

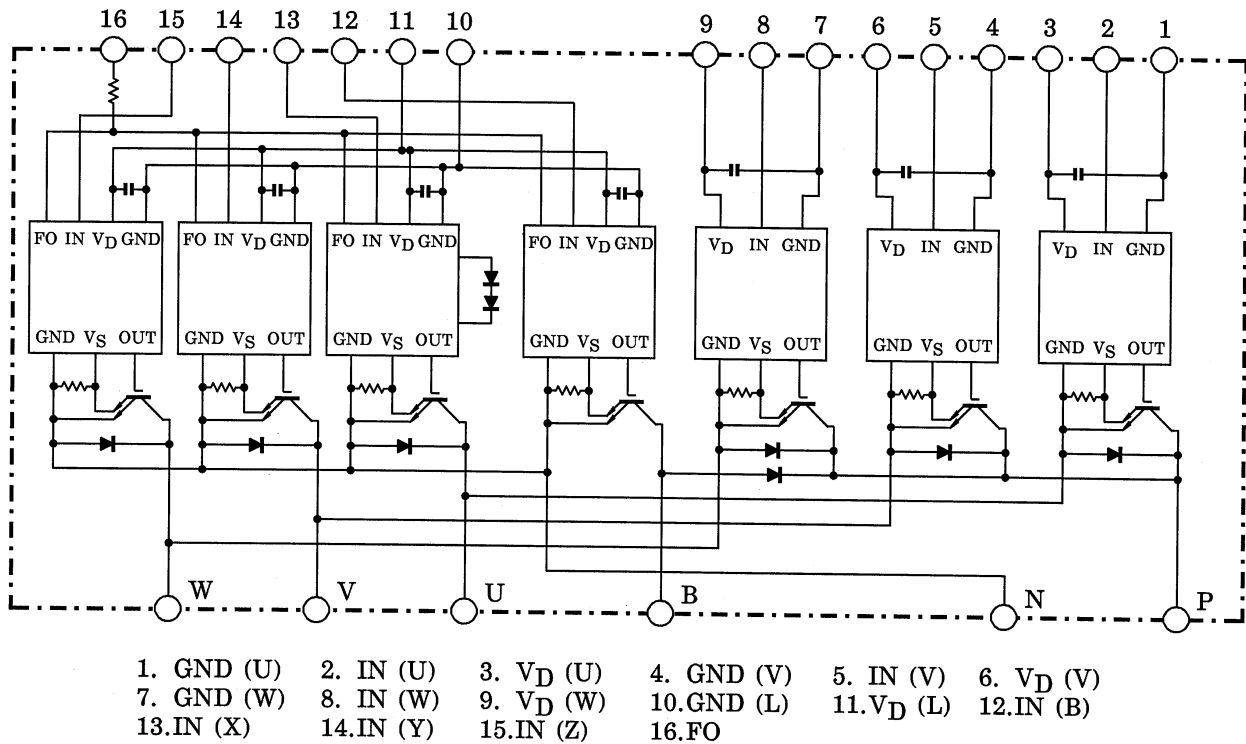
# MIG150J202H

High Power Switching Applications

Motor Control Applications

- Integrates inverter, brake power circuits & control circuits (IGBT drive units, protection units for over-current, under-voltage & over-temperature) in one package.
- The electrodes are isolated from case.
- High speed type IGBT :  $V_{CE(sat)} = 2.8V$  (max)  
 $t_{off} = 3.0 \mu s$  (max)  
 $t_{rr} = 0.30 \mu s$  (max)
- Package dimensions : TOSHIBA 2-110A1A
- Weight : 520g

