TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

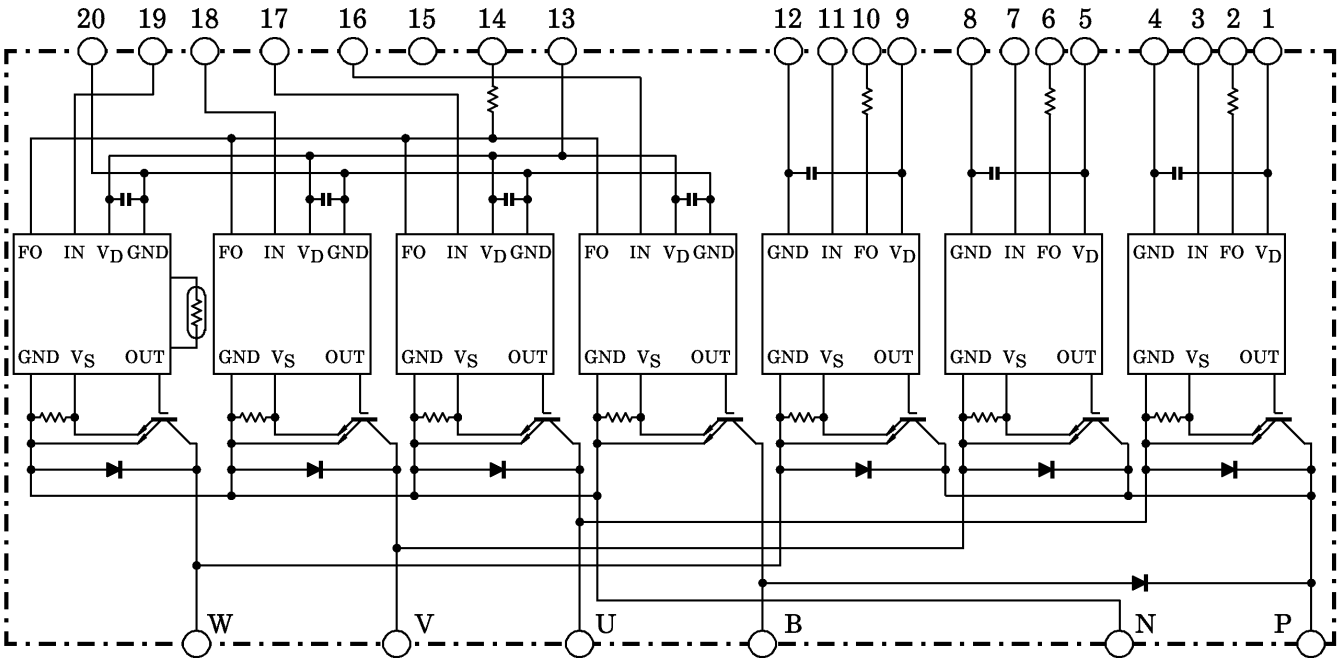
MIG100J7CSA0A (600V / 100A 7in1)

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 V (Typ.)

