

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

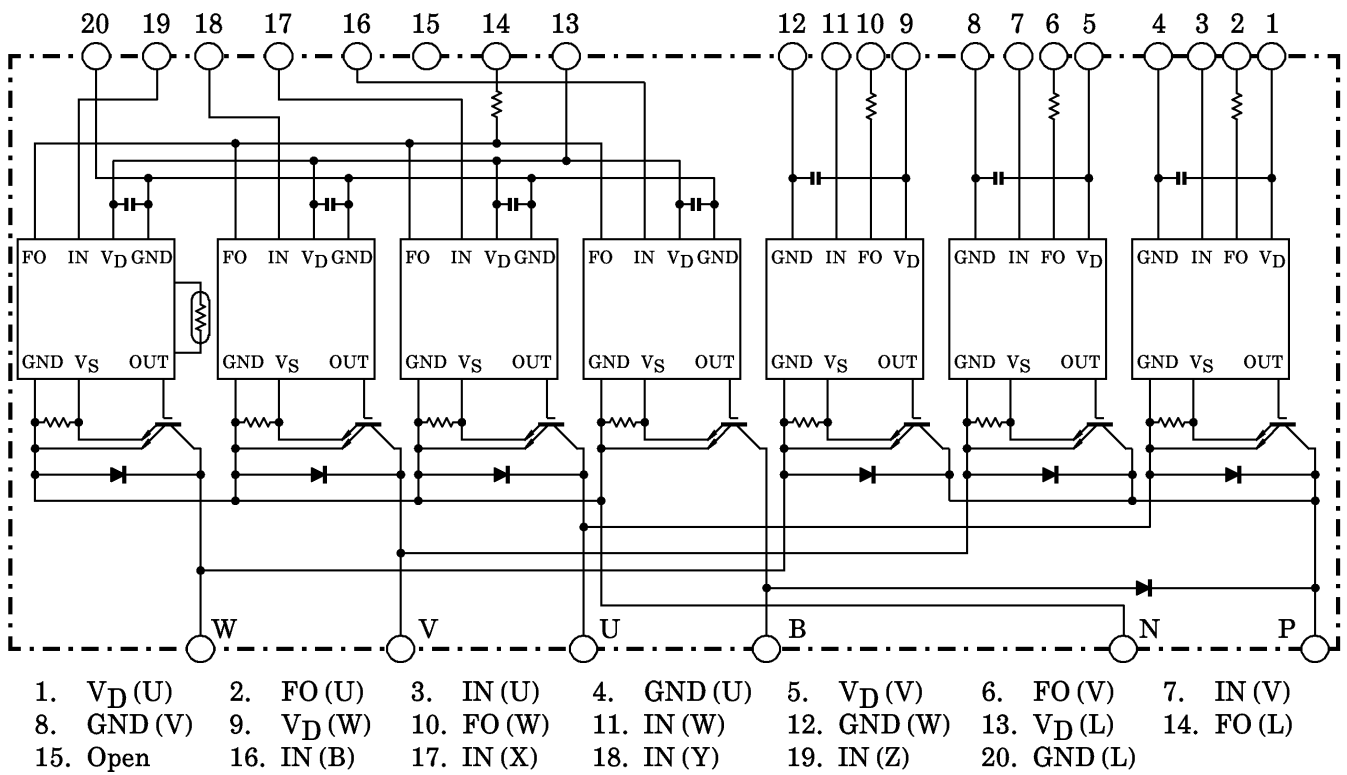
# MIG100J7CSA0A (600V / 100A 7in1)

