6MBP20RH060

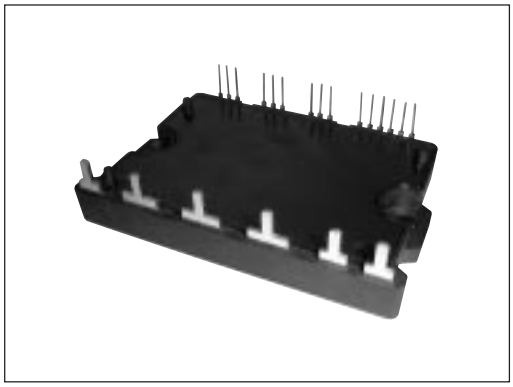
IGBT Modules

IGBT-IPM R series

600V / 20A / 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** (Tc=25˚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	20	A
	1ms	I_{CP}	40	A
	Duty=49.6%	$-I_C$	20	A
Collector power dissipation	One transistor	P_C	63	W
Junction temperature		T_j	150	˚C
Input voltage of power supply for pre-driver		V_{CC}	–0.3 to 20	V
Input signal voltage		V_{in}	Vz	V
Input singal current		I_{in}	1	mA
Alarm signal voltage		V_{ALM}	Vcc	V
Alarm signal current		I_{ALM}	15	mA
Storage temperature		T_{stg}	–40 to 125	˚C
Operating case temperature		T_{cop}	–20 to 100	˚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** (Tc=Tj=25˚C, Vcc=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Collector current at off signal input	I_{CES}	V_{CE}=600V, Vin open	–	–	1.0	mA
Collector-Emitter saturation voltage	$V_{CE\ (sat)}$	Ic=20A	–	–	2.7	V
Forward voltage of FWD	V_F	–Ic=20A	–	–	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	$V_{In\ (th)}$	T_{urn-on}	1.00	1.35	1.70	V
		$T_{urn-off}$	1.25	1.60	1.95	V
Input zener voltage	V_Z	R_{in}=20kΩ	–	8.0	–	V
IGBT chips overheat 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)	30	37	44	A
	V_{OC}	Between N1 and N2	190	200	210	mV
OC detecting resistance value	R_{OC}		–	5.4	–	mΩ
Protection delay time	t_{DOC}	Tj=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}	Ic=20A, V_{DC}=300V	0.5	–	–	µs
	t_{off}	Inductive-Load	–	–	3.5	µs
Switching time (FWD)	t_{rr}		–	–	0.5	µs

