

### IGBT-IPM R series

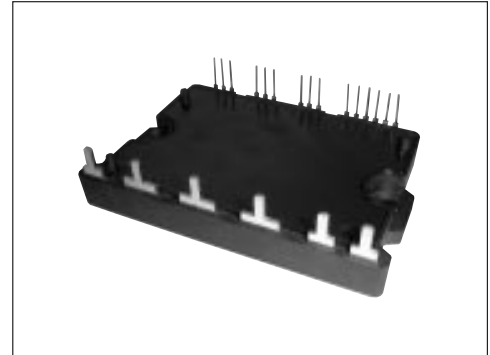
600V / 30A / 6 in one-package

#### ■ 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<sub>c</sub>=25°C unless otherwise specified)

Item	Symbol	Rating	Unit
DC bus voltage	V <sub>DC</sub>	450	V
DC bus voltage (Surge)	V <sub>DC</sub> (surge)	500	V
DC bus voltage (Short operating)	V <sub>SC</sub>	400	V
Collector-Emitter voltage	V <sub>CES</sub>	600	V
Collector current	DC	I <sub>C</sub>	30
	1ms	I <sub>CP</sub>	60
	Duty=56.6%	-I <sub>C</sub>	30
Collector power dissipation	P <sub>C</sub>	85	W
Junction temperature	T <sub>J</sub>	150	°C
Input voltage of power supply for pre-driver	V <sub>CC</sub>	-0.3 to 20	V
Input signal voltage	V <sub>in</sub>	V <sub>Z</sub>	V
Input signal current	I <sub>in</sub>	1	mA
Alarm signal voltage	V <sub>ALM</sub>	V <sub>CC</sub>	V
Alarm signal current	I <sub>ALM</sub>	15	mA
Storage temperature	T <sub>stg</sub>	-40 to 125	°C
Operating case temperature	T <sub>cop</sub>	-20 to 100	°C
Isolating voltage (Terminal to base, 50/60Hz sine wave 1min.)	V <sub>iso</sub>	AC 2500	V
Screw torque	Mounting (M4)	2.0	N • m

##### ● Electrical characteristics of power circuit (T<sub>c</sub>=T<sub>j</sub>=25°C, V<sub>CC</sub>=15V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Collector current at off signal input	I <sub>CES</sub>	V <sub>CE</sub> =600V, V <sub>in</sub> open	-	-	1.0	mA
Collector-Emitter saturation voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> =30A	-	-	2.7	V
Forward voltage of FWD	V <sub>F</sub>	-I <sub>C</sub> =30A	-	-	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)	ICCP	Vin=H	–	2.0	5.0	mA
Power supply current of N-line pre-driver	ICCN	Vin=H	–	4.0	10.0	mA
Input signal threshold voltage	Vin (th)	Turn-on	1.00	1.35	1.70	V
		Turn-off	1.25	1.60	1.95	V
Input zener voltage	Vz	Rin=20kΩ	–	8.0	–	V
IGBT chips overheat protection temperature level	Tjoh	Surface of IGBT	150	–	–	°C
Hysteresis	Tjh		–	20	–	°C
Collector current protection level	Ioc	N-side, (N1-N2 open)	44	54	64	A
	Voc	Between N1 and N2	190	200	210	mV
OC detecting resistance value	Roc		–	3.7	–	mΩ
Protection delay time	tDOC	Tj=25°C Fig. 1, Fig. 2	–	5.0	7.0	μs
Undervoltage protection level	VUV		11.0	–	12.5	V
Hysteresis	VH		0.2	–	0.8	V
Alarm signal hold time	tALM		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	ton	Ic=30A, Vdc=300V	0.5	–	–	μs
	toff	Inductive-Load	–	–	3.5	μs
Switching time (FWD)	ttr		–	–	0.5	μs