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

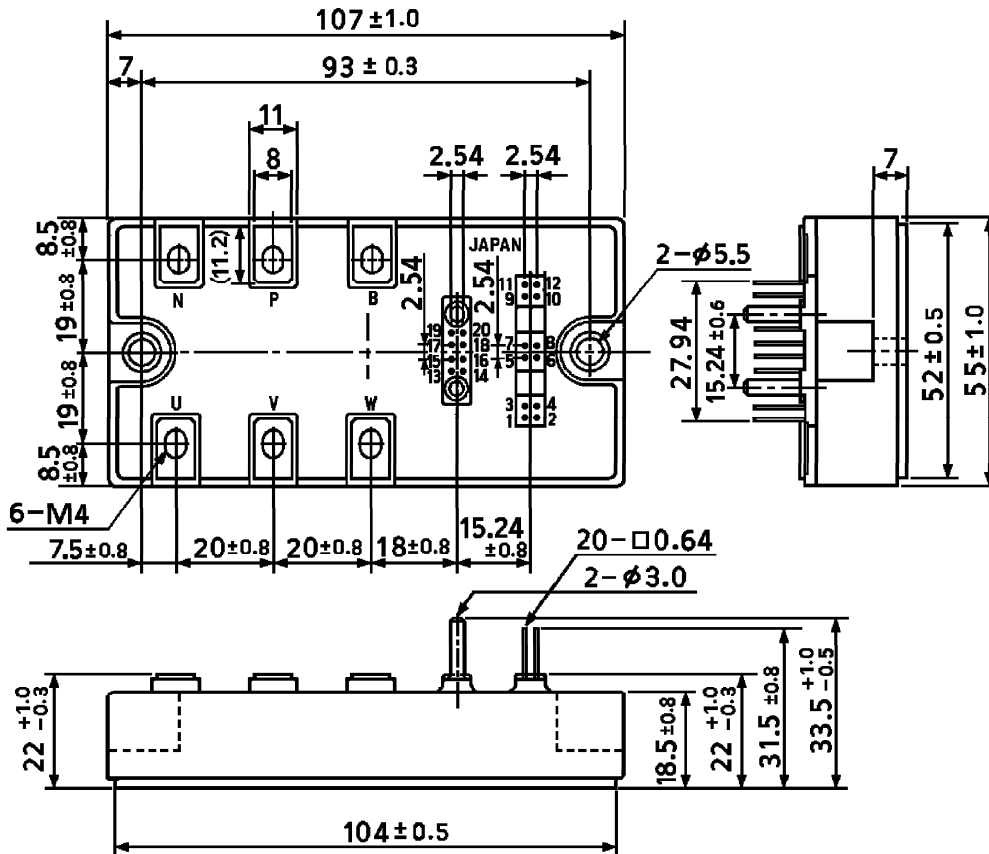
- Integrates Inverter, Brake Power Circuits & Control Circuits (IGBT drive unit, Protection units for Short-Current, Over-Current, Under-Voltage & Over Temperature) in One Package.
- The Electrodes are Isolated from Case.
- $V_{CE(sat)} = 1.6\text{ V (Typ.)}$

## EQUIVALENT CIRCUIT



OUTLINE : TOSHIBA 2-108G1A

Unit : mm

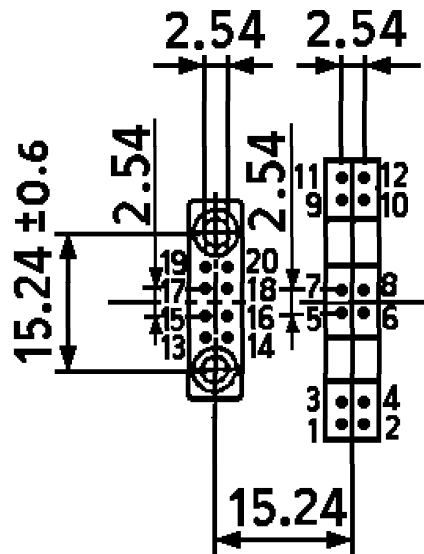


- |              |            |             |           |             |            |
|--------------|------------|-------------|-----------|-------------|------------|
| 1. $V_D(U)$  | 2. FO(U)   | 3. IN(U)    | 4. GND(U) | 5. $V_D(V)$ | 6. FO(V)   |
| 7. IN(V)     | 8. GND(V)  | 9. $V_D(W)$ | 10. FO(W) | 11. IN(W)   | 12. GND(W) |
| 13. $V_D(L)$ | 14. FO(L)  | 15. Open    | 16. IN(B) | 17. IN(X)   | 18. IN(Y)  |
| 19. IN(Z)    | 20. GND(L) |             |           |             |            |

Weight : 278 g (Typ.)

