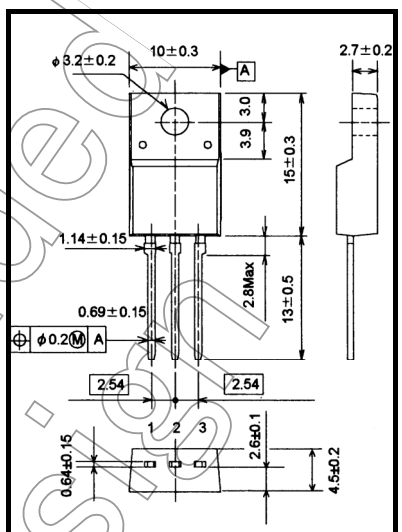
TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

GT45F123

For PDP-TV Applications

- 5th generation (trench gate structure) IGBT
- Enhancement-mode
- Low input capacitance: C_{ies} = 2700pF (typ.)
- Peak collector current: I_{CP} = 200 A (max)
- TO-220SIS package

Unit: mm



1. Gate
2. Collector
3. Emitter

JEDEC	-
JEITA	-
TOSHIBA	2-10U1C

Weight: 2 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

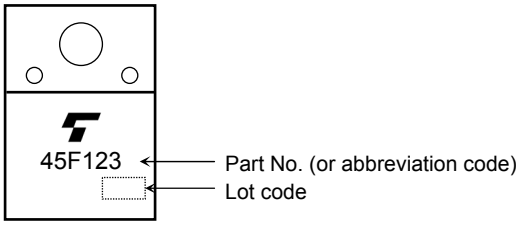
Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	300	V
Gate-emitter voltage		V_{GES}	± 30	V
Collector current	Pulse (Note 1)	I_{CP}	200	A
Collector power dissipation	Tc=25°C	P_C	26	W
	Ta=25°C		2	
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

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).

Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal resistance , junction to case (Tc = 25°C)	$R_{th\ (j-c)}$	4.8	°C/W
Thermal resistance , junction to ambient (Ta = 25°C)	$R_{th\ (j-a)}$	62.5	°C/W

Marking



Note 1: I_{CP} maximum rating(200A) is limited by pulse width (3 μs).

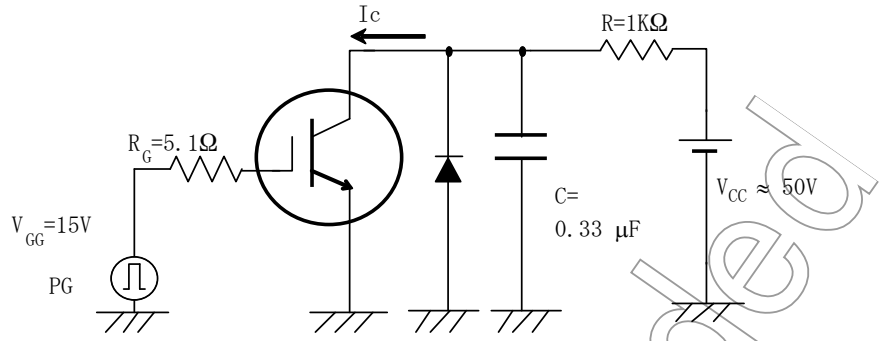
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GES}	V_{GE} = ± 30 V, V_{CE} = 0V	—	—	± 100	nA
Collector cut-off current		I_{CES}	V_{CE} = 300 V, V_{GE} = 0V	—	—	0.5	mA
Emitter-collector voltage		V_{ECS}	I_E = 0.5A, V_{GE} = 0V (Note2)	15	—	—	V
Gate-emitter cut-off voltage		$V_{GE\ (OFF)}$	I_C = 10 mA, V_{CE} = 5 V	3.0	4.5	5.5	V
Collector-emitter saturation voltage		$V_{CE\ (sat)}$ (1)	I_C = 45 A, V_{GE} = 15 V	—	1.35	1.6	V
Collector-emitter saturation voltage		$V_{CE\ (sat)}$ (2)	I_C = 120 A, V_{GE} = 15 V	—	1.95	2.4	V
Collector-emitter saturation voltage		$V_{CE\ (sat)}$ (3)	I_C = 200 A, V_{GE} = 15 V	—	2.6	3.3	V
Input capacitance		C_{ies}	V_{CE} = 10 V, V_{GE} = 0V, f = 1 MHz	—	2700	—	pF
Reverse transfer capacitance		C_{res}		—	155	—	
Output capacitance		C_{oes}		—	225	—	
Switching time (Resistance load)	Rise time	$t_{r\ (1)}$	 V_{IN}: $t_r \leq$ 100 ns, $t_f \leq$ 100 ns, Duty cycle ≤ 1%	—	180	—	ns
	Turn-on time	$t_{on(1)}$		—	230	—	
	Fall time	t_f		—	200	300	
	Turn-off time	t_{off}		—	290	—	
Switching time (Discharge mode)	Rise time	$t_{r\ (2)}$	V_{CC} ≈ 50V, I_{CP}=100A, V_{GG} = 15V/0V , R_G=5.1Ω (Note 3)	—	125	—	ns
	Turn-on time	$t_{on(2)}$		—	150	—	
Total gate charge (gate-emitter plus gate-drain)		Q_g	V_{CE} = 300 V, V_{GE} = 15V, I_C = 120 A	—	110	—	nC

