

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

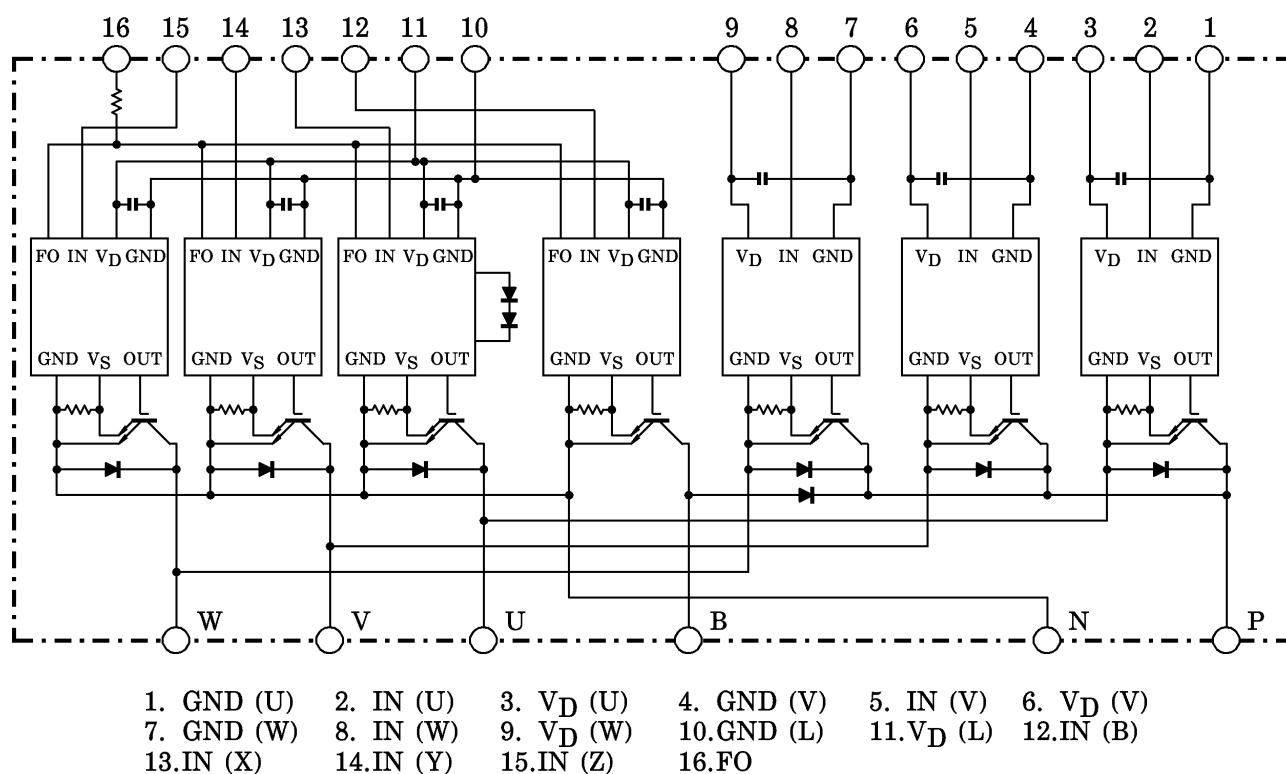
MIG150J202H

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.)
- Outline : TOSHIBA 2-110A1A
- Weight : 520g

EQUIVALENT CIRCUIT



961001EAA1

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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}	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	Nm

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}	$V_{CEX} = 600\text{V}$	$T_j = 25^\circ\text{C}$	—	1	mA
			$T_j = 125^\circ\text{C}$	—	20	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{V}$, $I_C = 150\text{A}$ $V_{IN} = 15\text{V} \rightarrow 0\text{V}$	$T_j = 25^\circ\text{C}$	—	2.2	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	μs
	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 _{CEX}	V _{CEX} = 600V	T _j = 25°C	—	—	1	mA
			T _j = 125°C	—	—	20	
Collector-Emitter Saturation Voltage	V _{CE} (sat)	V _D = 15V, I _C = 50A V _{IN} = 15V→0V	T _j = 25°C	—	2.0	3.0	V
			T _j = 125°C	—	2.0	—	
Reverse Current	I _R	V _R = 600V	T _j = 25°C	—	—	1	mA
			T _j = 125°C	—	—	20	
Forward Voltage	V _F	I _F = 50A		—	2.2	2.5	V
Switching Time	t _{on}	V _{CC} = 300V, I _C = 50A		—	1.0	2.0	μs
	t _{off}	V _D = 15V, V _{IN} = 15V↔0V		—	2.0	3.0	
	t _f	Inductive load		—	0.25	0.5	
	t _{rr}	(Note 1)		—	0.15	0.3	