## Equivalent Circuit



## Maximum Ratings ( $T_j = 25^\circ\text{C}$ )

Stage	Characteristic	Condition	Symbol	Ratings	Unit
Inverter	Supply voltage	P-N power terminal	$V_{CC}$	450	V
	Collector-emitter voltage	—	$V_{CES}$	600	V
	Collector current	$T_c = 25^\circ\text{C}$ , DC	$I_C$	150	A
	Forward current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	150	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	$P_C$	320	W
	Junction temperature	—	$T_j$	150	$^\circ\text{C}$
Brake	Supply voltage	P-N power terminal	$V_{CC}$	450	V
	Collector-emitter voltage	—	$V_{CES}$	600	V
	Collector current	$T_c = 25^\circ\text{C}$ , DC	$I_C$	50	A
	Reverse voltage	—	$V_R$	600	V
	Forward current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	50	A
	Collector power dissipation	$T_c = 25^\circ\text{C}$	$P_C$	120	W
	Junction temperature	—	$T_j$	150	$^\circ\text{C}$
Control	Control supply voltage	$V_D$ -GND terminal	$V_D$	20	V
	Input voltage	IN-GND terminal	$V_{IN}$	20	V
	Fault output voltage	FO-GND (L) terminal	$V_{FO}$	20	V
	Fault output current	FO sink current	$I_{FO}$	14	mA
Module	Operating temperature	—	$T_C$	$-20 \sim 100$	$^\circ\text{C}$
	Storage temperature range	—	$T_{stg}$	$-40 \sim +125$	$^\circ\text{C}$
	Isolation voltage	AC 1 minute	$V_{ISO}$	2500	V
	Screw torque	M5	—	3	N·m

## Electrical Characteristics ( $T_j = 25^\circ\text{C}$ )

### a. Inverter Stage

Characteristic	Symbol	Test Condition		Min	Typ.	Max	Unit
Collector cut-off current	$I_{CEX}$	$V_{CE} = 600\text{ V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	20	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_D = 15\text{ V}$ , $I_C = 150\text{ A}$ $V_{IN} = 15\text{ V} \rightarrow 0\text{ V}$	$T_j = 25^\circ\text{C}$	—	2.2	2.8	V
			$T_j = 125^\circ\text{C}$	—	2.3	—	
Forward voltage	$V_F$	$I_F = 150\text{ A}$		—	2.5	3.5	V
Switching time	$t_{on}$	$V_{CC} = 300\text{ V}$ , $I_C = 150\text{ A}$ $V_D = 15\text{ V}$ , $V_{IN} = 15\text{ V} \leftrightarrow 0\text{ V}$ Inductive load (Note 1)		—	1.2	2.0	$\mu\text{s}$
	$t_{off}$			—	2.0	3.0	
	$t_f$			—	0.25	0.5	
	$t_{rr}$			—	0.1	0.3	

**b. Brake Stage**

Characteristic	Symbol	Test Condition		Min	Typ.	Max	Unit
Collector cut-off current	I <sub>CEX</sub>	V <sub>CE</sub> = 600V	T <sub>J</sub> = 25°C	—	—	1	mA
			T <sub>J</sub> = 125°C	—	—	20	
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	V <sub>D</sub> = 15V, I <sub>C</sub> = 50A V <sub>IN</sub> = 15V→0V	T <sub>J</sub> = 25°C	—	2.0	3.0	V
			T <sub>J</sub> = 125°C	—	2.0	—	
Reverse current	I <sub>R</sub>	V <sub>R</sub> = 600V	T <sub>J</sub> = 25°C	—	—	1	mA
			T <sub>J</sub> = 125°C	—	—	20	
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 50A		—	2.2	2.5	V
Switching time	t <sub>on</sub>	V <sub>CC</sub> = 300V, I <sub>C</sub> = 50A V <sub>D</sub> = 15V, V <sub>IN</sub> = 15V ↔ 0V Inductive load  (Note 1)		—	1.0	2.0	μs
	t <sub>off</sub>			—	2.0	3.0	
	t <sub>f</sub>			—	0.25	0.5	
	t <sub>rr</sub>			—	0.15	0.3	