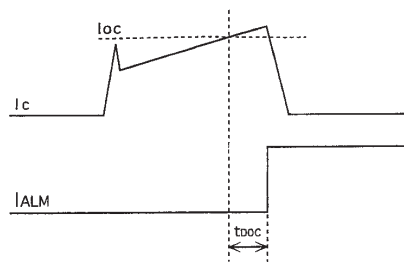


Fig.1 Definition of OC delay time

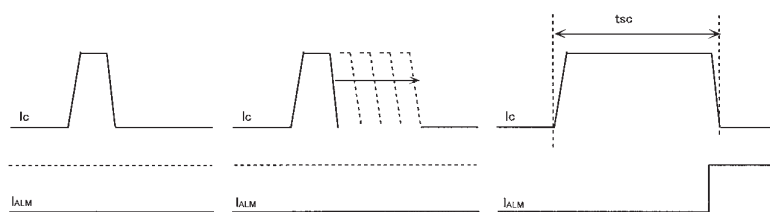


Fig.2 Definition of tsc

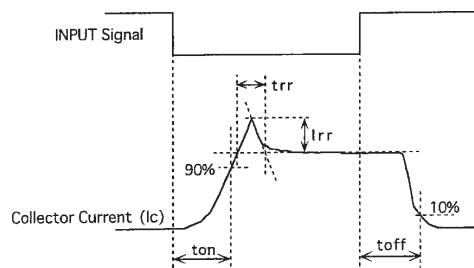


Fig.3 Definition of switching time

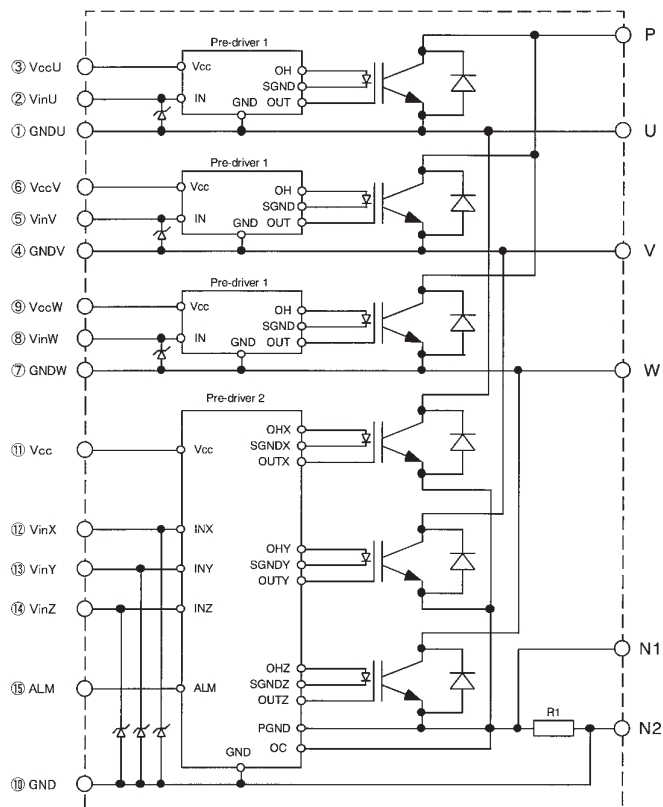
● Thermal characteristics (Tc=Tj=25°C, Vcc=15V)

Item	Symbol	Min.	Typ.	Max.	Unit	
Junction to case thermal resistance	IGBT	Rth (j-c)	–	–	1.47	°C/W
	FWD	Rth (j-c)	–	–	2.1	°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	Vdc	200	–	400	V
Operating power supply voltage range of pre-drive	Vcc	13.5	15	16.5	V
Switching frequency	fsw	1	–	20	kHz
Flatness of heat sink	–	–100	–	100	μm
Mounting screw torque (M4)	–	1.3	–	1.7	N • m

■ Block diagram



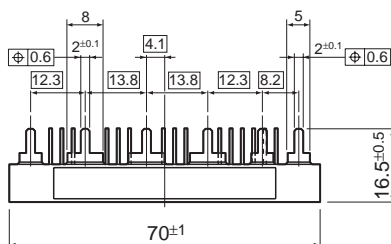
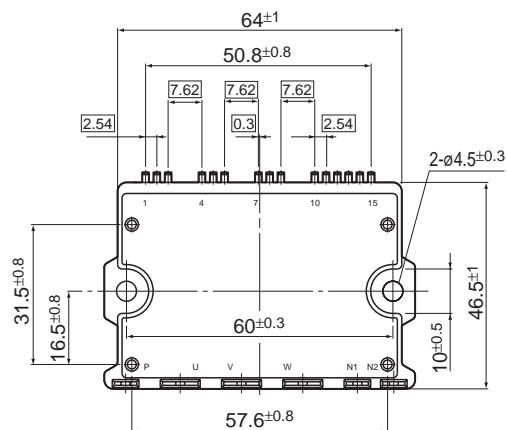
Pre-driver 1 includes following functions. (P-side)