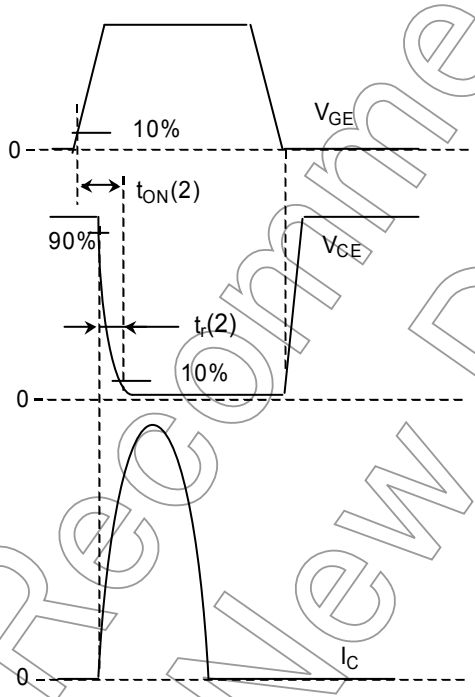
Note 2 : Pulse width ≈ 80 μs (duty ≈ 0.1%).

Note 3: Switching time measurement circuit and input/output waveforms.

< Switching circuit of discharge mode>



< Measurement waveforms >



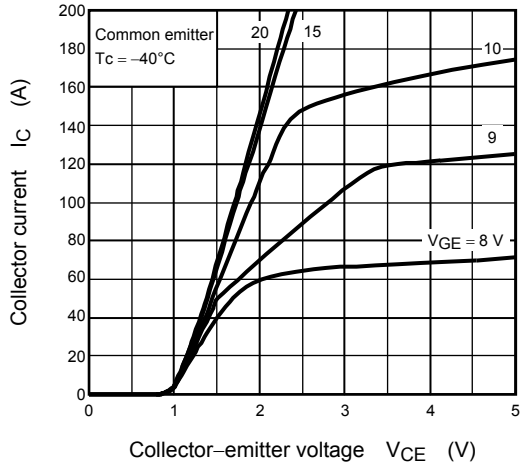
Caution on handling

This MOS gate device is sensitive to electrostatic discharge (ESD).
When handling the device, be sure that the environment is protected against static electricity.

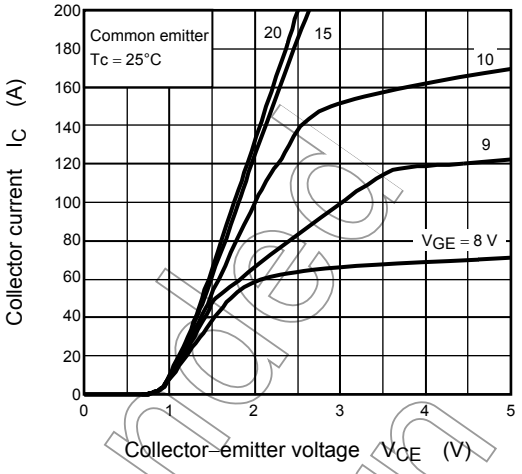
Caution in design

This devise is designed for use in PDP-TVs.
Please contact our sales section if the device is intended for any other use.