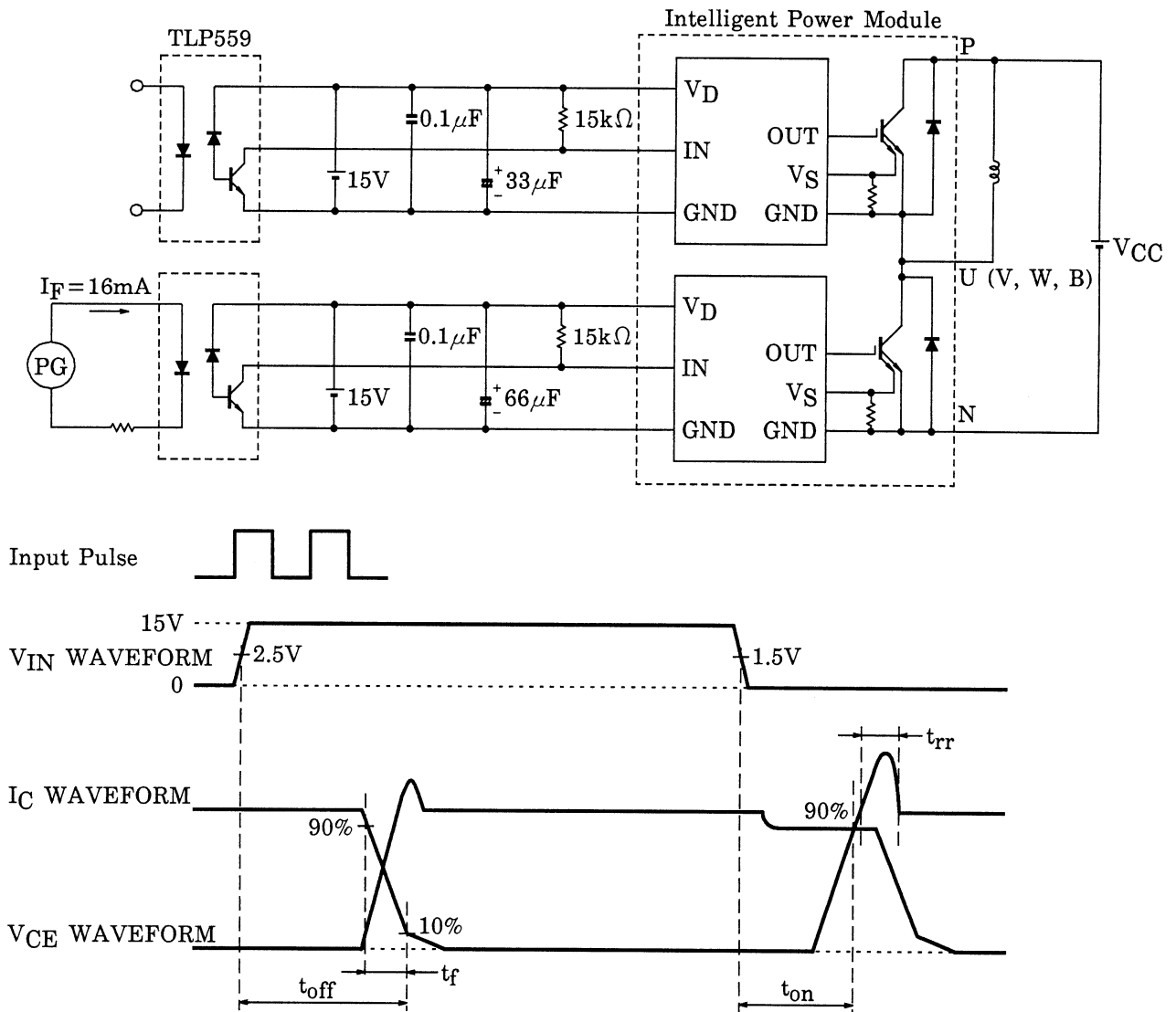
**c. Control Stage ( $T_J = 25^{\circ}C$ )**

