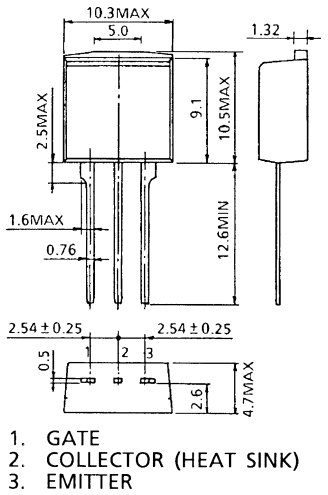
TOSHIBA INSULATED GATE BIPOLAR TRANSISTOR SILICON N CHANNEL IGBT

GT10J312, GT10J312(SM)

HIGH POWER SWITCHING APPLICATIONS
MOTOR CONTROL APPLICATIONS

- Third-generation IGBT
- Enhancement mode type
- High speed : t_f = 0.30μs (Max.)
- Low saturation voltage : $V_{CE\ (sat)}$ = 2.7V (Max.)
- FRD included between emitter and collector

Unit: mm

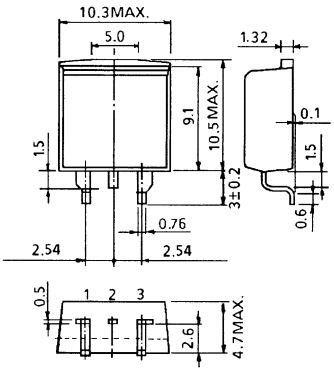


1. GATE
2. COLLECTOR (HEAT SINK)
3. EMITTER

JEDEC	—
JEITA	—
TOSHIBA	2−10S1C

Weight: 1.5 g (typ.)

GT10J312(SM)



1. GATE
2. COLLECTOR (HEAT SINK)
3. EMITTER

JEDEC	—
JEITA	—
TOSHIBA	2−10S2C

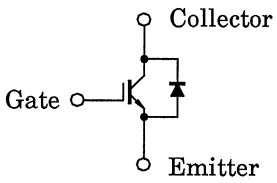
Weight: 1.4 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

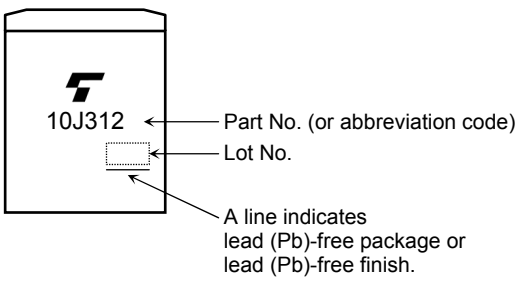
CHARACTERISTIC		SYMBOL	RATING	UNIT
Collector−Emitter Voltage		V_{CES}	600	V
Gate−Emitter Voltage		V_{GES}	±20	V
Collector Current	DC	I_C	10	A
	1ms	I_{CP}	20	A
Emitter−Collector Forward Current	DC	I_F	10	A
	1ms	I_{FM}	20	A
Collector Power Dissipation (Tc = 25°C)		P_C	60	W
Junction Temperature		T_j	150	°C
Storage Temperature Range		T_{stg}	−55~150	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Equivalent Circuit