SIGNAL TERMINAL LAYOUT

Unit : mm



- |                        |            |                       |           |                       |            |
|------------------------|------------|-----------------------|-----------|-----------------------|------------|
| 1. V <sub>D</sub> (U)  | 2. FO(U)   | 3. IN(U)              | 4. GND(U) | 5. V <sub>D</sub> (V) | 6. FO(V)   |
| 7. IN(V)               | 8. GND(V)  | 9. V <sub>D</sub> (W) | 10. FO(W) | 11. IN(W)             | 12. GND(W) |
| 13. V <sub>D</sub> (L) | 14. FO(L)  | 15. Open              | 16. IN(B) | 17. IN(X)             | 18. IN(Y)  |
| 19. IN(Z)              | 20. GND(L) |                       |           |                       |            |

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

STAGE	CHARACTERISTIC	CONDITION	SYMBOL	RATING	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	$I_C$	100	A
	Forward Current	$T_c = 25^\circ\text{C}$ , DC	$I_F$	100	A
	Collector Power Dissipation	$T_c = 25^\circ\text{C}$	$P_C$	290	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	$T_c = 25^\circ\text{C}$	$P_C$	150	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 Terminal	$V_{FO}$	20	V
	Fault Output Current	FO Sink Current	$I_{FO}$	14	mA
Module	Operating Temperature	—	$T_c$	-20~+100	$^\circ\text{C}$
	Storage Temperature Range	—	$T_{stg}$	-40~+125	$^\circ\text{C}$
	Isolation Voltage	AC 1 min	$V_{ISO}$	2500	V
	Screw Torque (Terminal)	M4	—	2	Nm
	Screw Torque (Mounting)	M5	—	3	Nm

ELECTRICAL CHARACTERISTICS

a. Inverter Stage ( $T_j = 25^\circ\text{C}$ )

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
			$T_j = 125^\circ\text{C}$	—	—	10	
Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$V_D = 15\text{ V}$ , $I_C = 100\text{ A}$ , $V_{IN} = 15\text{ V} \rightarrow 0\text{ V}$	$T_j = 25^\circ\text{C}$	1.3	1.6	2.0	V
			$T_j = 125^\circ\text{C}$	—	1.6	—	
Forward Voltage	$V_F$	$I_F = 100\text{ A}$	1.5	1.9	2.3	V	
Switching Time	$t_{on}$	$V_{CC} = 300\text{ V}$ , $I_C = 100\text{ A}$ $V_D = 15\text{ V}$ , $V_{IN} = 15\text{ V} \leftrightarrow 0\text{ V}$ Inductive Load (Note 1)	—	1.3	2.2	$\mu\text{s}$	
	$t_c(\text{on})$		—	0.4	1.0		
	$t_{rr}$		—	0.2	0.6		
	$t_{off}$		—	1.7	3.0		
	$t_c(\text{off})$		—	0.4	0.8		

b. Brake Stage ( $T_j = 25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Collector Cut-Off Current	$I_{CE}$	$V_{CE} = 600\text{ V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	10	
Collector-Emitter Saturation Voltage	$V_{CE(\text{sat})}$	$V_D = 15\text{ V},$ $I_C = 50\text{ A},$ $V_{IN} = 15\text{ V} \rightarrow 0\text{ V}$	$T_j = 25^\circ\text{C}$	—	1.6	2.0	V
			$T_j = 125^\circ\text{C}$	—	1.6	—	
Reverse Current	$I_R$	$V_R = 600\text{ V}$	$T_j = 25^\circ\text{C}$	—	—	1	mA
			$T_j = 125^\circ\text{C}$	—	—	10	
Forward Voltage	$V_F$	$I_F = 50\text{ A}$	1.5	1.9	2.3	V	
Switching Time	$t_{\text{on}}$	$V_{CC} = 300\text{ V}, I_C = 50\text{ A}$ $V_D = 15\text{ V}, V_{IN} = 15\text{ V} \leftrightarrow 0\text{ V}$ Inductive Load (Note 1)	—	1.4	2.6	$\mu\text{s}$	
	$t_{\text{c(on)}}$		—	0.65	1.2		
	$t_{\text{rr}}$		—	0.45	0.9		
	$t_{\text{off}}$		—	1.85	3.2		
	$t_{\text{c(off)}}$		—	0.4	0.7		