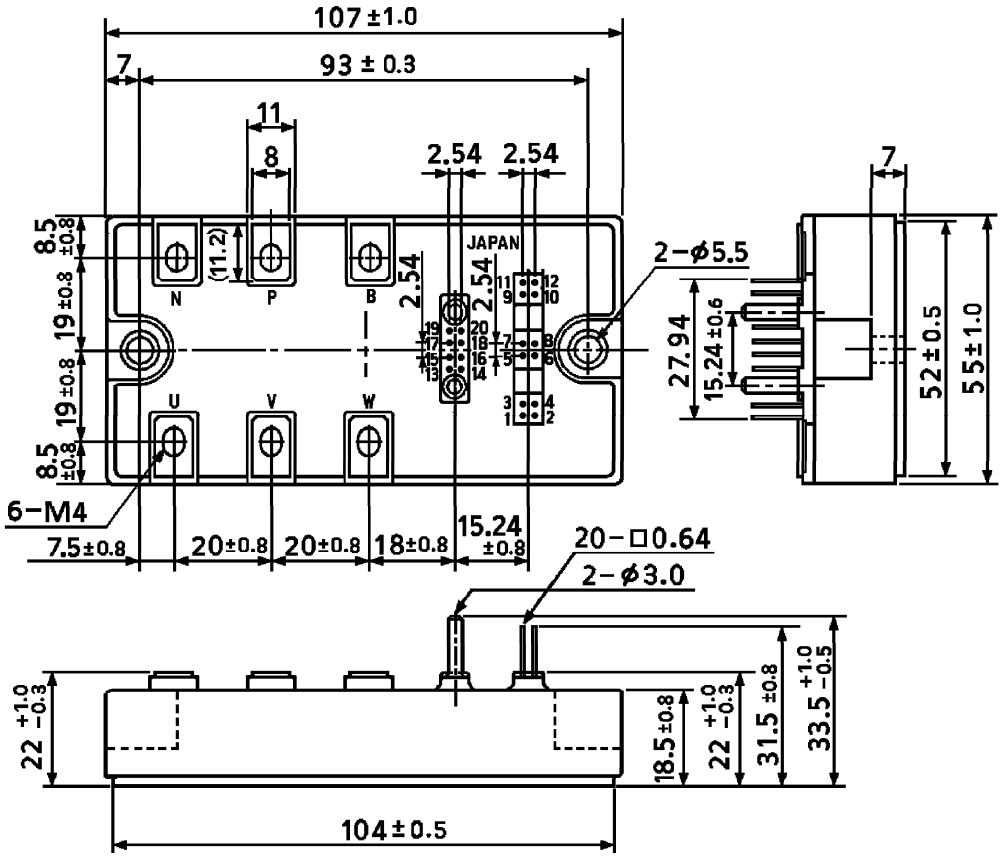
EQUIVALENT CIRCUIT



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)	

OUTLINE : TOSHIBA 2-108G1A

Unit : mm

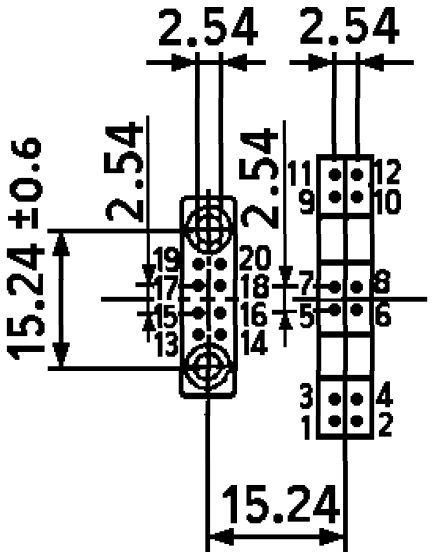


1.	V_D (U)	2.	FO (U)	3.	IN (U)	4.	GND (U)	5.	V_D (V)	6.	FO (V)
7.	IN (V)	8.	GND (V)	9.	V_D (W)	10.	FO (W)	11.	IN (W)	12.	GND (W)
13.	V_D (L)	14.	FO (L)	15.	Open	16.	IN (B)	17.	IN (X)	18.	IN (Y)
19.	IN (Z)	20.	GND (L)								

Weight : 278 g (Typ.)