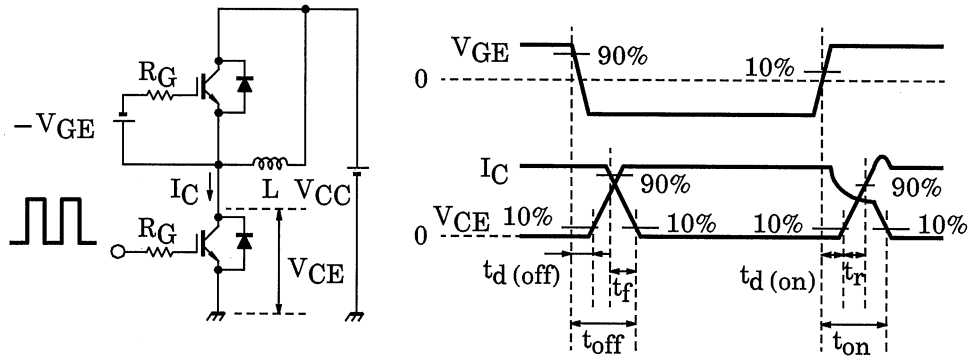
Marking



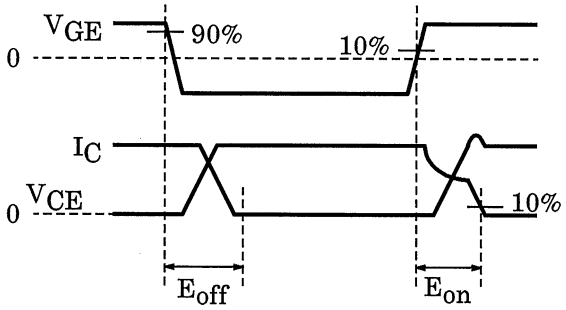
Electrical Characteristics (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Gate Leakage Current		I_{GES}	V_{GE} = ±20V, V_{CE} = 0	—	—	±500	nA
Collector Cut−Off Current		I_{CES}	V_{CE} = 600V, V_{GE} = 0	—	—	1.0	mA
Gate−Emitter Cut−Off Voltage		$V_{GE\ (OFF)}$	I_C = 1mA, V_{CE} = 5V	5.0	—	8.0	V
Collector−Emitter Saturation Voltage		$V_{CE\ (sat)}$	I_C = 10A, V_{GE} = 15V	—	2.1	2.7	V
Input Capacitance		C_{ies}	V_{CE} = 20V, V_{GE} = 0, f = 1MHz	—	720	—	pF
Switching Time	Rise Time	t_r	Inductive Load V_{CC} = 300V, I_C = 10A V_{GG} = ±15V, R_G = 100Ω (Note 1)	—	0.12	—	μs
	Turn−On Time	t_{on}		—	0.40	—	
	Fall Time	t_f		—	0.15	0.30	
	Turn−Off Time	t_{off}		—	0.40	—	
Peak Forward Voltage		V_F	I_F = 10A, V_{GE} = 0	—	—	2.0	V
Reverse Recovery Time		t_{rr}	I_F = 10A, di / dt = −100A / μs	—	—	200	ns
Thermal Resistance (IGBT)		$R_{th\ (j-c)}$	—	—	—	2.08	°C / W
Thermal Resistance (Diode)		$R_{th\ (j-c)}$	—	—	—	3.76	°C / W

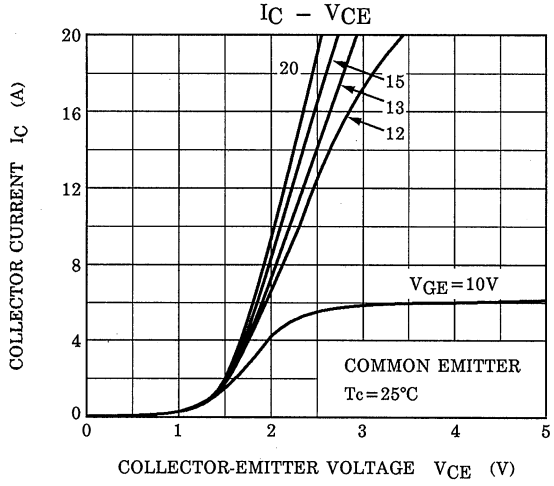
Note 1: Switching time measurement circuit and input / output waveforms



