

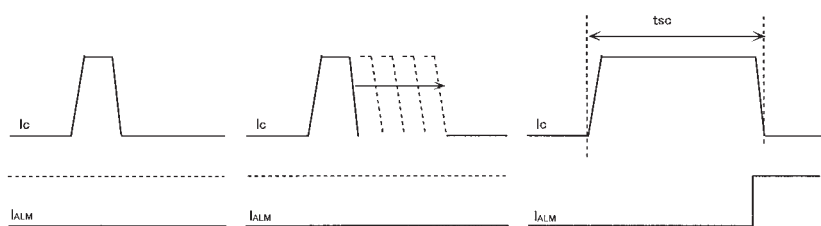


Fig.2 Definition of tsc

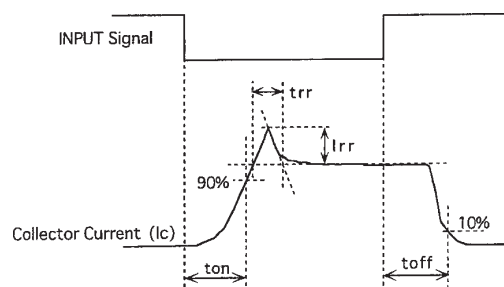


Fig.3 Definition of switching time

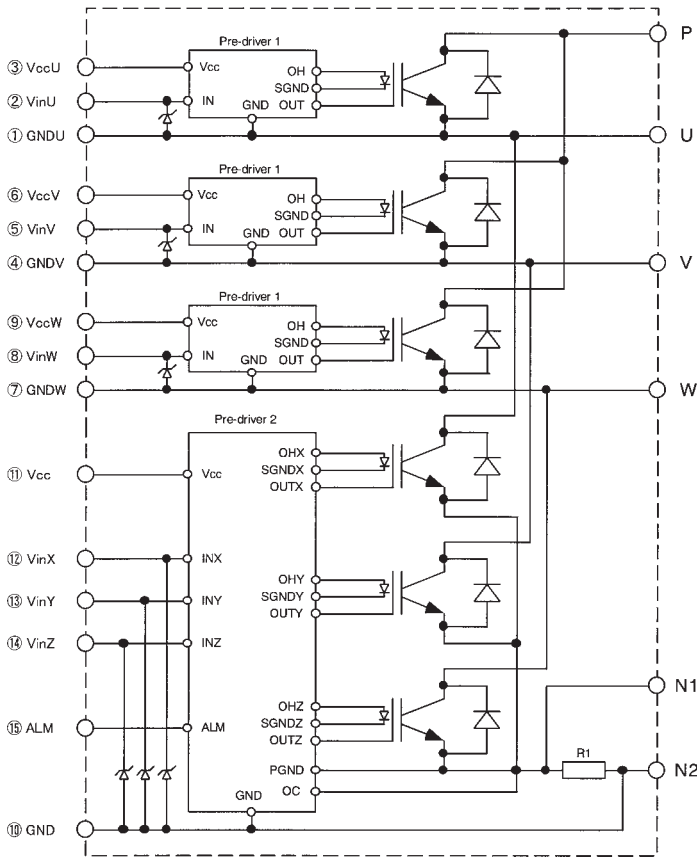
● Thermal characteristics (Tc=Tj=25°C, Vcc=15V)

Item	Symbol	Min.	Typ.	Max.	Unit	
Junction to case thermal resistance	IGBT	R _{th (j-c)}	–	–	3.1	°C/W
	FWD	R _{th (j-c)}	–	–	5.4	°C/W
Case to fin thermal resistance with compound	R _{th (c-f)}	–	0.05	–	°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-drive	V _{CC}	13.5	15	16.5	V
Switching frequency	f _{sw}	1	–	20	kHz
Flatness of heat sink	–	–100	–	100	μm
Mounting screw torque (M4)	–	1.3	–	1.7	N • m