SIGNAL TERMINAL LAYOUT

Unit : mm



1.	V_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)								

MAXIMUM RATINGS (T_j = 25°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	Tc = 25°C, DC	I_C	100	A
	Forward Current	Tc = 25°C, DC	I_F	100	A
	Collector Power Dissipation	Tc = 25°C	P_C	290	W
	Junction Temperature	—	T_j	150	°C
Brake	Supply Voltage	P-N Power Terminal	V_{CC}	450	V
	Collector-Emitter Voltage	—	V_{CES}	600	V
	Collector Current	Tc = 25°C, DC	I_C	50	A
	Reverse Voltage	—	V_R	600	V
	Forward Current	Tc = 25°C, DC	I_F	50	A
	Collector Power Dissipation	Tc = 25°C	P_C	150	W
	Junction Temperature	—	T_j	150	°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	—	Tc	−20~+100	°C
	Storage Temperature Range	—	T_{stg}	−40~+125	°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°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Collector Cut-Off Current	I_{CEX}	V_{CE} = 600 V	T_j = 25°C	—	—	1	mA
			T_j = 125°C	—	—	10	
Collector-Emitter Saturation Voltage	$V_{CE\ (sat)}$	V_D = 15 V, I_C = 100 A, V_{IN} = 15 V → 0 V	T_j = 25°C	1.3	1.6	2.0	V
			T_j = 125°C	—	1.6	—	
Forward Voltage	V_F	I_F = 100 A		1.5	1.9	2.3	V
Switching Time	t_{on}	V_{CC} = 300 V, I_C = 100 A V_D = 15 V, V_{IN} = 15 V ↔ 0 V Inductive Load (Note 1)		—	1.3	2.2	μs
	$t_{c\ (on)}$			—	0.4	1.0	
	t_{rr}			—	0.2	0.6	
	t_{off}			—	1.7	3.0	
	$t_{c\ (off)}$			—	0.4	0.8	

b. Brake Stage (T_j = 25°C)

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

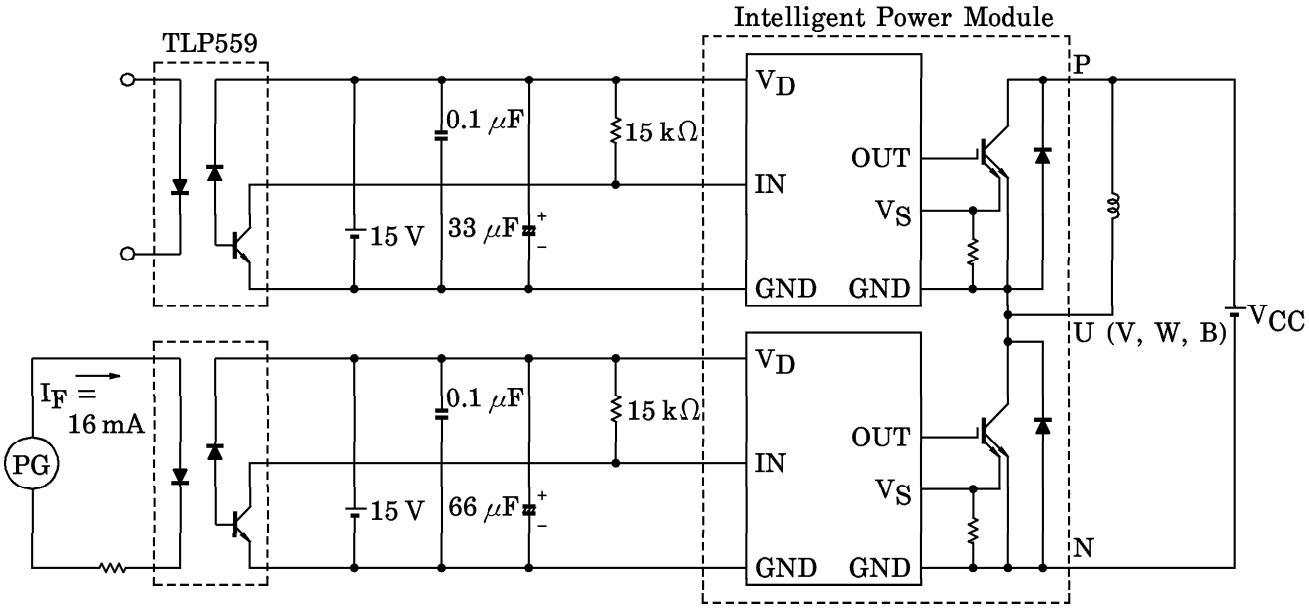
c. Control Stage (T_j = 25°C)