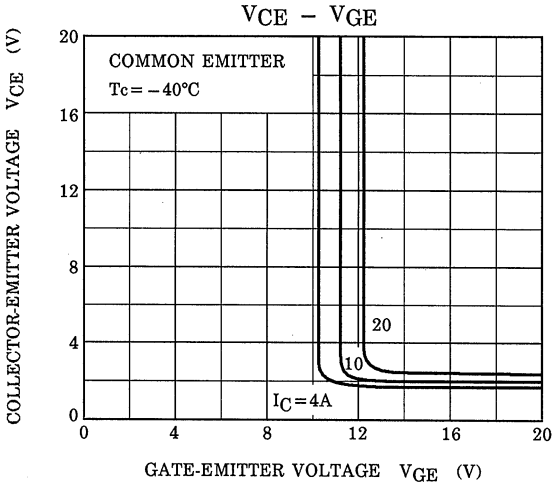
Switching loss measurement waveforms



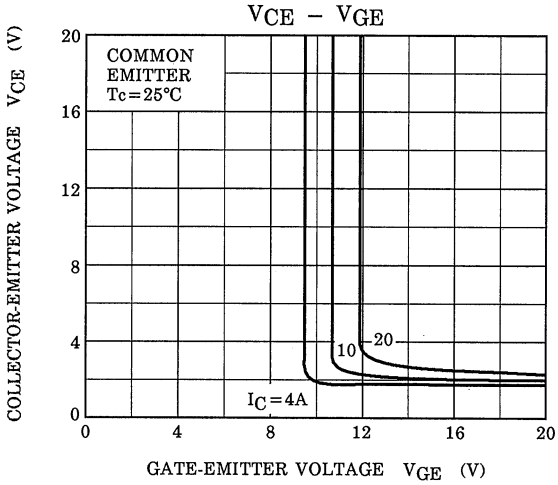
I_C – V_{CE}



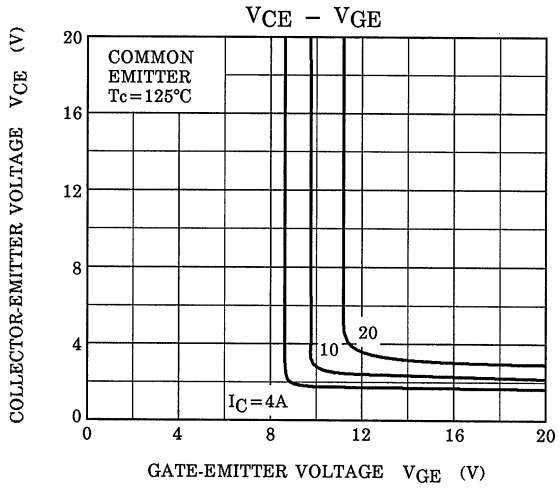
V_{CE} – V_{GE}



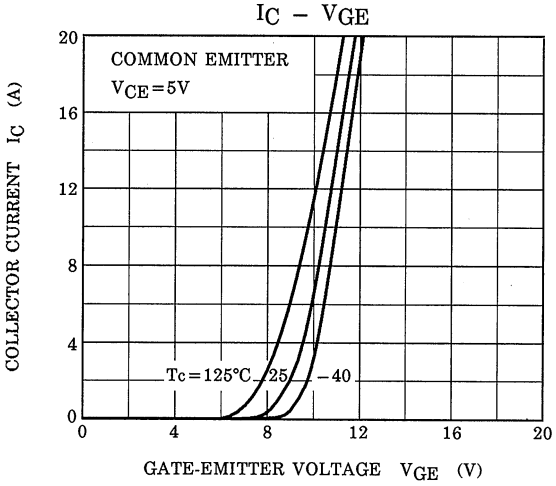
V_{CE} – V_{GE}



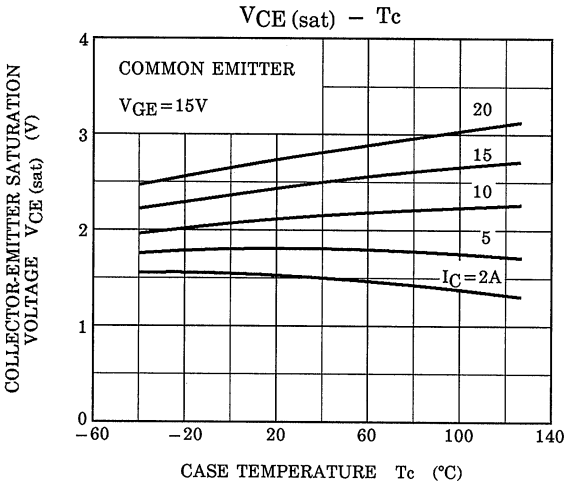
V_{CE} – V_{GE}



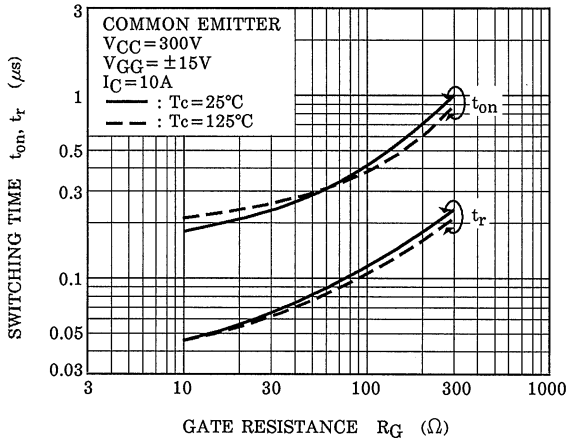
I_C – V_{GE}



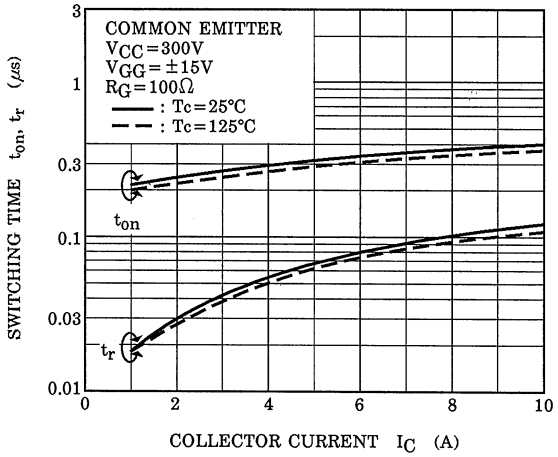