- 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

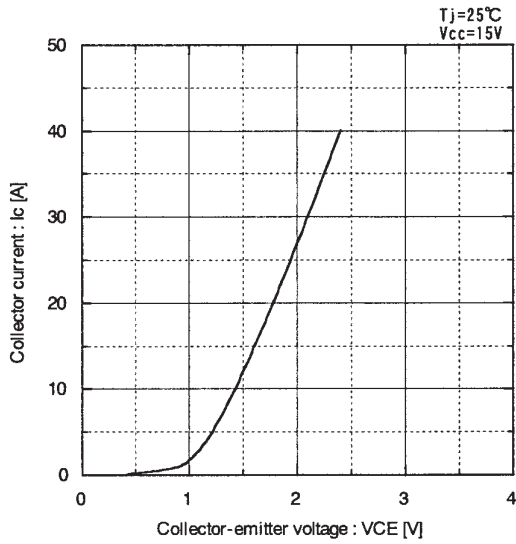
■ Outline drawings, mm



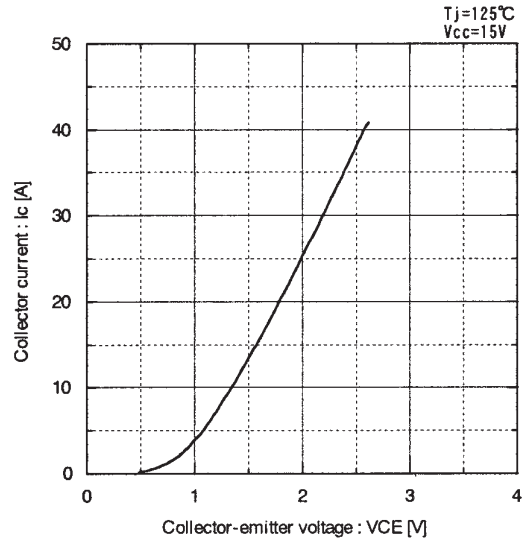
□ Shows theory dimensions

Mass: 50g

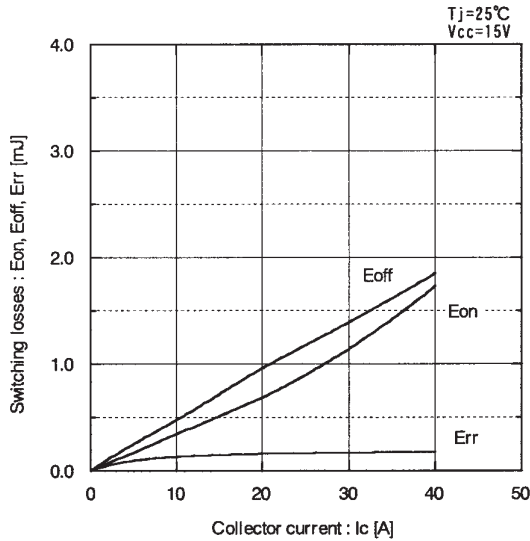
■ Characteristics (Representative)



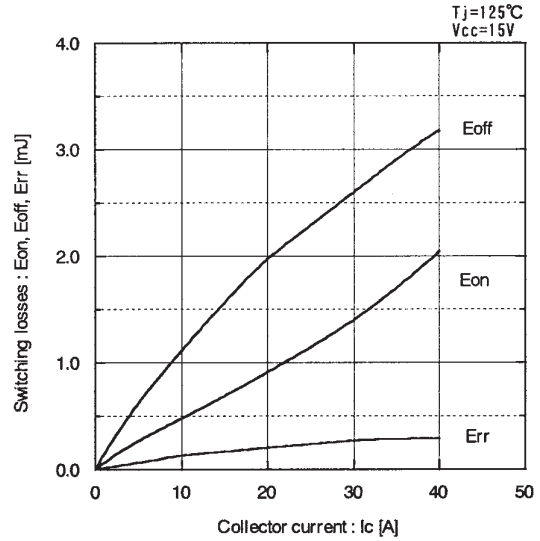
Collector current vs. Collector-emitter voltage



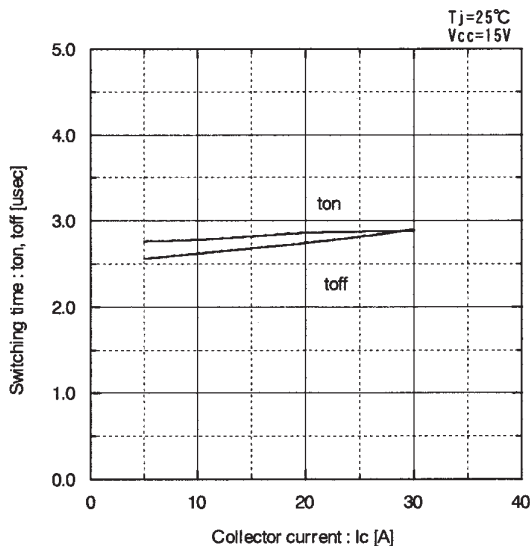
Collector current vs. Collector-emitter voltage



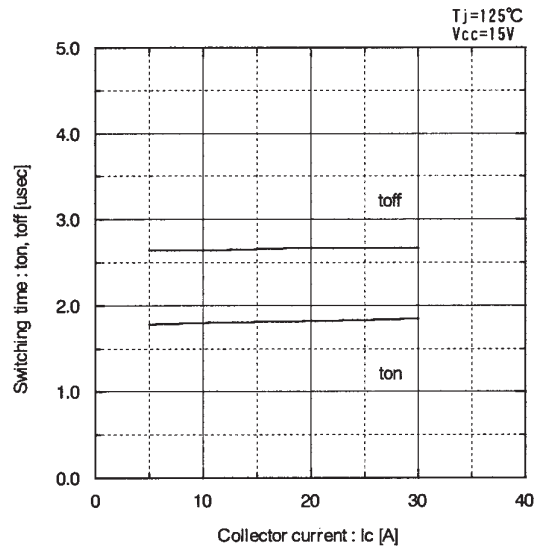
Switching losses vs. Collector current



Switching losses vs. Collector current



Switching time vs. Collector current



Switching time vs. Collector current

