

TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

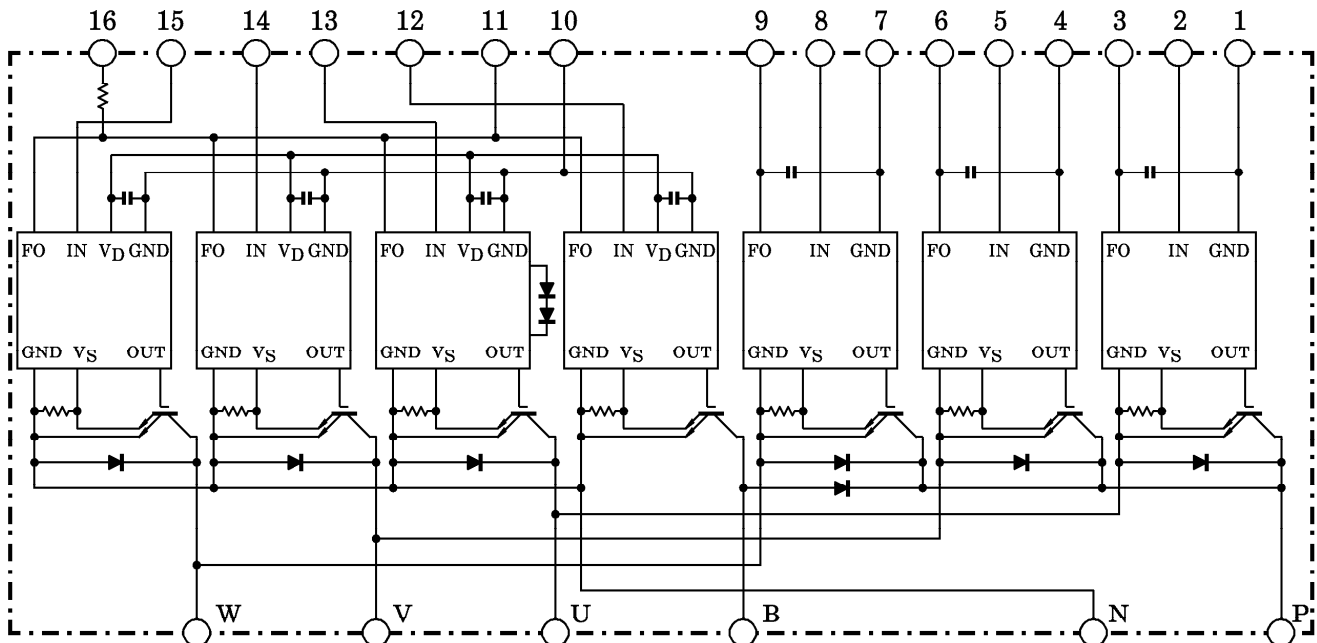
MIG75Q202H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Brake Power Circuits & Control Circuits (IGBT drive units, Protection units for Over-Current, Realtime-Current-Control (RTC), Under-Voltage & Over-Temperature) in One Package.
- The Electrodes are Isolated from Case.
- High Speed Type IGBT : $V_{CE(sat)} = 3.5V$ (MAX.)
 $t_{off} = 2.8\mu s$ (MAX.)
 $t_{rr} = 0.21\mu s$ (MAX.)
- Outline TOSHIBA 2-110A1A
- Weight 520g

EQUIVALENT CIRCUIT



1. GND (U)	2. IN (U)	3. V_D (U)	4. GND (V)	5. IN (V)	6. V_D (V)
7. GND (W)	8. IN (W)	9. V_D (W)	10. GND (L)	11. V_D (L)	12. IN (B)
13. IN (X)	14. IN (Y)	15. IN (Z)	16. FO		

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MAXIMUM RATINGS ($T_j = 25^\circ\text{C}$)

STAGE	CHARACTERISTIC	CONDITION	SYMBOL	RATINGS	UNIT
Inverter	Supply Voltage	P-N power terminal	V_{CC}	900	V
	Collector-Emitter Voltage	—	V_{CES}	1200	V
	Collector Current	$T_c = 25^\circ\text{C}$, DC	I_C	75	A
	Forward Current	$T_c = 25^\circ\text{C}$, DC	I_F	75	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	P_C	400	W
	Junction Temperature	—	T_j	150	$^\circ\text{C}$
Brake	Supply Voltage	P-N power terminal	V_{CC}	900	V
	Collector-Emitter Voltage	—	V_{CES}	1200	V
	Collector Current	$T_c = 25^\circ\text{C}$, DC	I_C	25	A
	Reverse Voltage	—	V_R	1200	V
	Forward Current	$T_c = 25^\circ\text{C}$, DC	I_F	25	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	P_C	140	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}	10	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	Nm