$V_{CE\,(sat)}$ – Tc



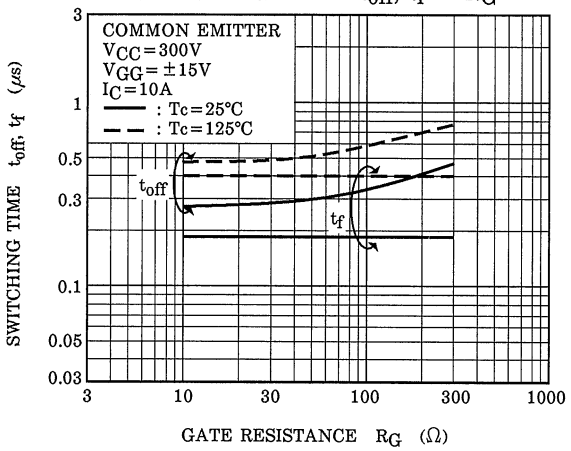
SWITCHING TIME t_{on}, t_r – R_G



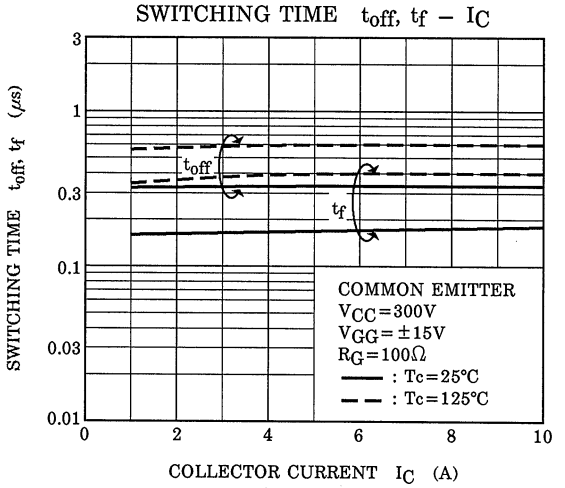
SWITCHING TIME t_{on}, t_r – I_C



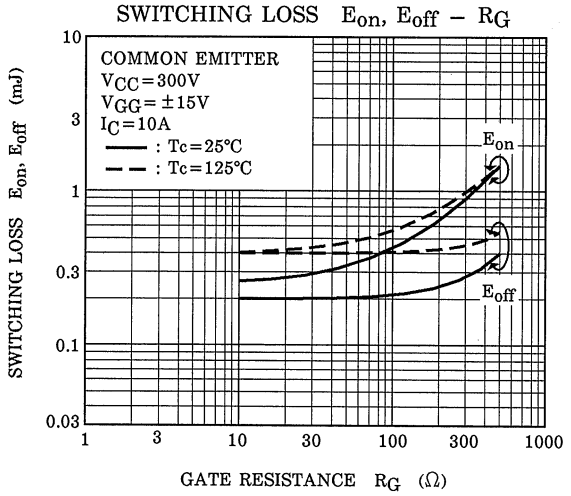
SWITCHING TIME t_{off}, t_f – R_G



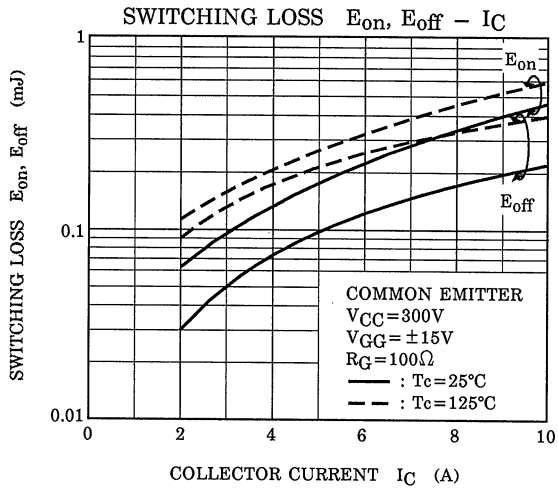
SWITCHING TIME t_{off}, t_f – I_C



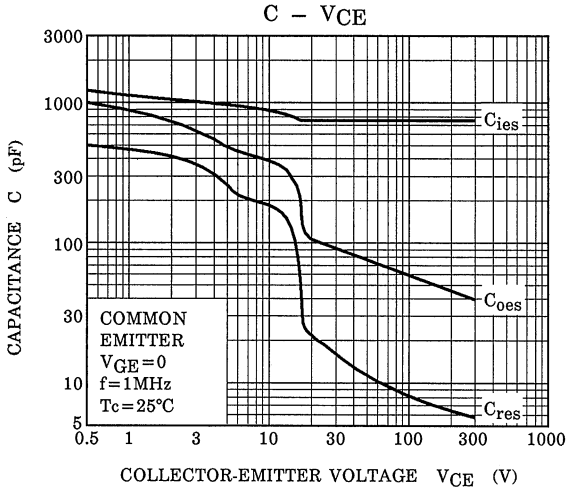