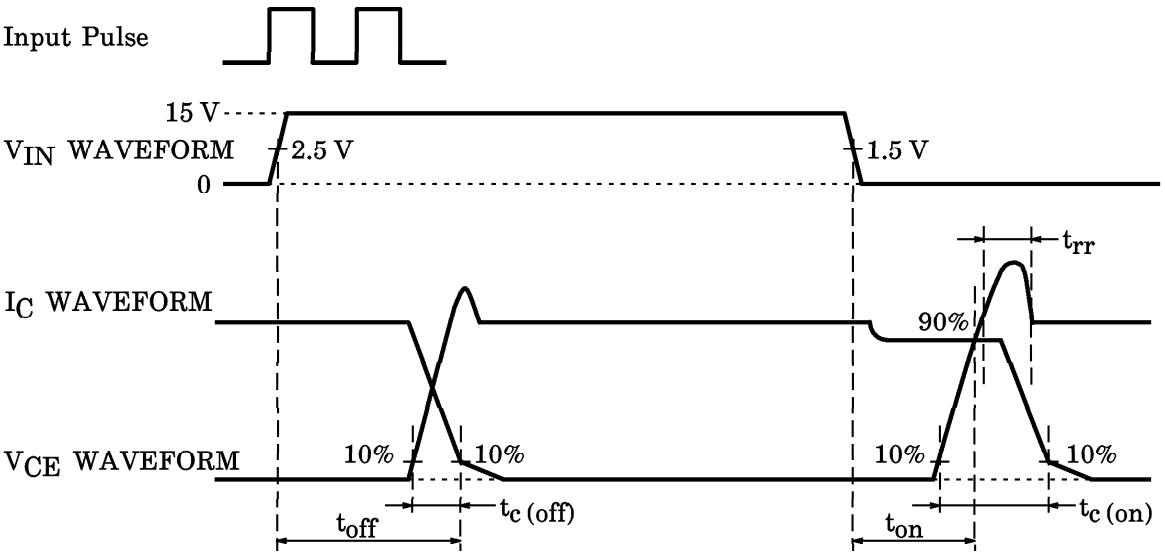
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Control Circuit Current	High Side	$I_{D\ (H)}$	V_D = 15 V	—	8	12	mA
	Low Side	$I_{D\ (L)}$		—	42	60	
Input On Signal Voltage		$V_{IN\ (on)}$	V_D = 15 V, I_C = 50 mA	1.4	1.6	1.8	V
Input Off Signal Voltage		$V_{IN\ (off)}$	—	2.2	2.5	2.8	
Fault Output Current	Protection	$I_{FO\ (on)}$	V_D = 15 V	—	10	12	mA
	Normal	$I_{FO\ (off)}$		—	—	0.1	
Over Current Protection Trip Level	Inverter	OC	V_D = 15 V, $T_j \leqq$ 125°C	160	—	—	A
	Brake			80	—	—	
Short Circuit Protection Trip Level	Inverter	SC	V_D = 15 V, $T_j \leqq$ 125°C	200	—	—	A
	Brake			100	—	—	
Over Current Cut-Off Time		$t_{off\ (OC)}$	V_D = 15 V	—	5	—	μs
Over Temperature Protection	Trip Level	OT	Case Temperature	110	118	125	°C
	Reset Level	OTr		—	98	—	
Control Supply Under Voltage Protection	Trip Level	UV	—	11.0	12.0	12.5	V
	Reset Level	UVr		12.0	12.5	13.0	
Fault Output Pulse Width		t_{FO}	V_D = 15 V	1	2	3	ms

d. Thermal Resistance (Tc = 25°C)