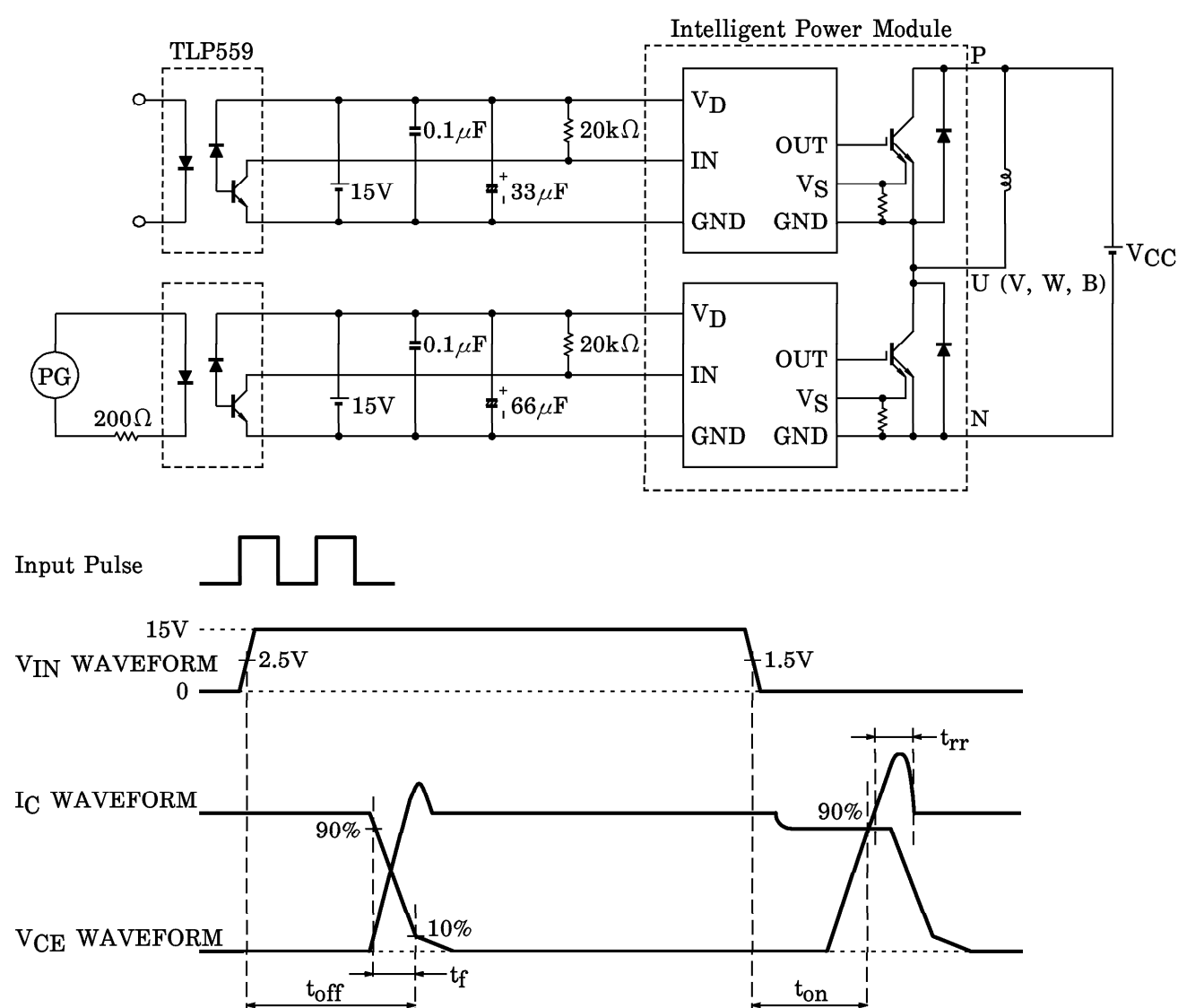
c. Control stage (T_j = 25°C)