SWITCHING LOSS E_{on}, E_{off} – R_G



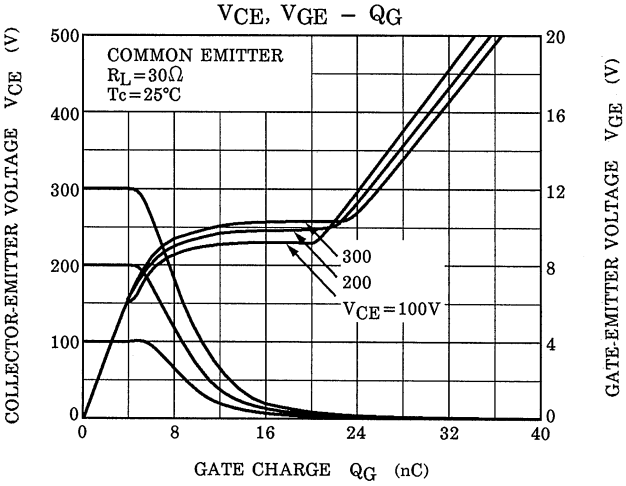
SWITCHING LOSS E_{on}, E_{off} – I_C



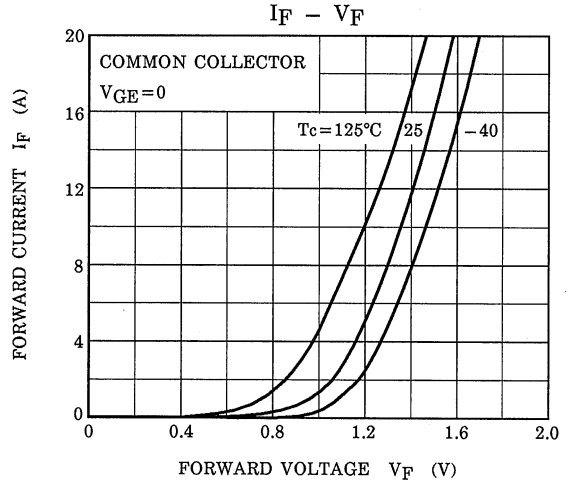
C – V_{CE}



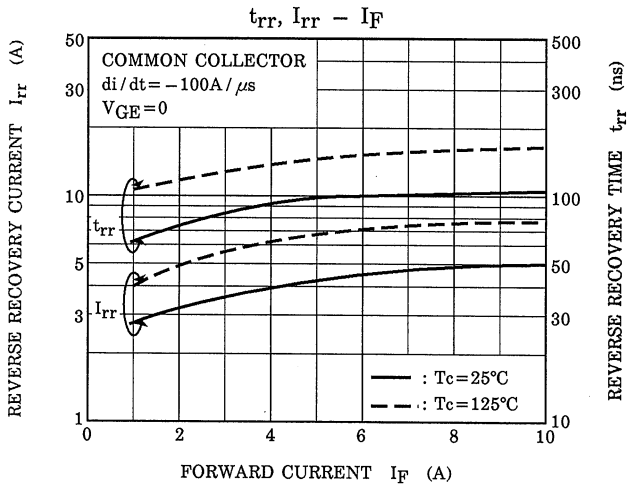
V_{CE}, V_{GE} – Q_G



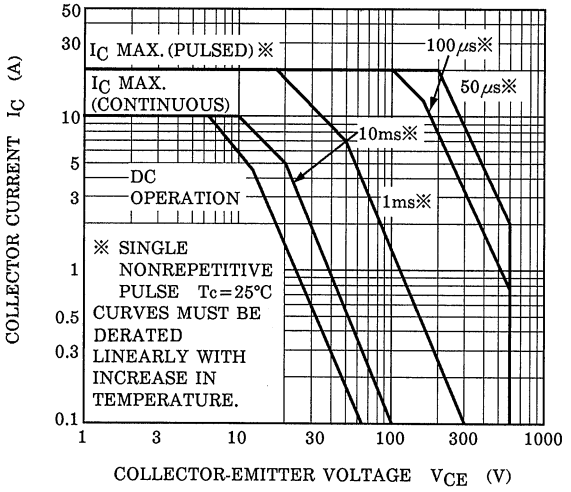
I_F – V_F



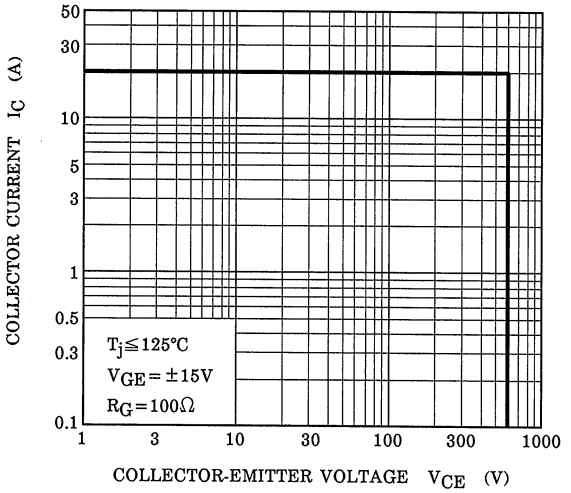
t_{rr}, I_{rr} – I_F

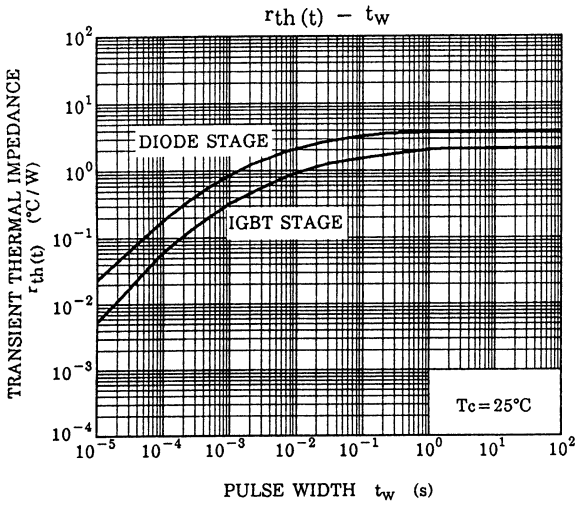


SAFE OPERATING AREA



REVERSE BIAS SOA




$r_{th}(t) - t_w$
TRANSIENT THERMAL IMPEDANCE $r_{th}(t)$ (°C / W)
10^2
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
DIODE STAGE
IGBT STAGE
Tc = 25°C
10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^0 10^1 10^2
PULSE WIDTH t_w (s)

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20070701-EN

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