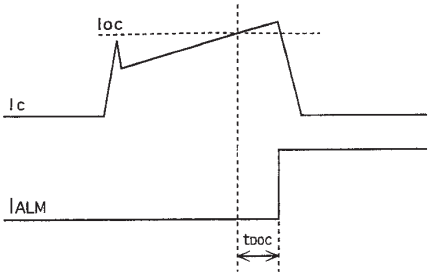


Fig.1 Definition of OC delay time

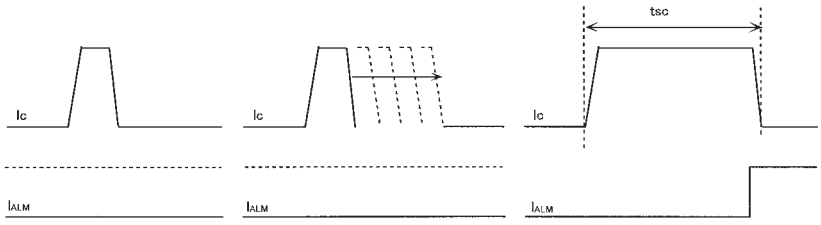


Fig.2 Definition of tsc

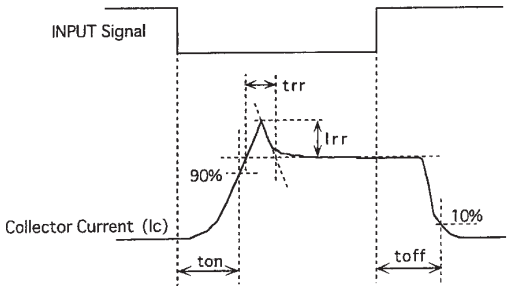


Fig.3 Definition of switching time

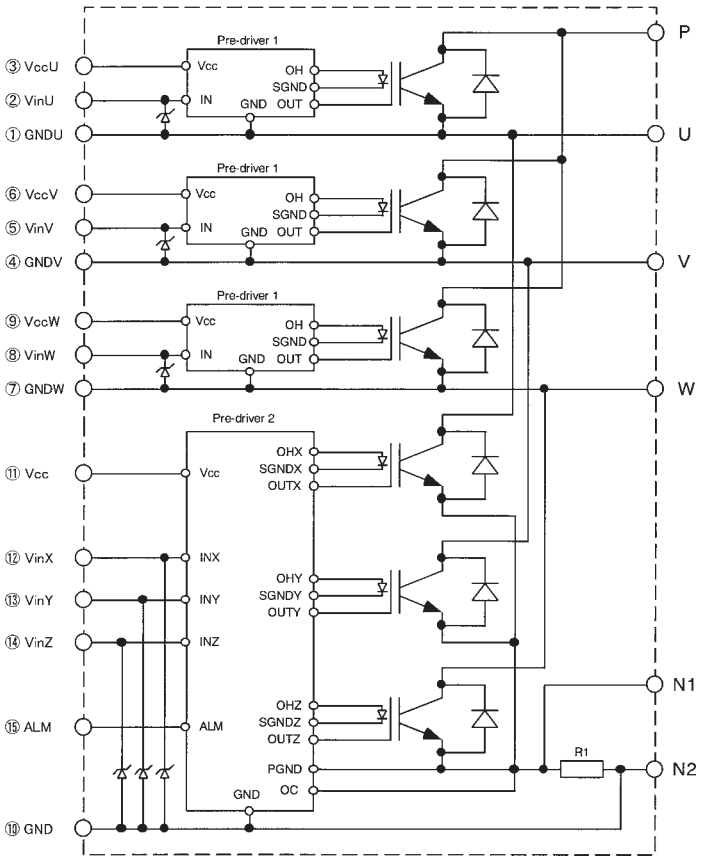
● **Thermal characteristics** (Tc=Tj=25˚C, Vcc=15V)

Item		Symbol	Min.	Typ.	Max.	Unit
Junction to case thermal resistance	IGBT	Rth (j-c)	–	–	2.0	˚C/W
	FWD	Rth (j-c)	–	–	3.6	˚C/W
Case to fin thermal resistance with compound		Rth (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