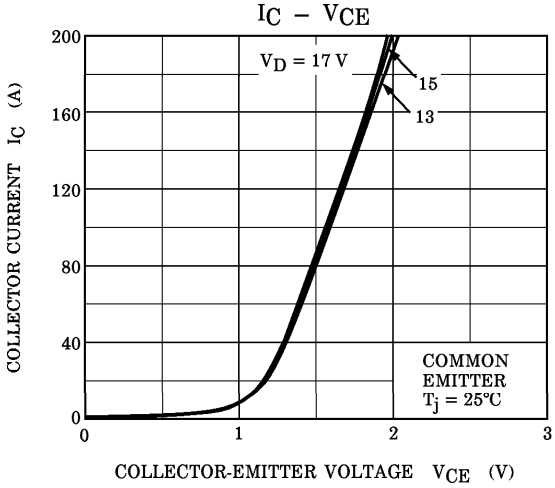
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Junction to Case Thermal Resistance	$R_{th\ (j\text{-}c)}$	Inverter IGBT Stage	—	—	0.43	°C / W
		Inverter FRD Stage	—	—	0.63	
		Brake IGBT Stage	—	—	0.83	
		Brake FRD Stage	—	—	1.0	

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

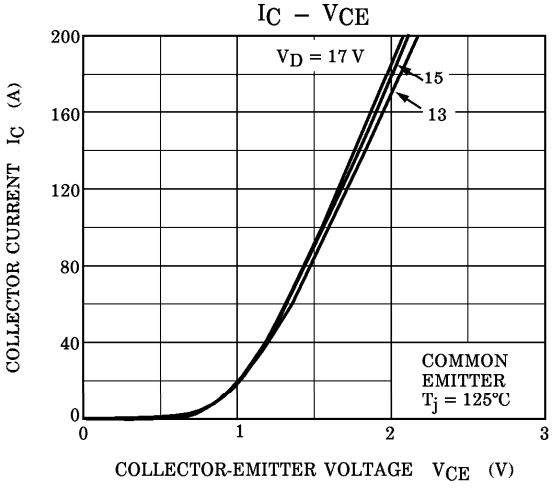