ELECTRICAL CHARACTERISTICS

a. Inverter stage

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	$V_{CEX} = 1200\text{V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	10	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{V}$, $I_C = 75\text{A}$ $V_{IN} = 15\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.6	3.5	V
			$T_j = 125^\circ\text{C}$	—	2.5	—	
Forward Voltage	V_F	$I_F = 75\text{A}$		—	2.2	3.0	V
Switching Time	t_{on}	$V_{CC} = 600\text{V}$, $I_C = 75\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 15\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1)			1.0	1.7	μs
	$t_{c(on)}$				0.4	0.8	
	t_{rr}				0.16	0.21	
	t_{off}				1.9	2.6	
	$t_{c(off)}$				0.35	0.6	

b. Brake stage

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	$V_{CEX} = 1200V$	$T_j = 25^{\circ}C$	—	1	mA
			$T_j = 125^{\circ}C$	—	10	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15V, I_C = 25A$ $V_{IN} = 15V \rightarrow 0V$	$T_j = 25^{\circ}C$	—	2.6	V
			$T_j = 125^{\circ}C$	—	2.5	
Reverse Voltage	I_R	$V_R = 1200V$	$T_j = 25^{\circ}C$	—	1	mA
			$T_j = 125^{\circ}C$	—	10	
Forward Voltage	V_F	$I_F = 25A$	—	1.4	2.2	V
Switching Time	t_{on}	$V_{CC} = 600V, I_C = 25A$ $V_D = 15V, V_{IN} = 15V \leftrightarrow 0V$ Inductive load (Note 1)	—	1.3	1.9	μs
	$t_c(on)$		—	0.85	1.6	
	t_{rr}		—	0.42	0.50	
	t_{off}		—	1.9	2.6	
	$t_c(off)$		—	0.3	0.6	

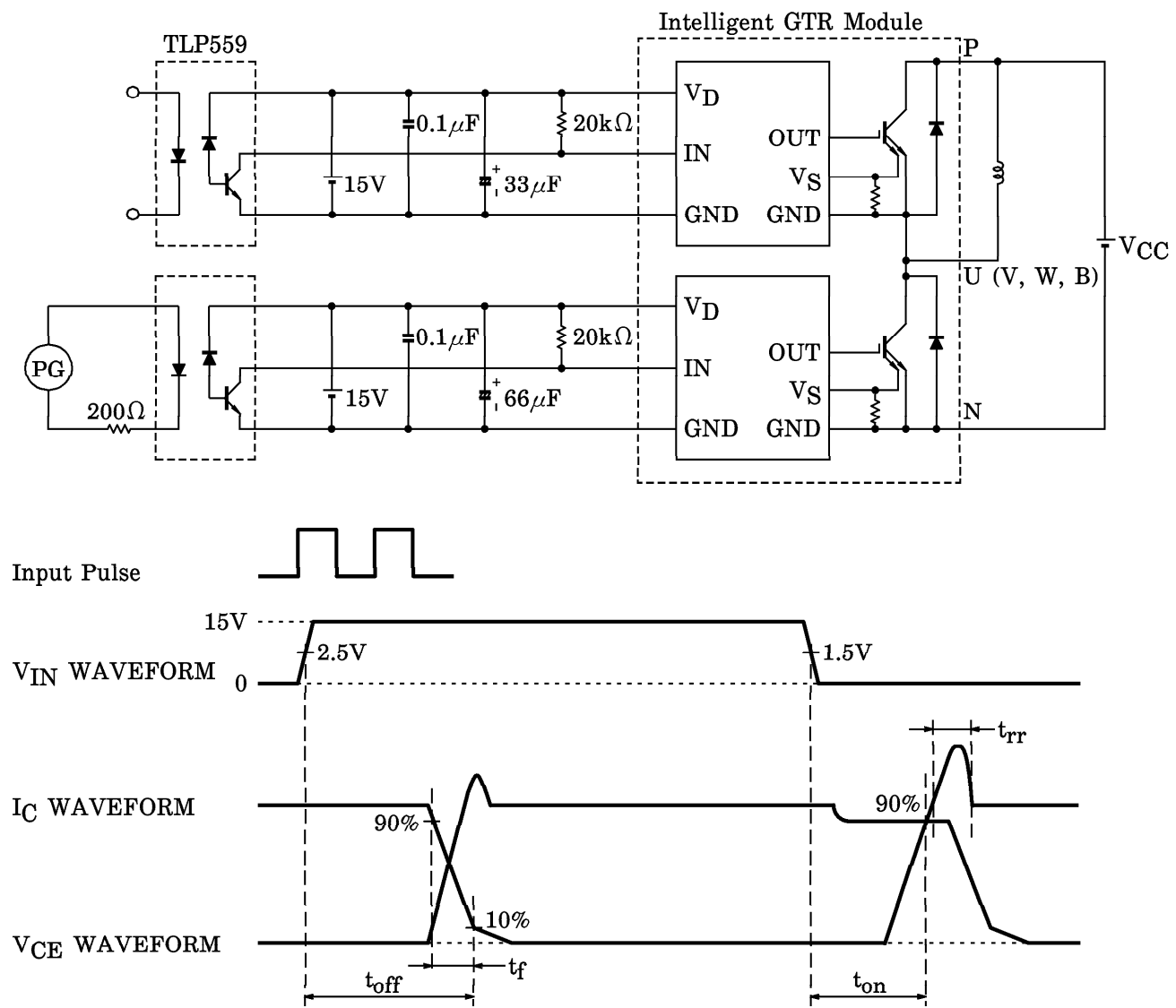
c. Control stage ($T_j = 25^{\circ}C$)