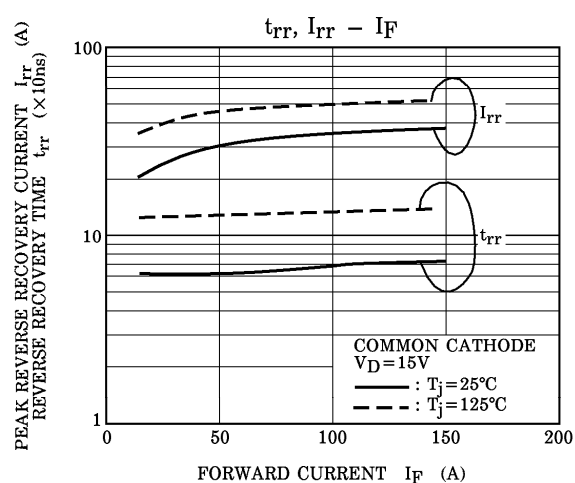
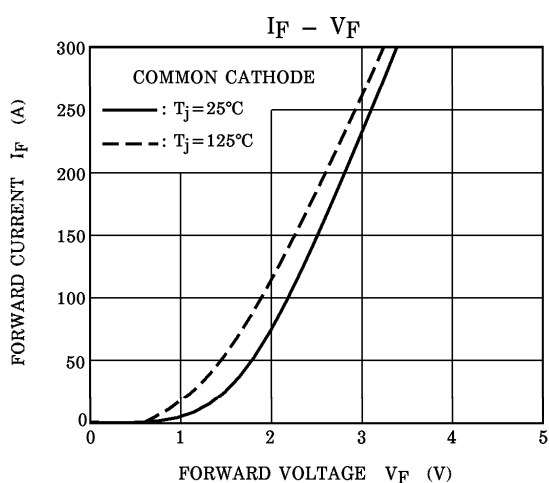
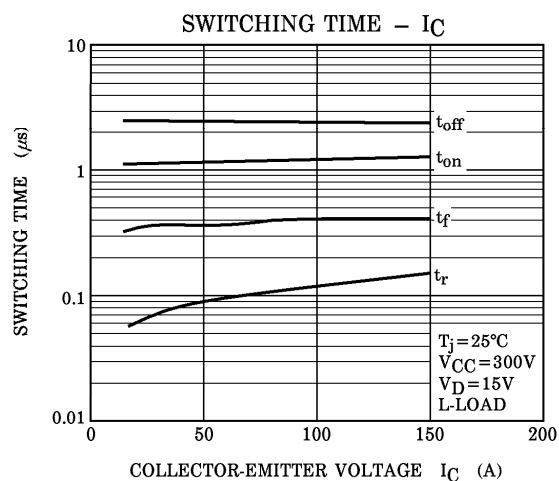
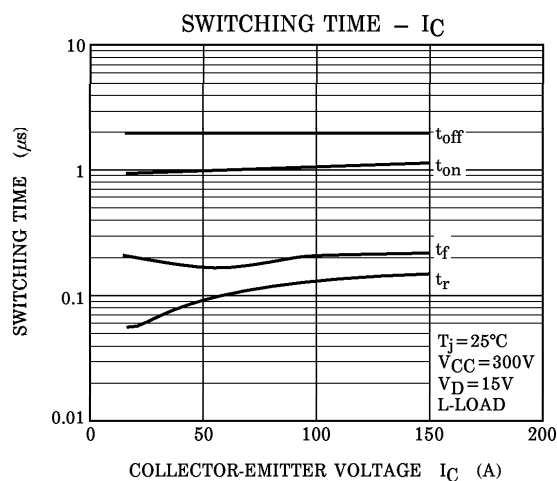
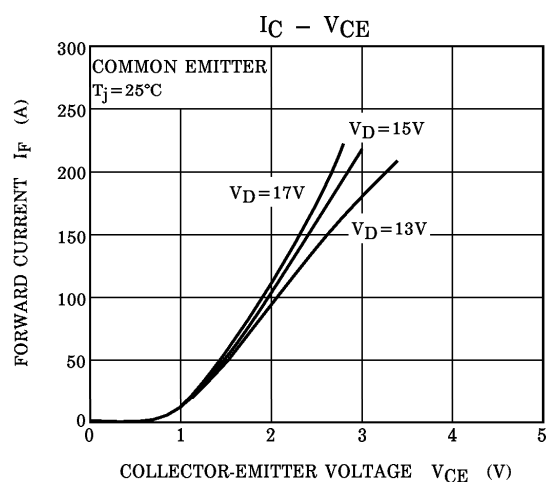
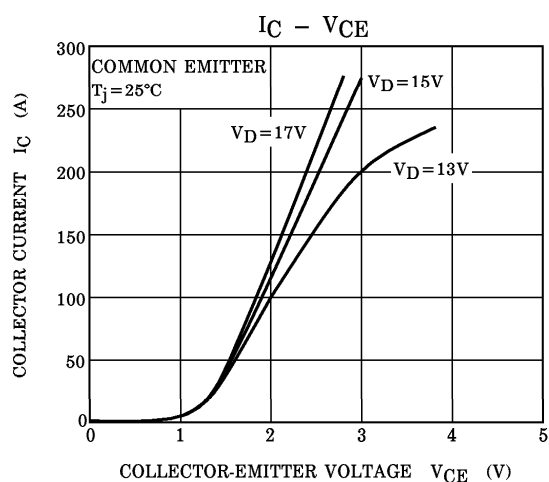
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	I _D (H)	V _D = 15V	—	8	mA
	Low Side			—	32	
Input-On Signal Voltage	V _{IN (on)}	V _D = 15V, I _C = 150mA	1.3	1.5	1.7	V
Input-Off Signal Voltage	V _{IN (off)}	V _D = 15V, I _C = 150mA	2.2	2.5	2.8	V
Fault Output Current	Protection	I _{FO (on)}	V _D = 15V	8	10	mA
	Normal			—	—	
Over Current Protection Trip Level	Inverter	OC	V _D = 15V, T _j = 125°C	190	300	A
	Brake			60	—	
Short Circuit Protection Trip Level	Inverter	SC	V _D = 15V, T _j = 125°C	285	450	A
	Brake			90	—	
Over Current Cut-Off Time	t _{off (OC)}	V _D = 15V	—	5	—	μs
Over Temperature Protection	Trip Level	OT	Case temperature	110	118	°C
	Reset Level			—	98	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.0	12.0	V
	Reset Level			—	12.5	
Fault Output Pulse Width	t _{FO}	V _D = 15V	1	2	3	ms