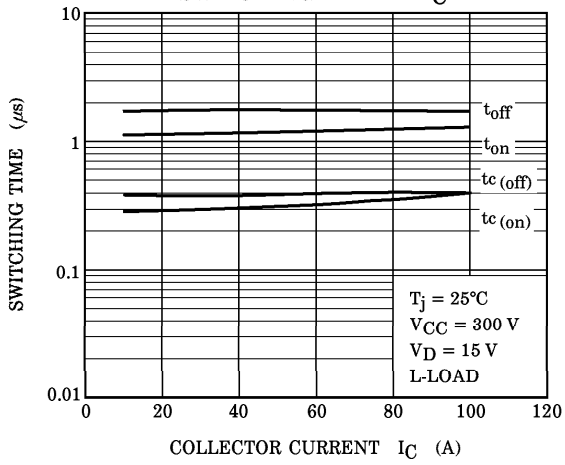
I_C – V_{CE}



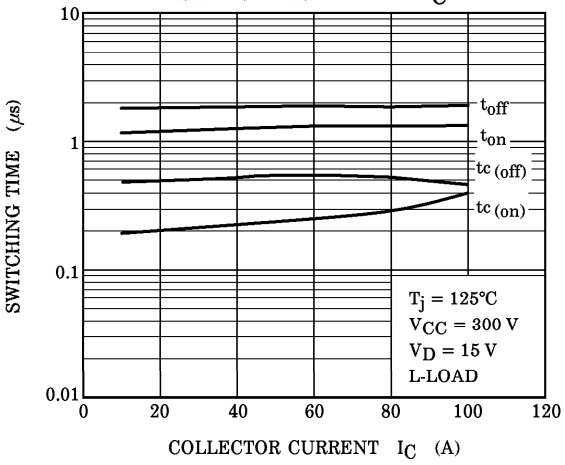
I_C – V_{CE}



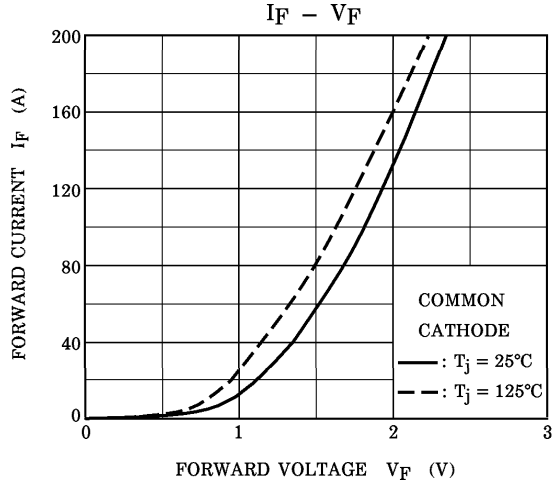
SWITCHING TIME – I_C



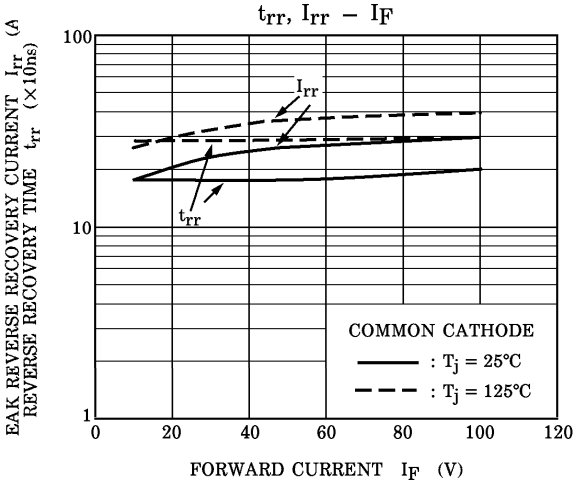
SWITCHING TIME – I_C



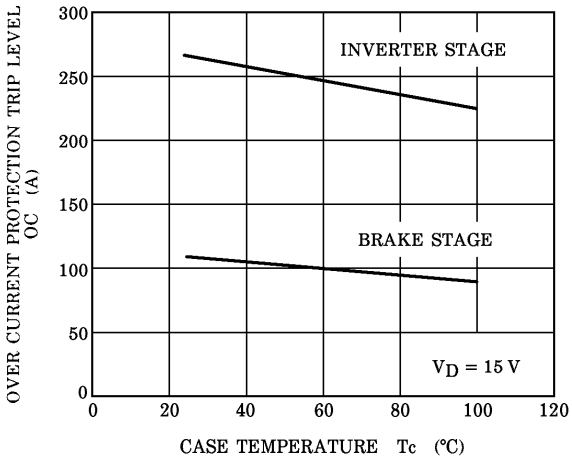
I_F – V_F



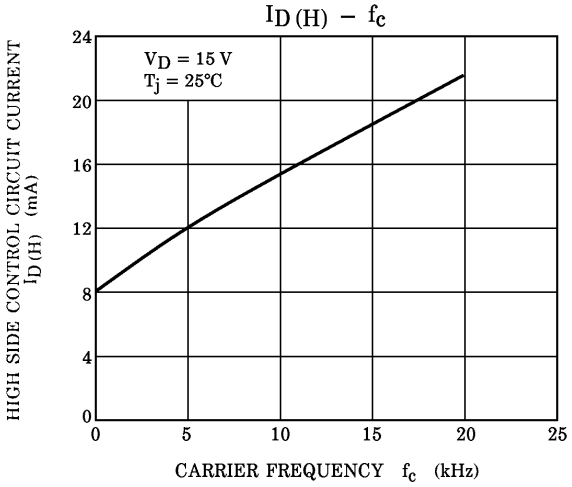
t_{rr}, I_{rr} – I_F