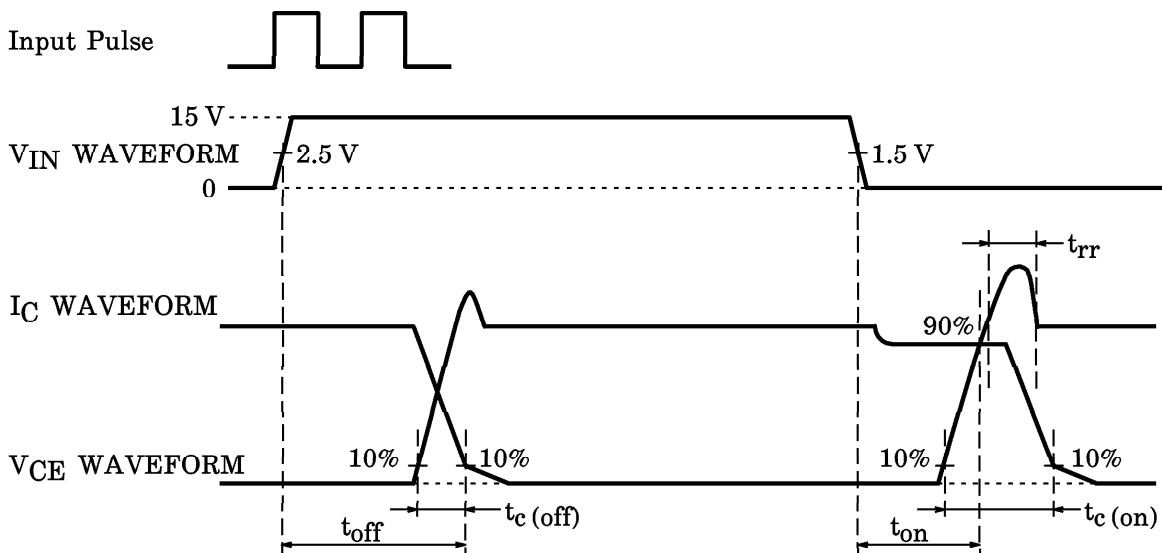
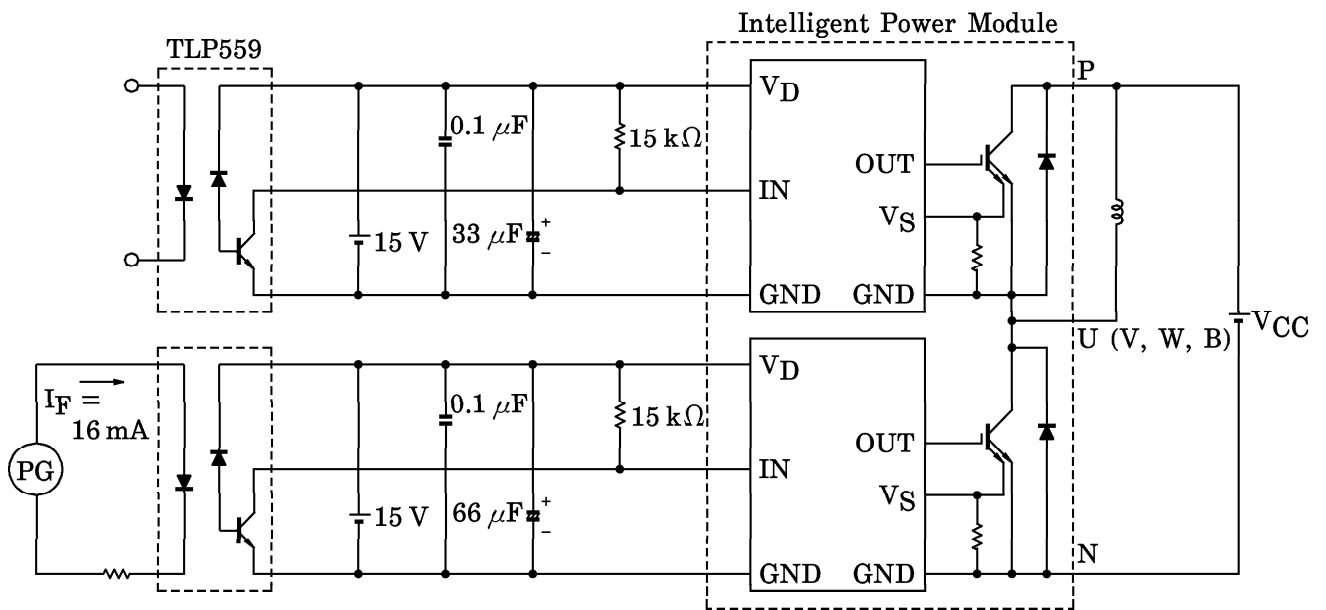
c. Control Stage ( $T_j = 25^\circ\text{C}$ )