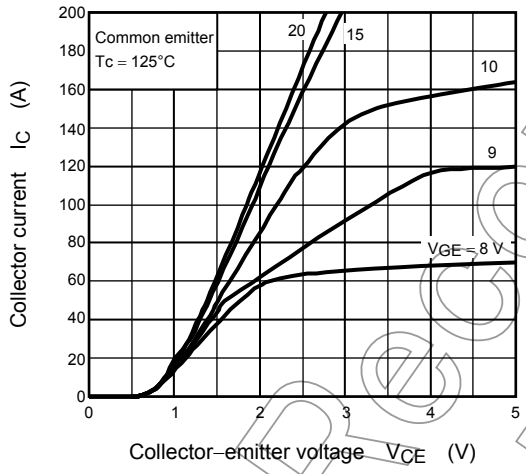
$I_C - V_{CE}$



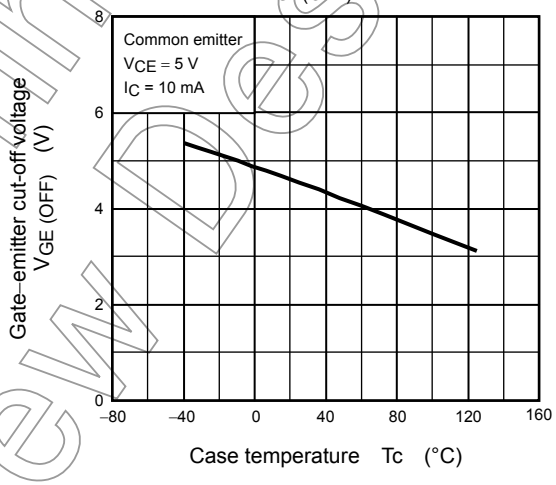
$I_C - V_{CE}$



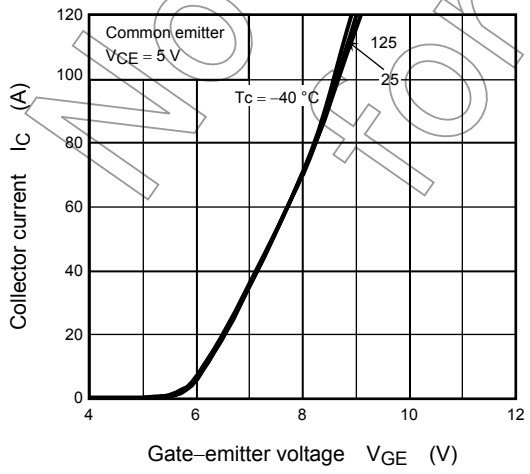
$I_C - V_{CE}$



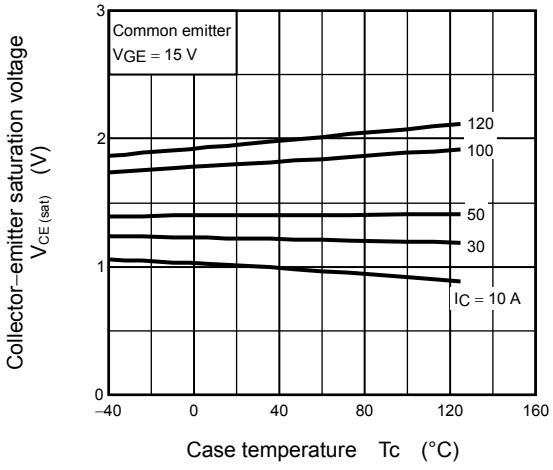
$V_{GE(OFF)} - Tc$



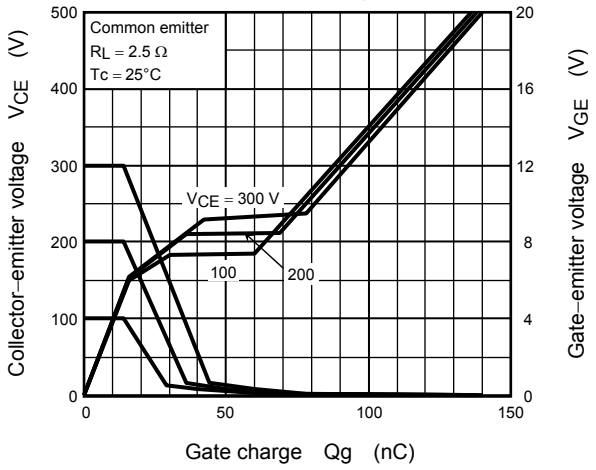
$I_C - V_{GE}$



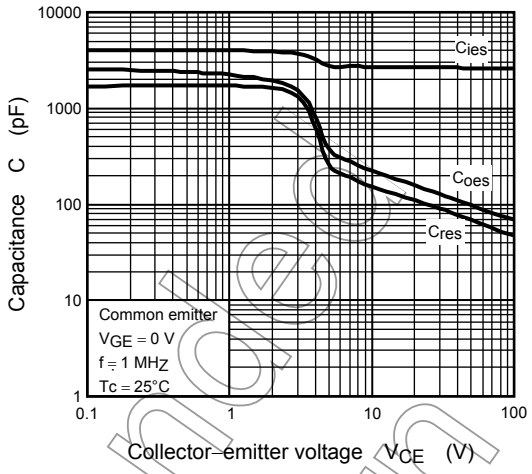
$V_{CE\ (sat)} - Tc$



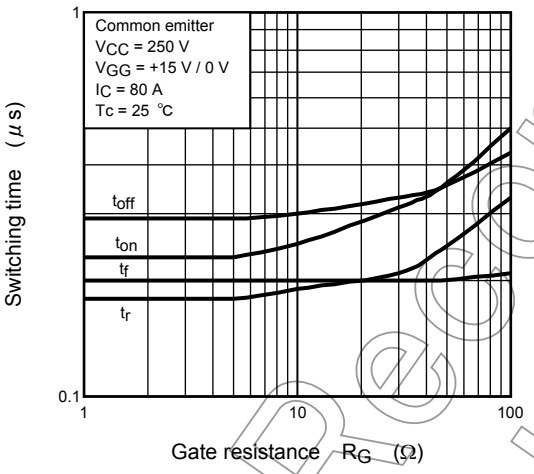
V_{CE}, V_{GE} – Q_g



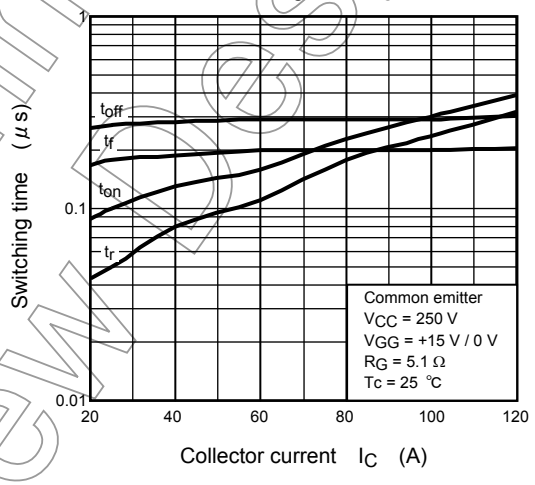
C – V_{CE}



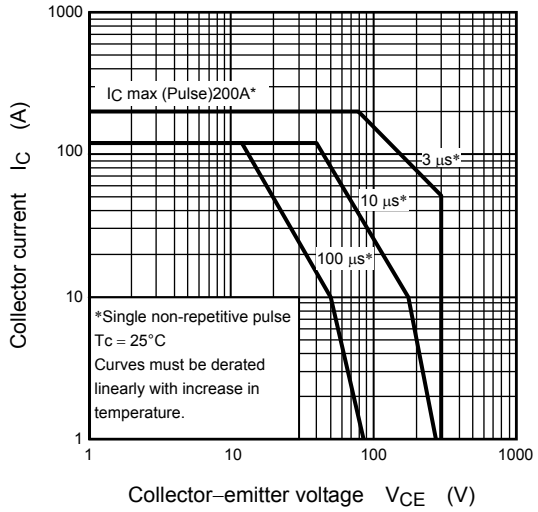