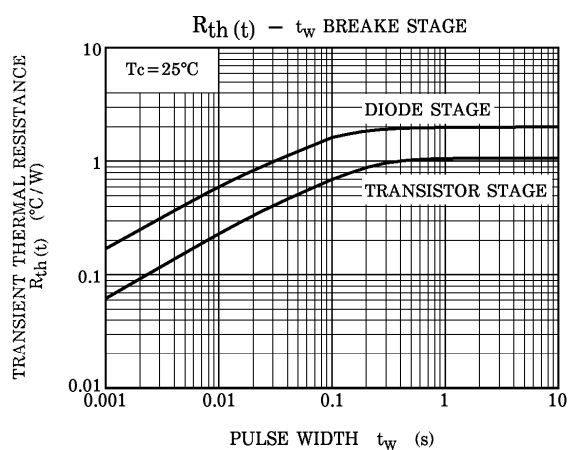
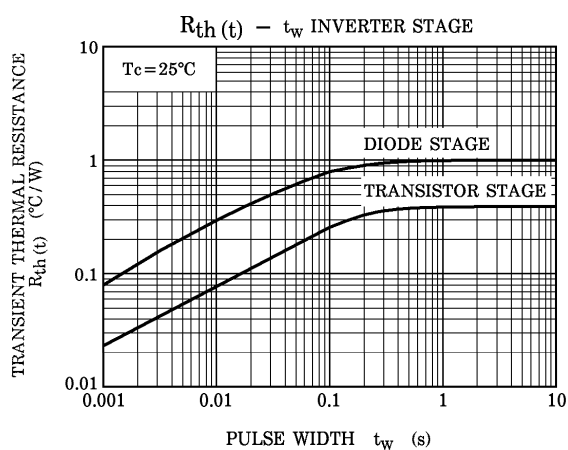
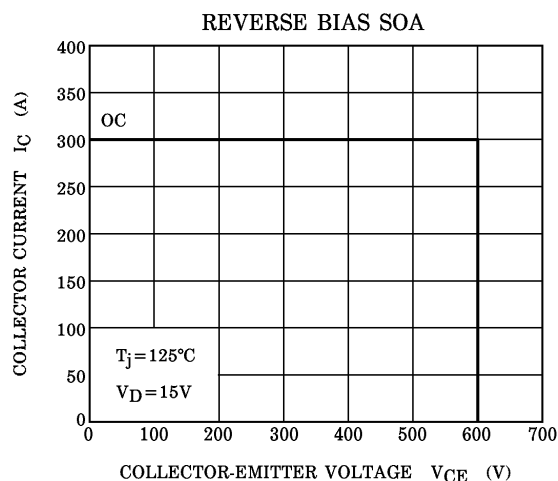
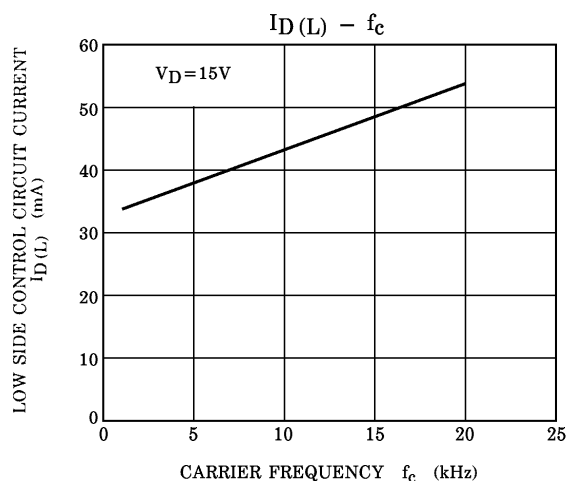
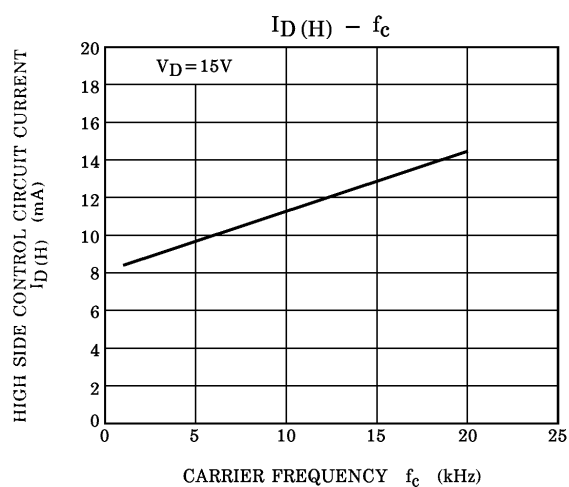
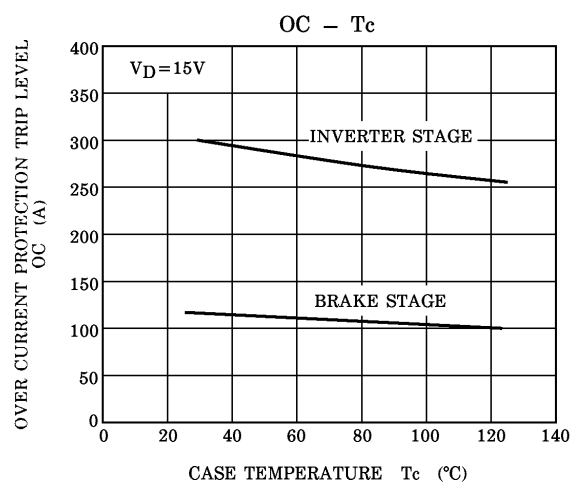
d. Thermal resistance ($T_j = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT	—	—	0.390	$^\circ\text{C/W}$
		Inverter FRD	—	—	1.041	
		Brake IGBT	—	—	1.041	
		Brake FRD	—	—	2.000	
Case to Fin Thermal Resistance	$R_{th(c-f)}$	Compound is applied	—	0.05	—	$^\circ\text{C/W}$

Attached 1 : Switching time test circuit & timing chart







OUTLINE

Unit : mm