■ Block diagram



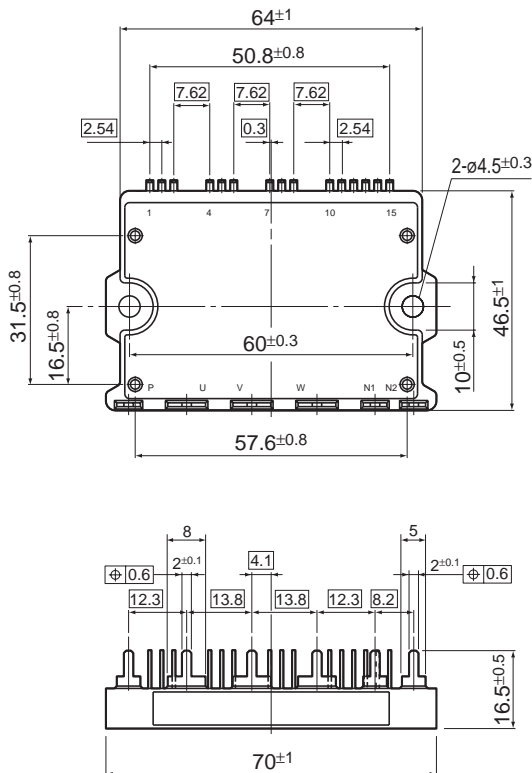
Pre-driver 1 includes following functions. (P-side)

- Amplifier for drive
- Power supply undervoltage protection
- IGBT chip overheating protection

Pre-driver 2 includes following functions. (N-side)

- Amplifier for drive
- Power supply undervoltage protection
- IGBT chip overheating protection
- Overcurrent protection
- Alarm signal output

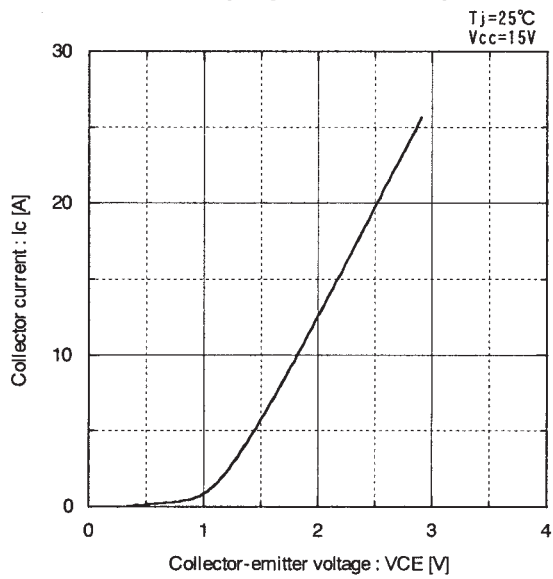
■ Outline drawings, mm



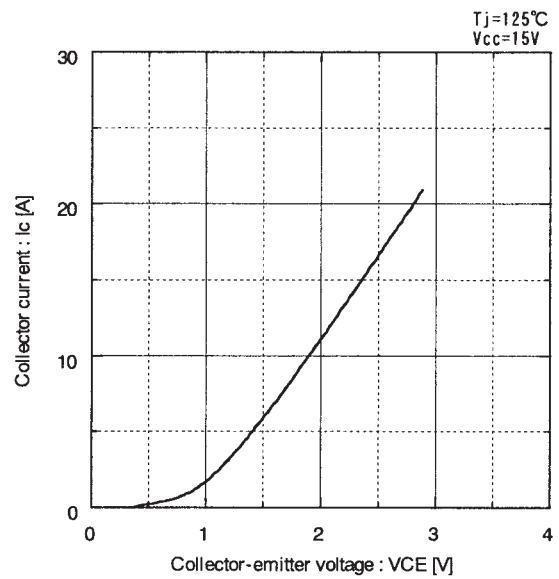
□ Shows theory dimensions

Mass: 50g

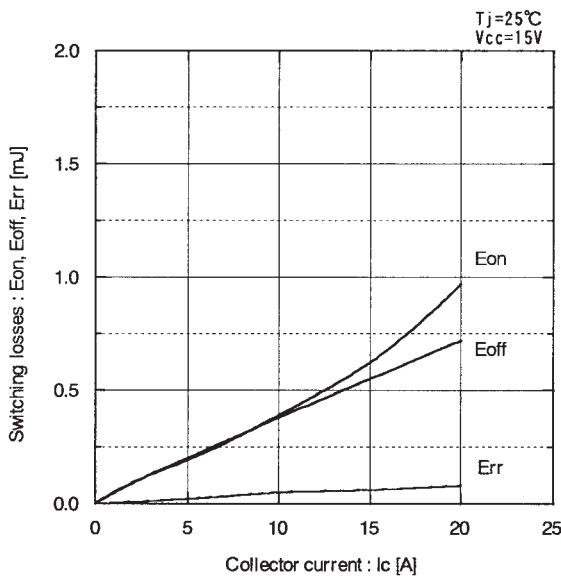
■ Characteristics (Representative)