Switching time – R_G



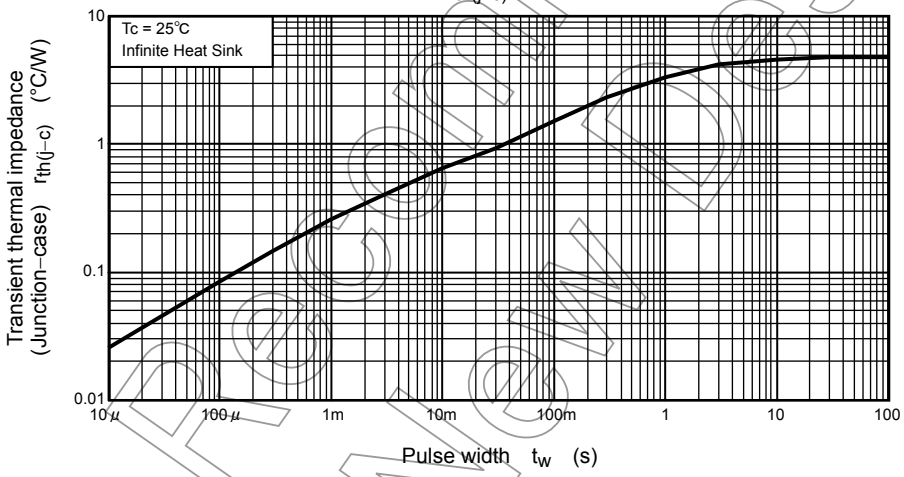
Switching time – I_C



Safe operating area



$r_{th(j-c)} - t_w$



RESTRICTIONS ON PRODUCT USE

20070701-EN GENERAL

- The information contained herein is subject to change without notice.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc.
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.).These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in his document shall be made at the customer’s own risk.
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