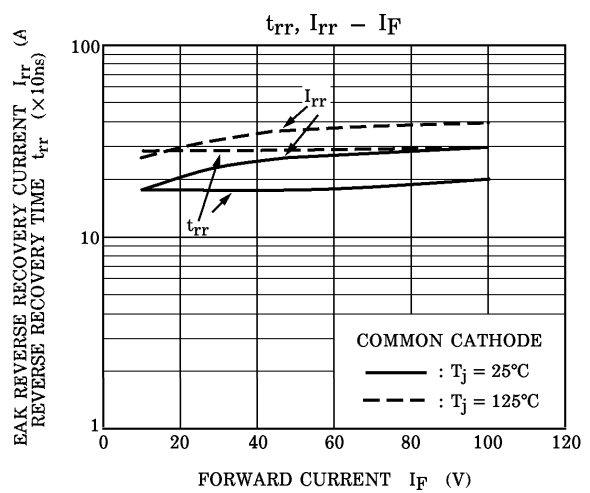
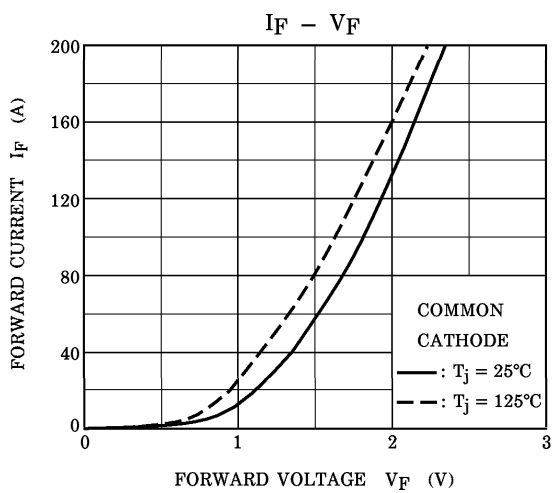
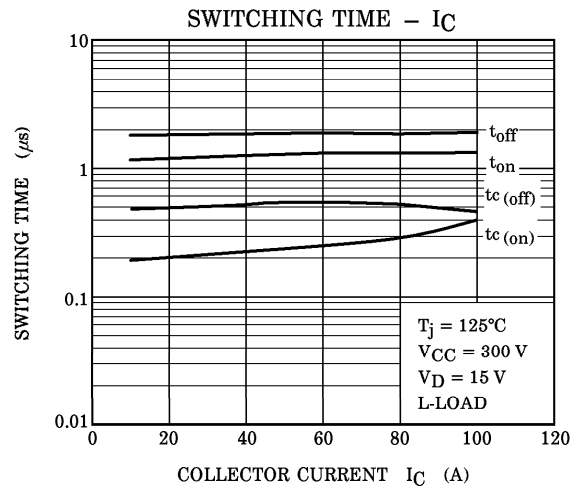
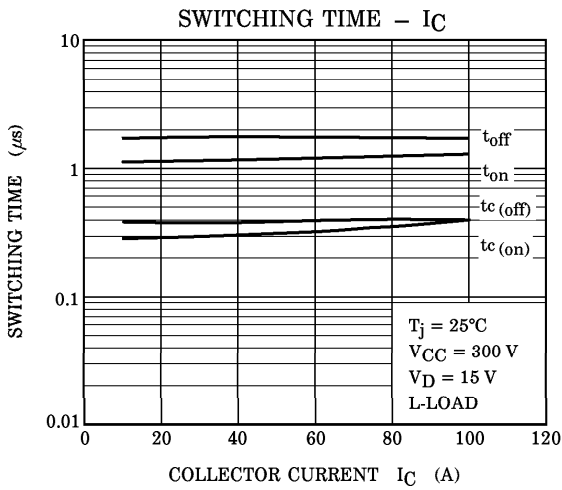
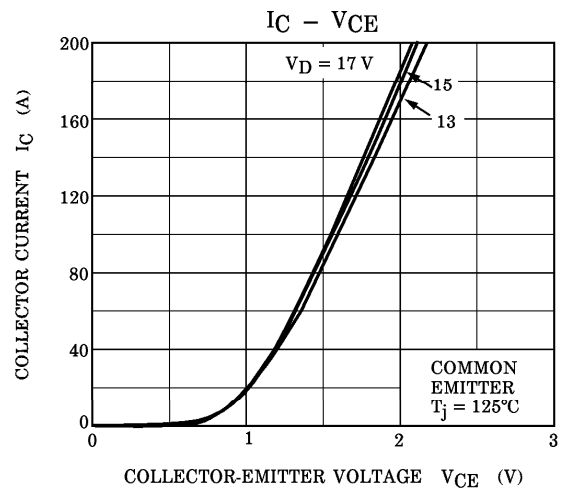
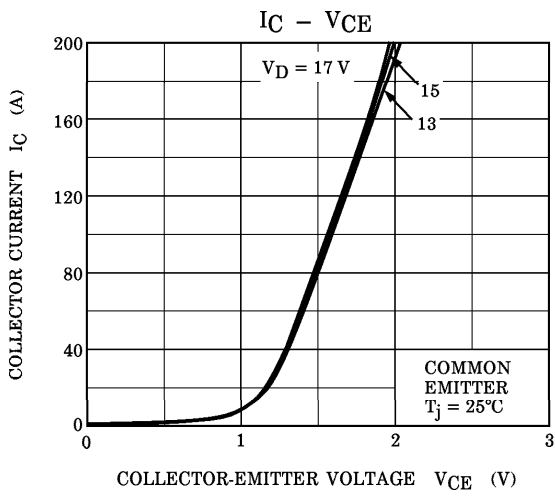
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	$V_D = 15\text{ V}$	—	8	12	mA
	Low Side		—	42	60	
Input On Signal Voltage	$V_{IN(\text{on})}$	$V_D = 15\text{ V}, I_C = 50\text{ mA}$	1.4	1.6	1.8	V
Input Off Signal Voltage	$V_{IN(\text{off})}$	—	2.2	2.5	2.8	
Fault Output Current	Protection	$V_D = 15\text{ V}$	—	10	12	mA
	Normal		$I_{FO(\text{off})}$	—	—	
Over Current Protection Trip Level	Inverter	$V_D = 15\text{ V}, T_j \leq 125^\circ\text{C}$	160	—	—	A
	Brake		80	—	—	
Short Circuit Protection Trip Level	Inverter	$V_D = 15\text{ V}, T_j \leq 125^\circ\text{C}$	200	—	—	A
	Brake		100	—	—	
Over Current Cut-Off Time	$t_{\text{off(OC)}}$	$V_D = 15\text{ V}$	—	5	—	$\mu\text{s}$
Over Temperature Protection	Trip Level	Case Temperature	110	118	125	$^\circ\text{C}$
	Reset Level		—	98	—	
Control Supply Under Voltage Protection	Trip Level	—	11.0	12.0	12.5	V
	Reset Level		12.0	12.5	13.0	
Fault Output Pulse Width	$t_{FO}$	$V_D = 15\text{ V}$	1	2	3	ms