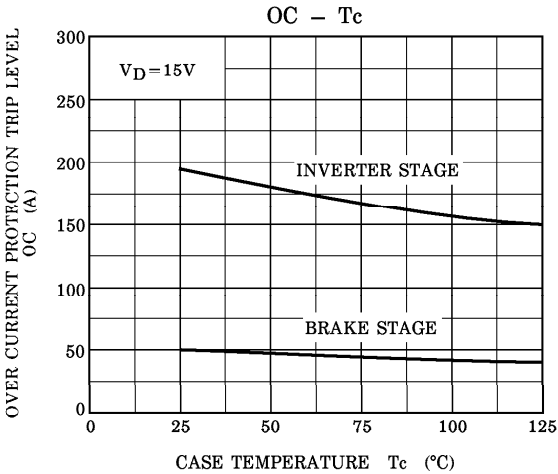
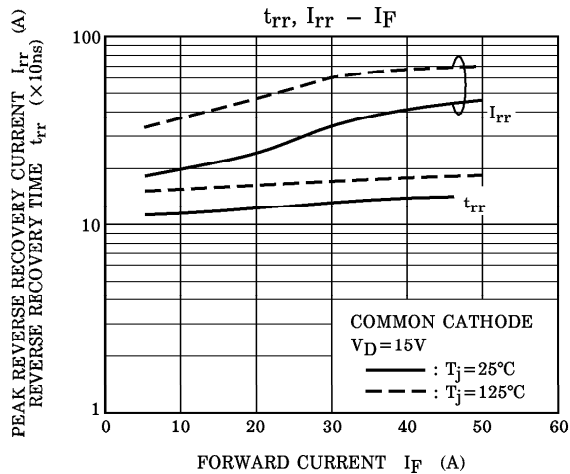
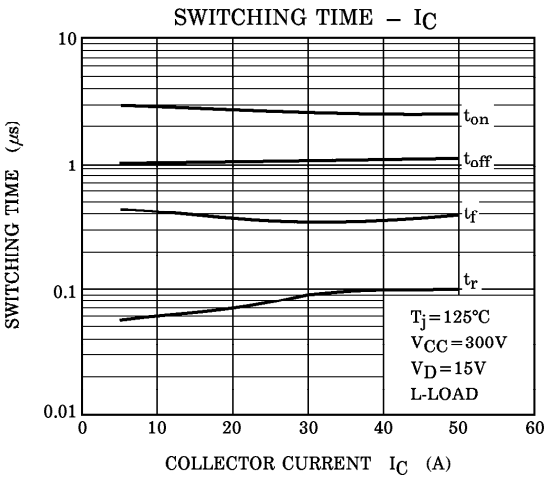
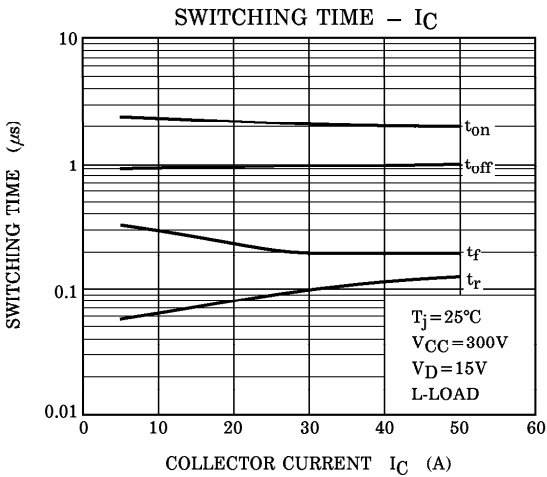
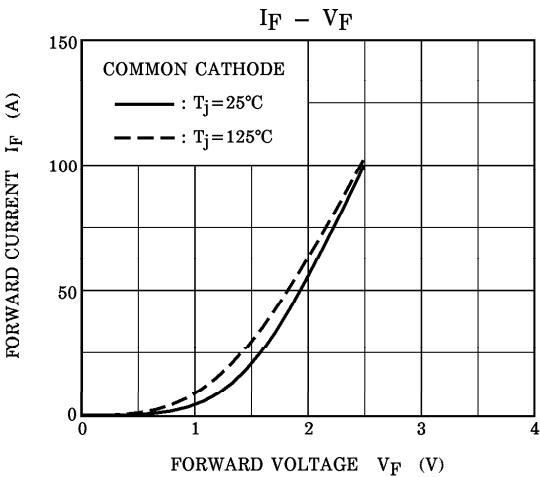
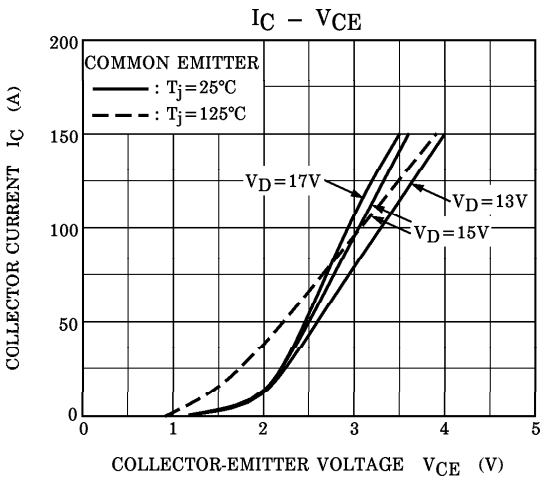
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	$I_D(H)$	$V_D = 15V$	8	12	mA
	Low Side			32	48	
Input On Signal Voltage	$V_{IN(on)}$	$V_D = 15V, I_C = 75mA$	1.4	1.6	1.8	V
Input Off Signal Voltage	$V_{IN(off)}$	—	2.2	2.5	2.8	mA
Fault Output Current	Protection	$I_{FO(on)}$	$V_D = 15V$	5.4	6.0	
	Normal			—	0.1	
Over Current Protection Trip Level	Inverter	OC	$V_D = 15V, T_j = 125^{\circ}C$	105	150	A
	Brake			85	100	
Short Circuit Protection Trip Level	Inverter	SC	$V_D = 15V, T_j = 125^{\circ}C$	150	250	A
	Brake			120	150	
Over Current Cut-Off Time	$t_{off(OC)}$	$V_D = 15V$	—	5	—	μs
Over Temperature Protection	Trip Level	OT	Case temperature	110	118	$^{\circ}C$
	Reset Level			—	98	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.5	12.0	V
	Reset Level			12.0	12.5	
Fault Output Pulse Width	t_{FO}	$V_D = 15V$	1	2	3	ms