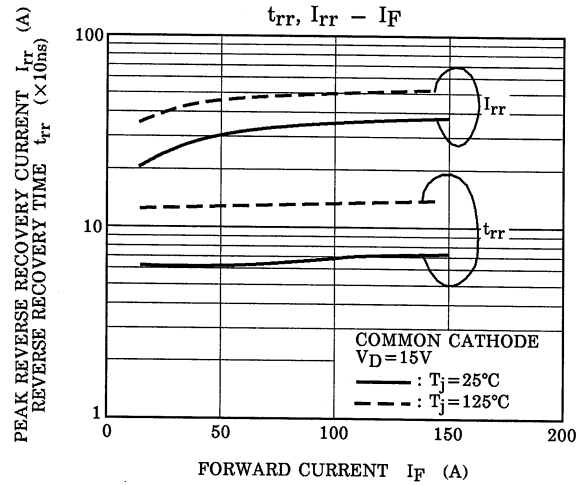
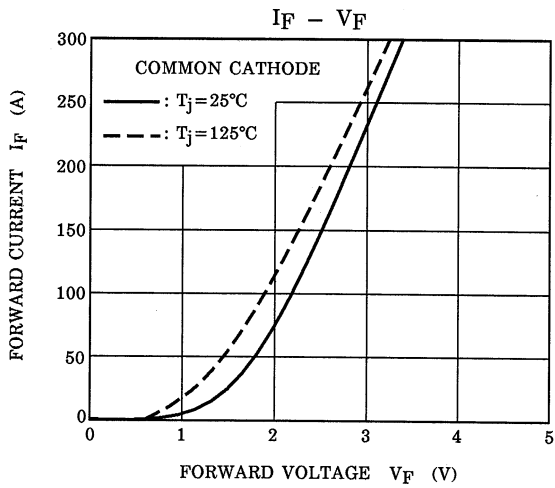
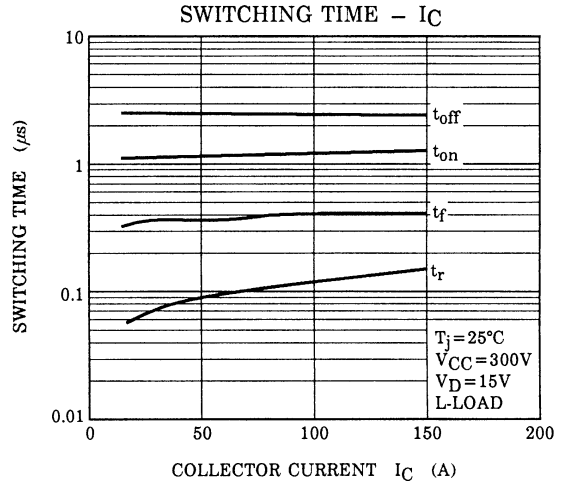
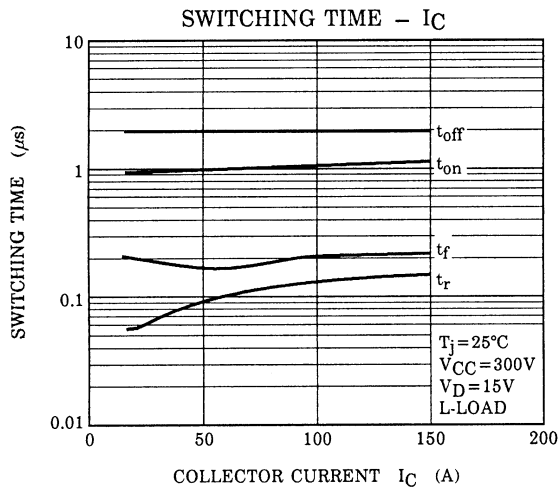
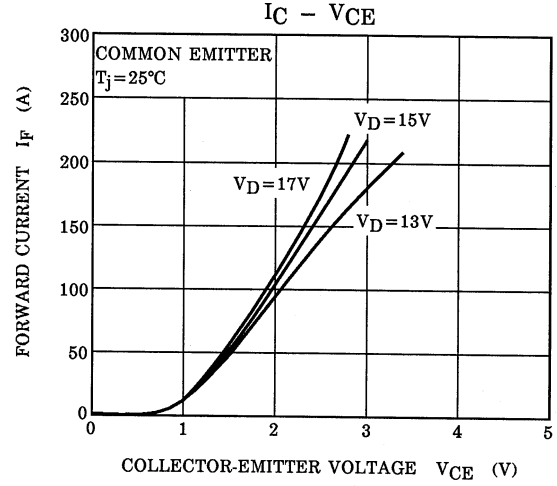
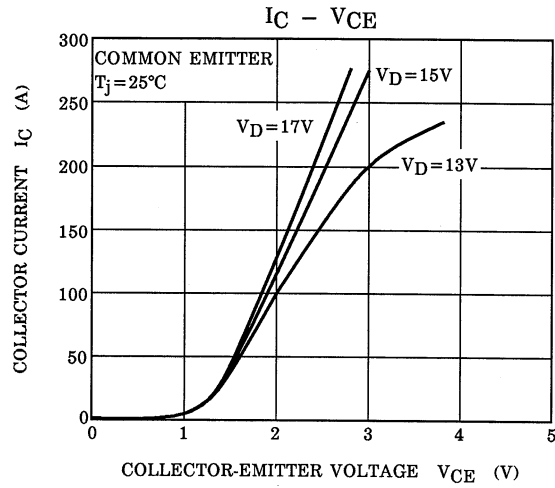
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Control circuit current	High side $I_D(H)$	$V_D = 15V$	—	8	—	mA
	Low side $I_D(L)$		—	32	—	
Input-on signal voltage	$V_{IN(on)}$	$V_D = 15V, I_C = 150mA$	1.3	1.5	1.7	V
Input-off signal voltage	$V_{IN(off)}$	$V_D = 15V, I_C = 150mA$	2.2	2.5	2.8	V
Fault output current	Protection $I_{FO(on)}$	$V_D = 15V$	8	10	12	mA
	Normal $I_{FO(off)}$		—	—	1	
Over current protection trip level	Inverter OC	$V_D = 15V, T_J = 125^{\circ}C$	190	300	—	A
	Brake		60	—	—	
Short current protection trip level	Inverter SC	$V_D = 15V, T_J = 125^{\circ}C$	285	450	—	A
	Brake		90	—	—	
Over current cut-off time	$t_{off(OC)}$	$V_D = 15V$	—	5	—	$\mu s$
Over temperature protection	Trip level OT	Case temperature	110	118	125	$^{\circ}C$
	Reset level OTr		—	98	—	
Control supply under voltage protection	Trip level UV	—	11.0	12.0	12.5	V
	Reset level UVr		—	12.5	—	
Fault output pulse width	$t_{FO}$	$V_D = 15V$	1	2	3	ms