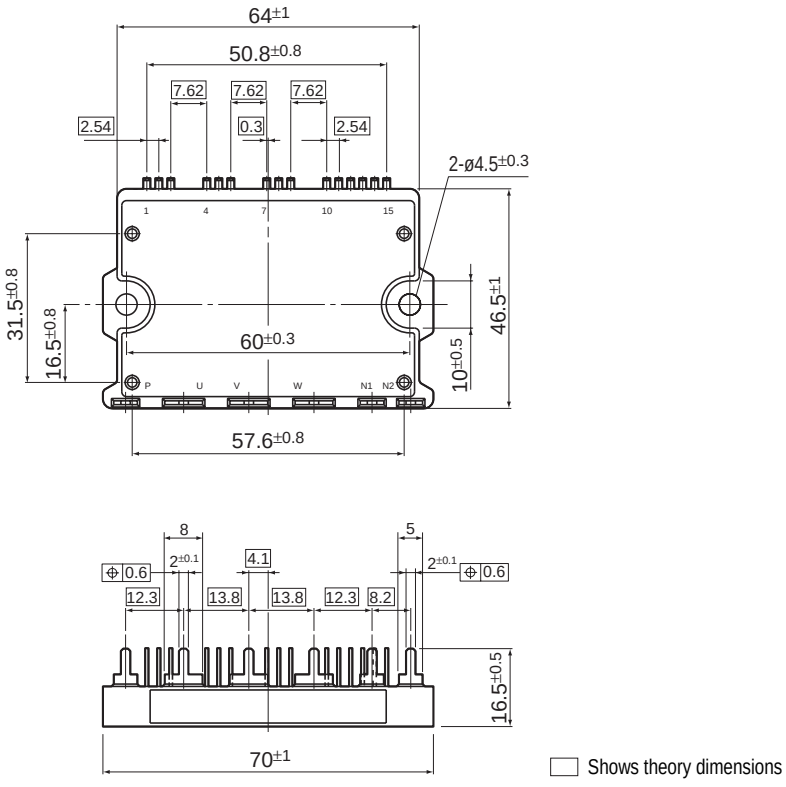
■ Block diagram



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

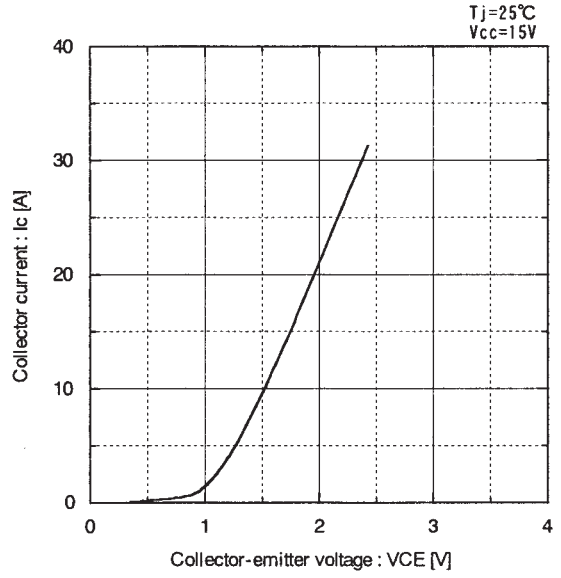
■ Outline drawings, mm



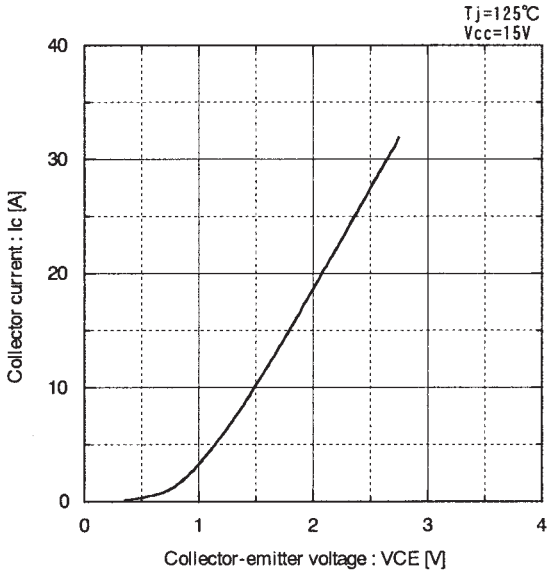
Shows theory dimensions

Mass: 50g

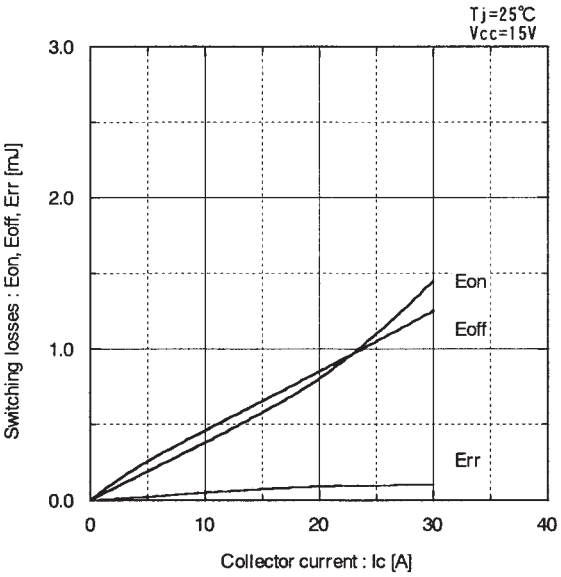
■ Characteristics (Representative)