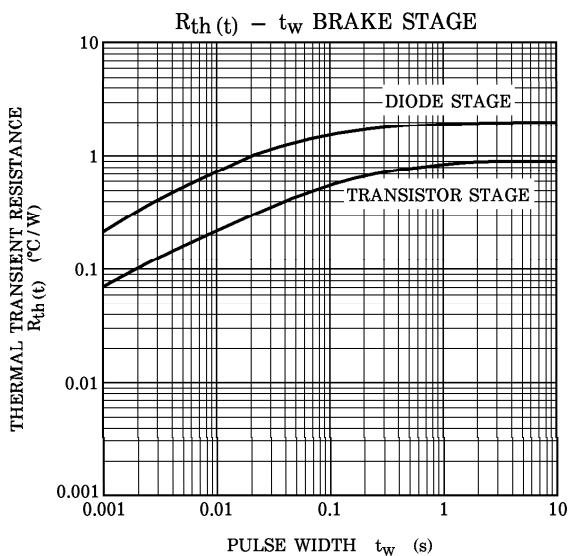
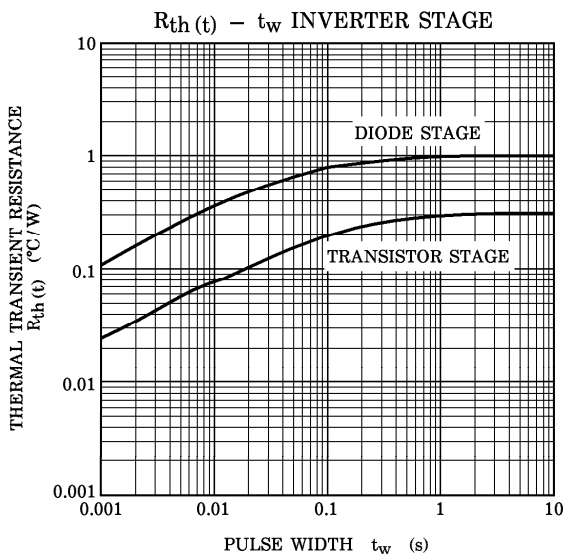
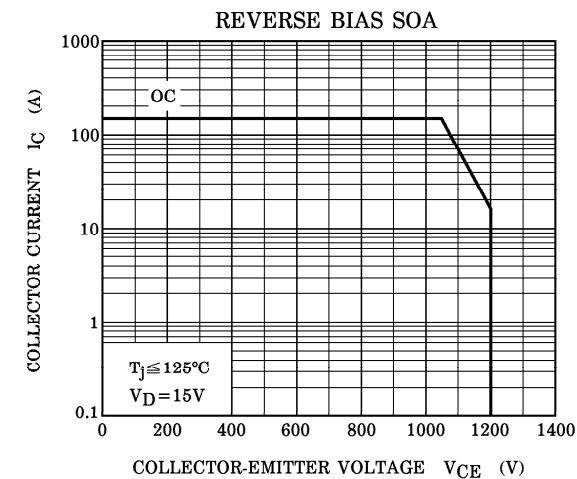
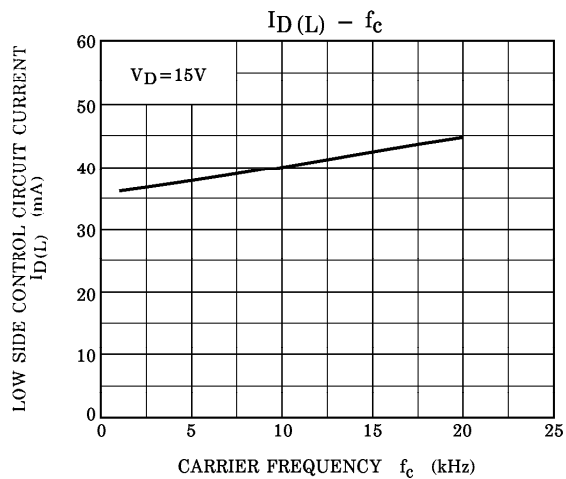
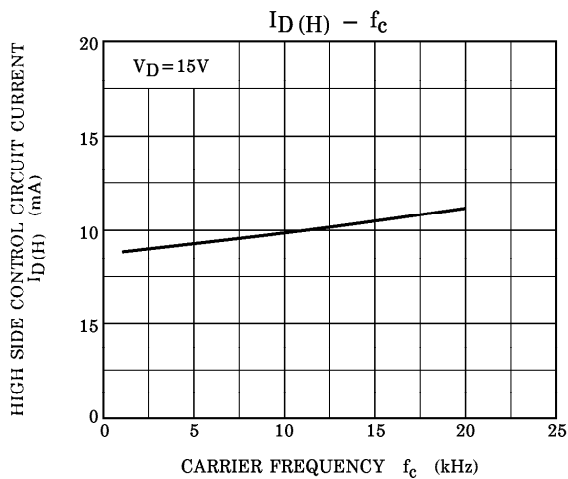
d. Thermal resistance ($T_j = 25^{\circ}\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT stage	—	—	0.312	$^{\circ}\text{C} / \text{W}$
		Inverter FRD stage	—	—	1.00	
		Brake IGBT stage	—	—	0.892	
		Brake FRD stage	—	—	2.00	
Case to Fin Thermal Resistance	$R_{th(c-f)}$	Compound is applied	—	0.05	—	$^{\circ}\text{C} / \text{W}$

Note 1 : Switching time test circuit & timing chart







Unit : mm