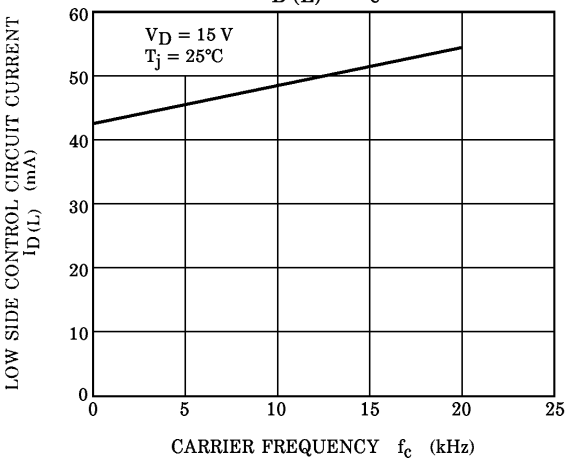
OC – Tc



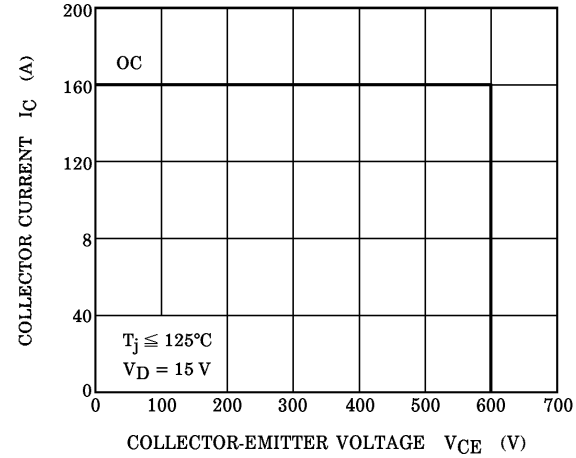
$I_{D\,(H)}$ – f_c



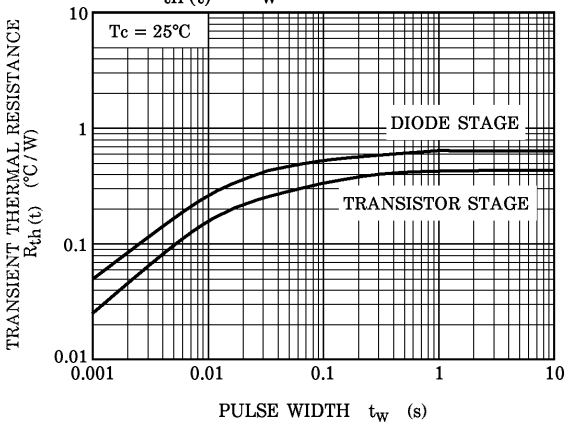
$I_{D\,(L)}$ – f_c



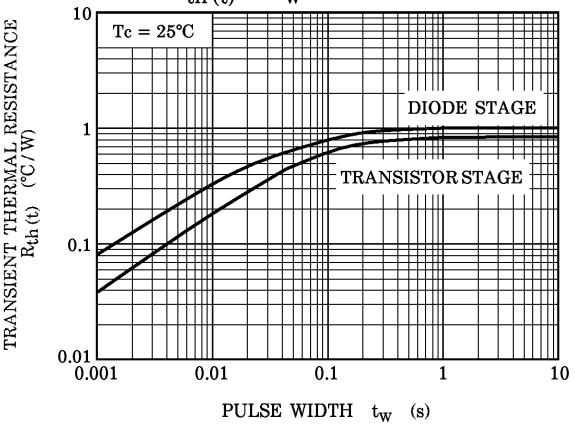
REVERSE BIAS SOA



$R_{th\,(t)}$ – t_w INVERTER STAGE



$R_{th\,(t)}$ – t_w BRAKE STAGE



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