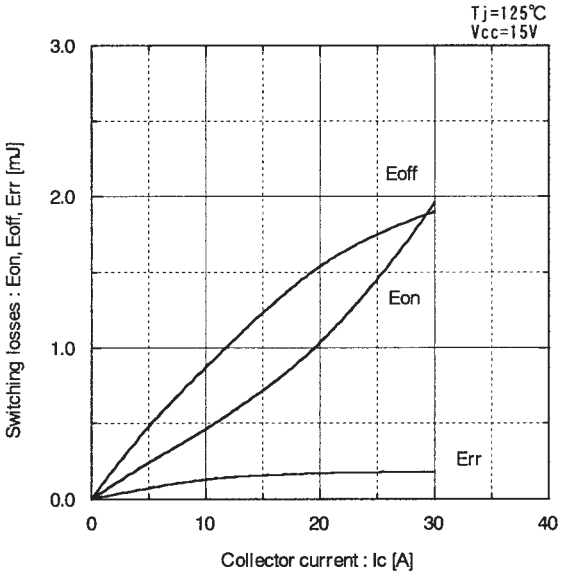
Collector current vs. Collector-emitter voltage



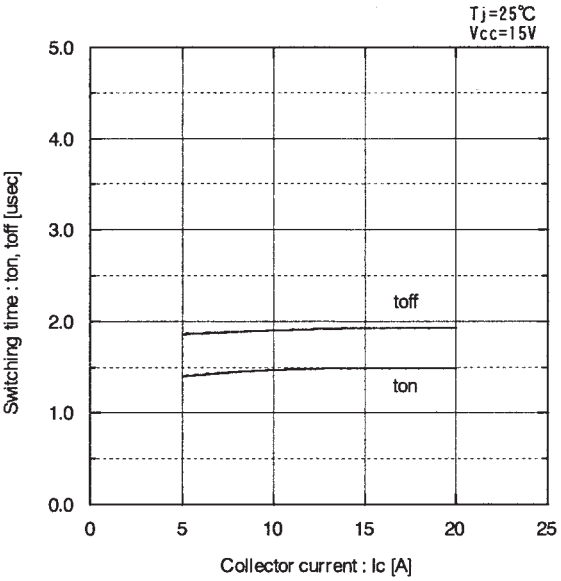
Collector current vs. Collector-emitter voltage