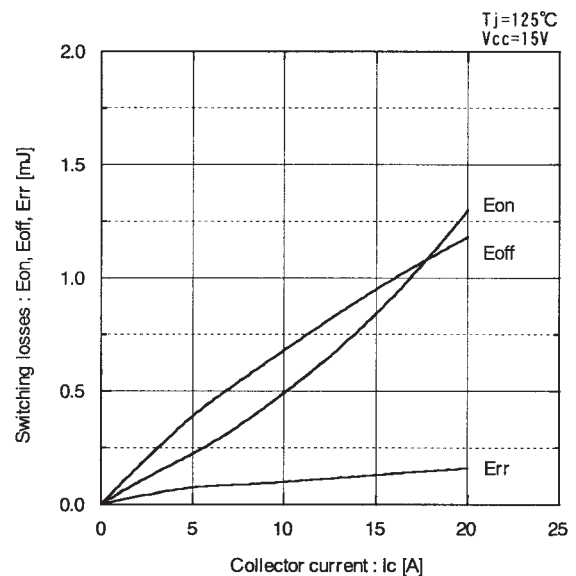
Collector current vs. Collector-emitter voltage



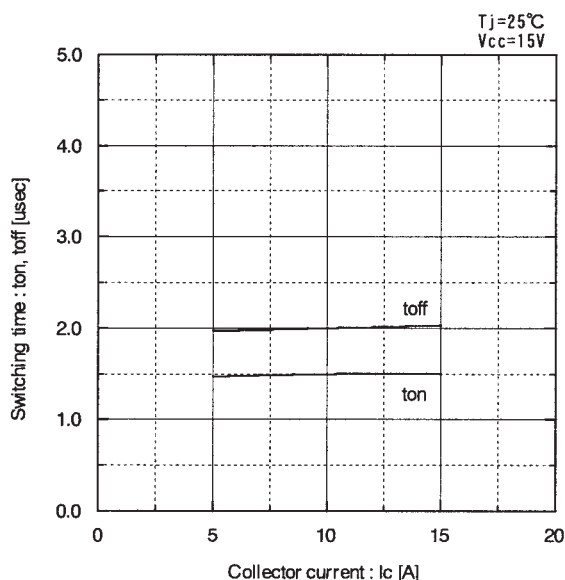
Collector current vs. Collector-emitter voltage



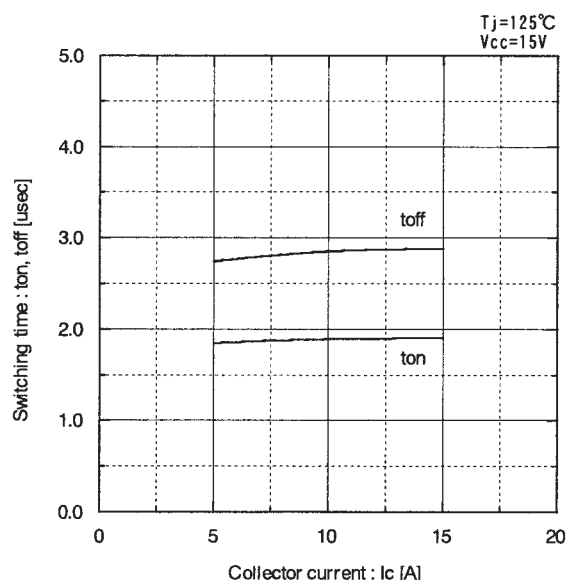
Switching losses vs. Collector current



Switching losses vs. Collector current



Switching time vs. Collector current



Switching time vs. Collector current