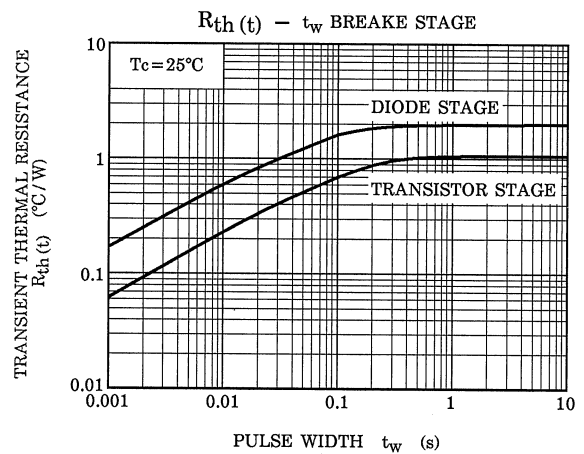
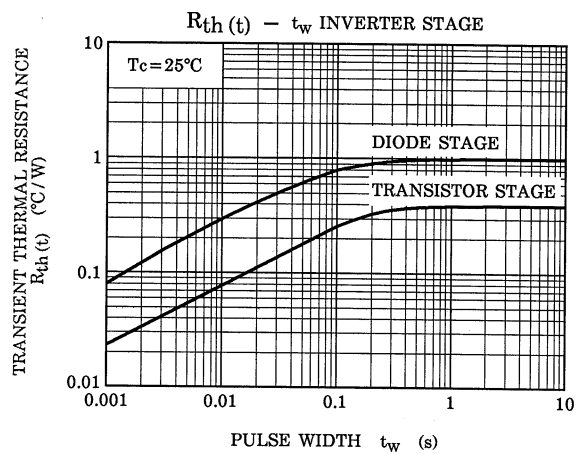
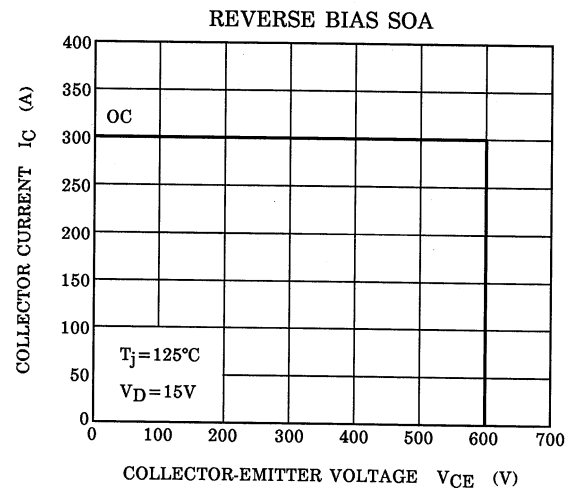
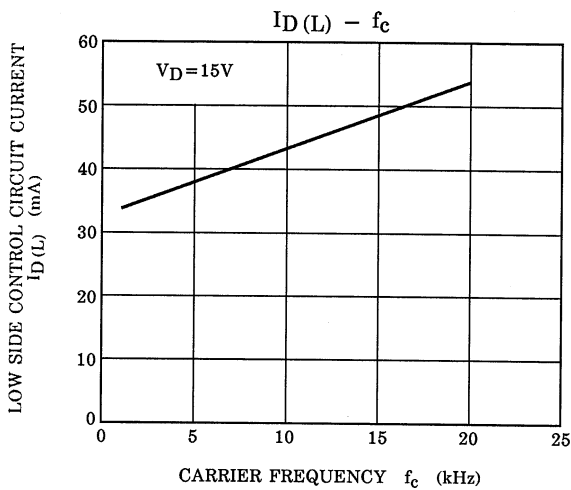
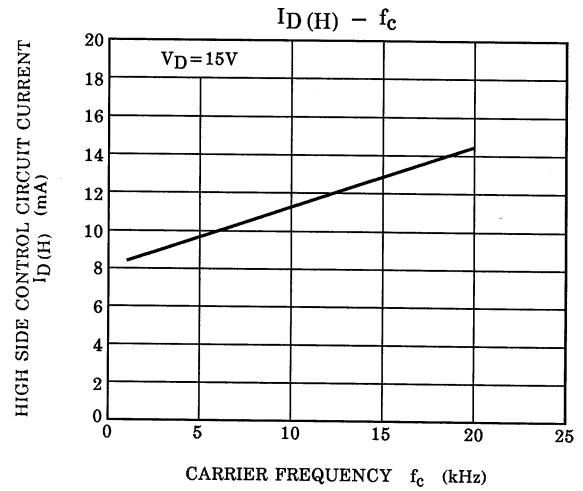
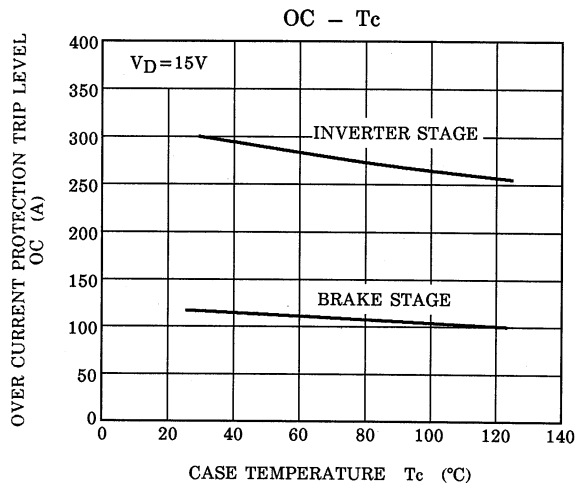
d. Thermal Resistance (T<sub>j</sub> = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Junction to case thermal resistance	R <sub>th (j-c)</sub>	Inverter IGBT	—	—	0.390	°C / W
		Inverter FRD	—	—	1.041	
		Brake IGBT	—	—	1.041	
		Brake FRD	—	—	2.000	
Case to fin thermal resistance	R <sub>th (c-f)</sub>	Compound is applied	—	0.05	—	°C / W

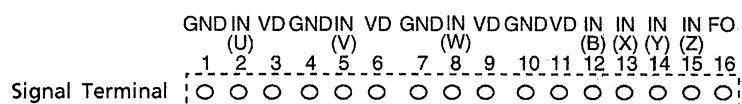
Note 1 : Switching time test circuit & timing chart







## Unit: mm



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