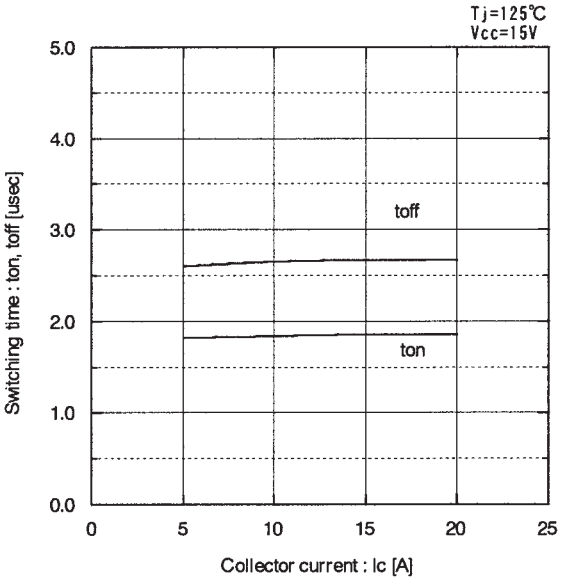
Switching losses vs. Collector current



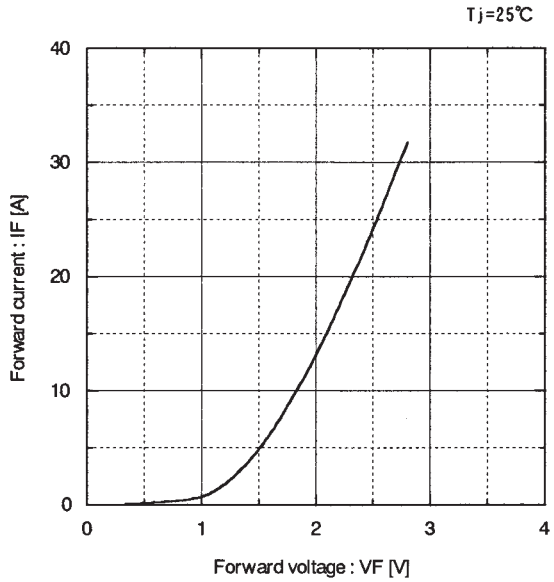
Switching losses vs. Collector current



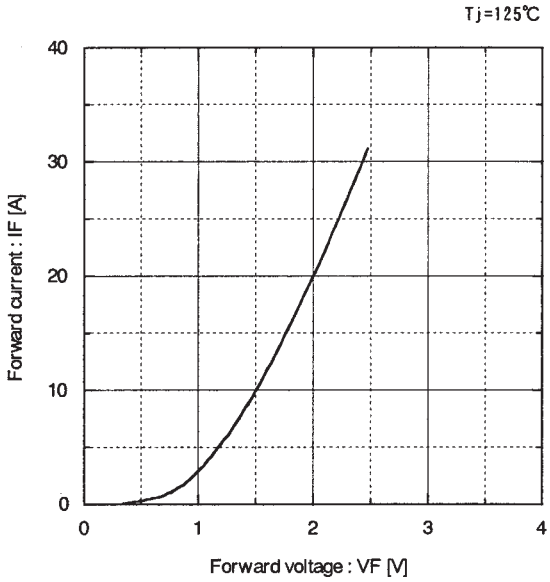
Switching time vs. Collector current



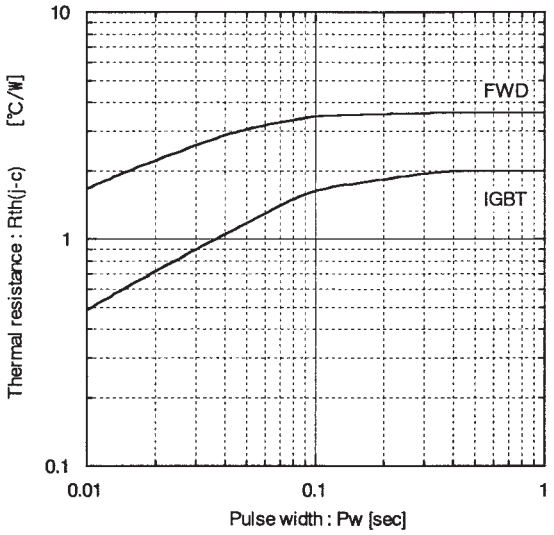
Switching time vs. Collector current



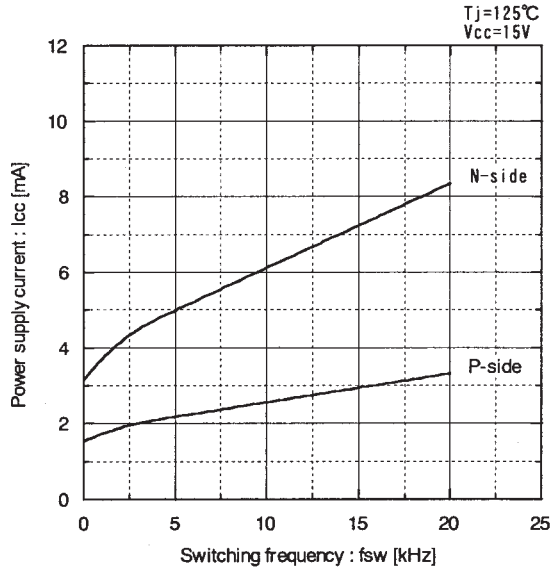
Forward voltage vs. Forward current



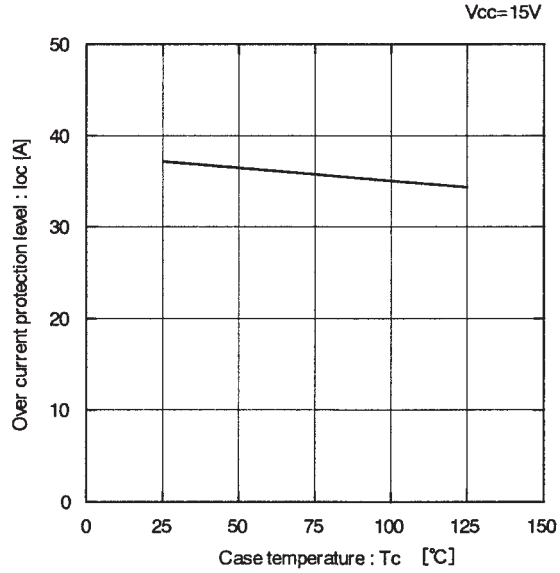
Forward voltage vs. Forward current



Transient thermal resistance



Power supply current vs. Switching frequency



Overcurrent protection vs. Case temperature