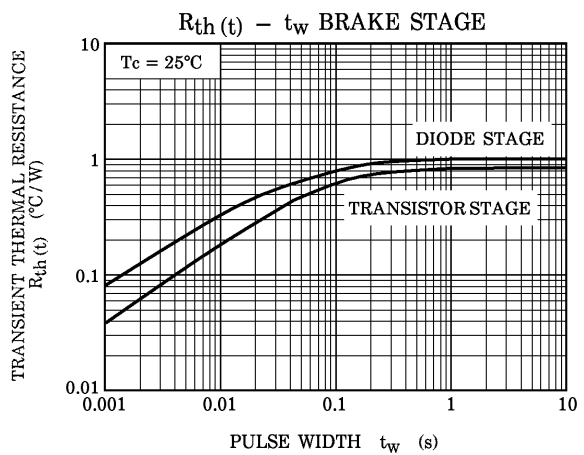
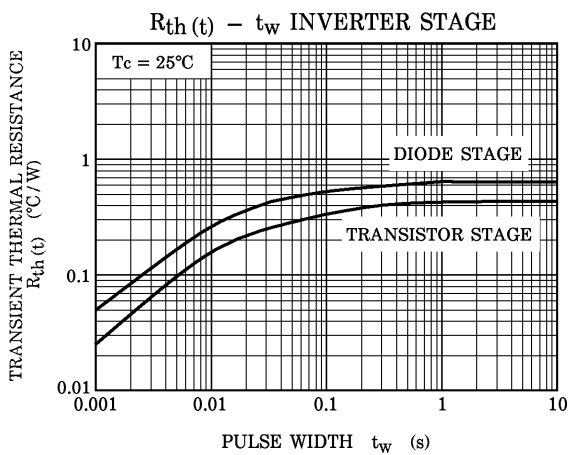
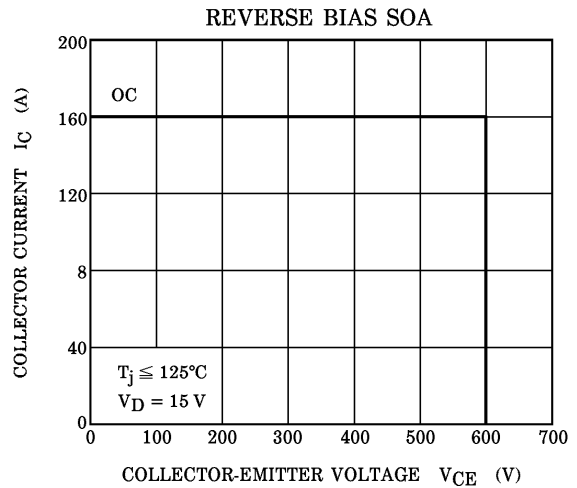
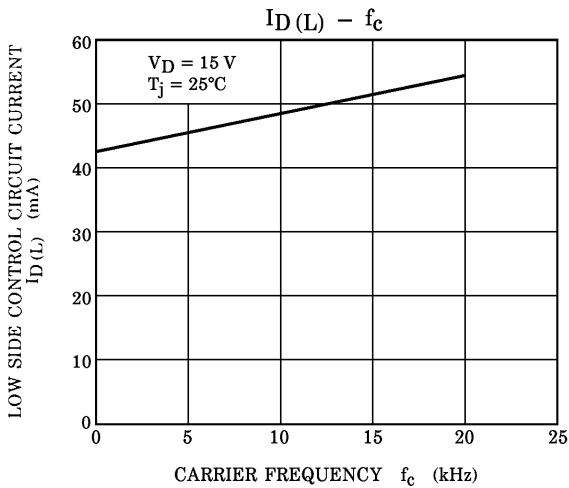
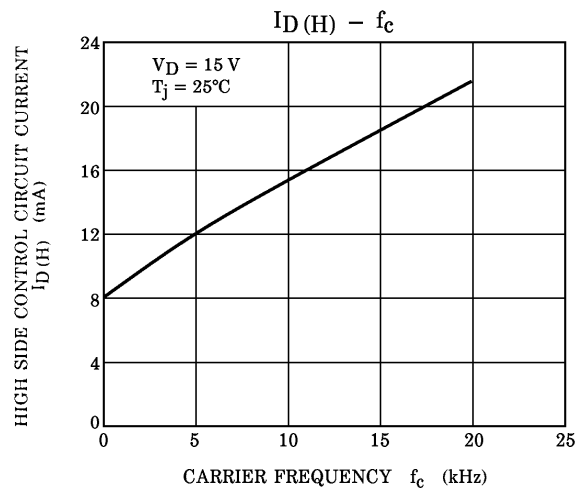
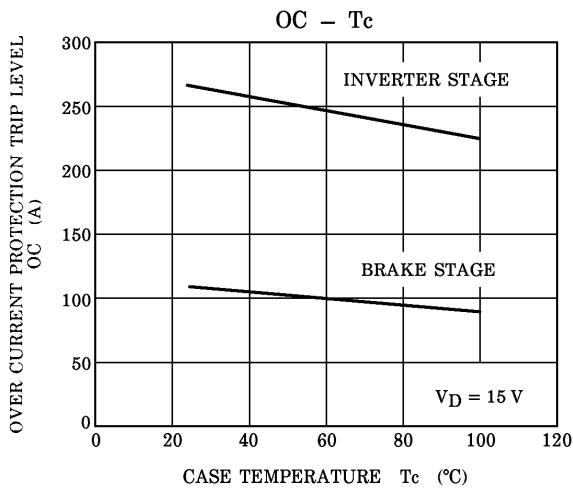
d. Thermal Resistance ( $T_c = 25^\circ\text{C}$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT Stage	—	—	0.43	$^\circ\text{C/W}$
		Inverter FRD Stage	—	—	0.63	
		Brake IGBT Stage	—	—	0.83	
		Brake FRD Stage	—	—	1.0	

(Note 1) : Switching time test circuit & timing chart









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