

TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

GT20J321

High Power Switching Applications

Fast Switching Applications

- Fourth-generation IGBT
- Enhancement mode type
- Fast switching (FS): Operating frequency up to 50 kHz (reference)
High speed: $t_f = 0.04 \mu s$ (typ.)
Low switching loss : $E_{on} = 0.40 mJ$ (typ.)
: $E_{off} = 0.43 mJ$ (typ.)
- Low saturation voltage: $V_{CE(sat)} = 2.0 V$ (typ.)
- FRD included between emitter and collector

Absolute Maximum Ratings ($T_a = 25^\circ C$)

Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	600	V
Gate-emitter voltage		V_{GES}	± 20	V
Collector current	DC	I_C	20	A
	1 ms	I_{CP}	40	
Emitter-collector forward current	DC	I_F	20	A
	1 ms	I_{FM}	40	
Collector power dissipation ($T_c = 25^\circ C$)		P_C	45	W
Junction temperature		T_j	150	$^\circ C$
Storage temperature range		T_{stg}	-55 to 150	$^\circ C$

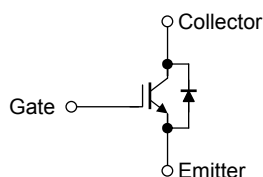
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

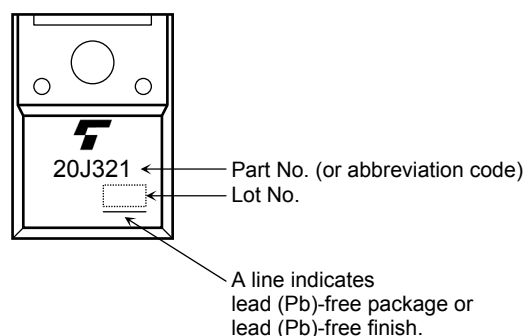
Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance (IGBT)	$R_{th(j-c)}$	2.78	$^\circ C/W$
Thermal resistance (diode)	$R_{th(j-c)}$	4.23	$^\circ C/W$

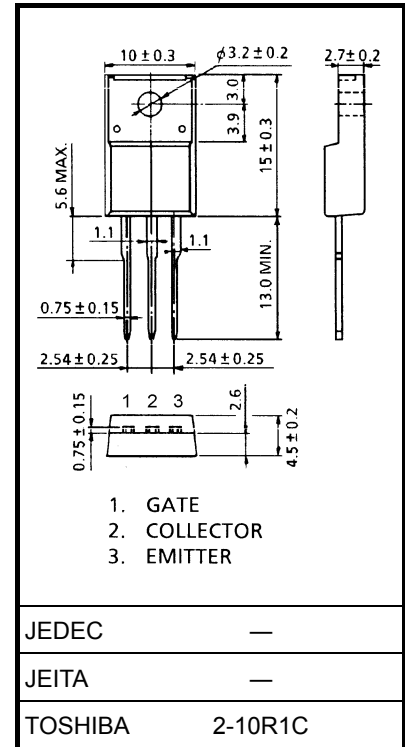
Equivalent Circuit



Marking



Unit: mm

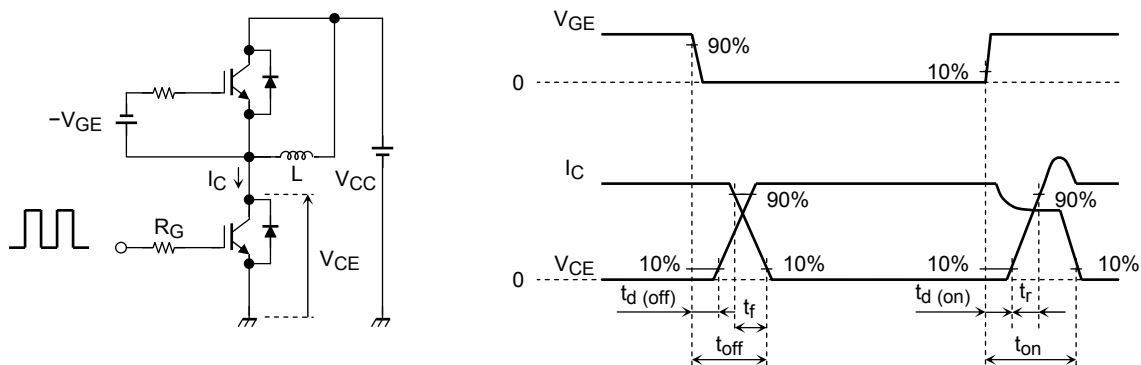


Weight: 1.7 g (typ.)

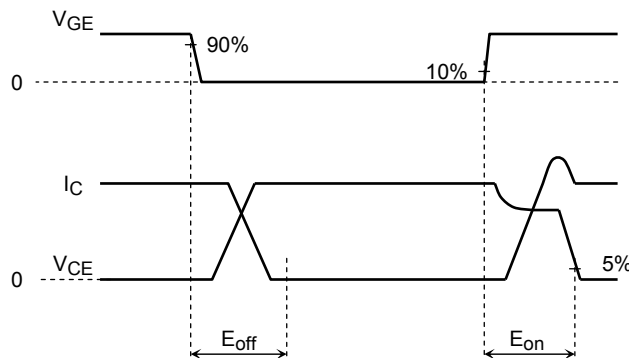
Electrical Characteristics (Ta = 25°C)

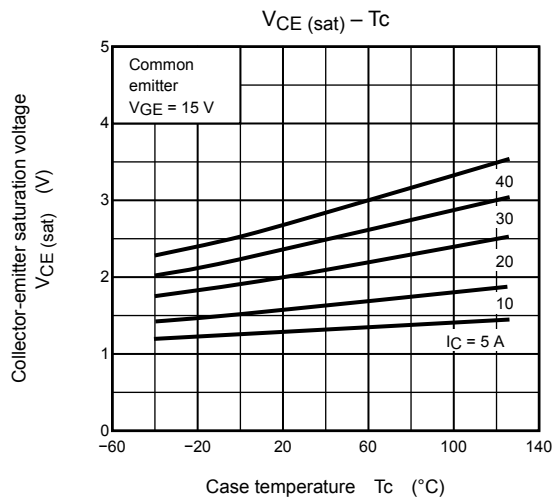
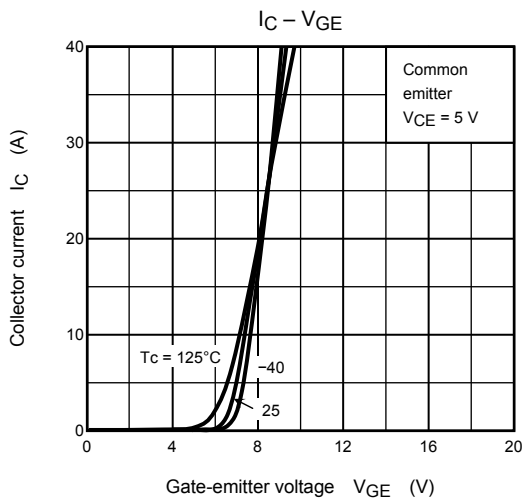
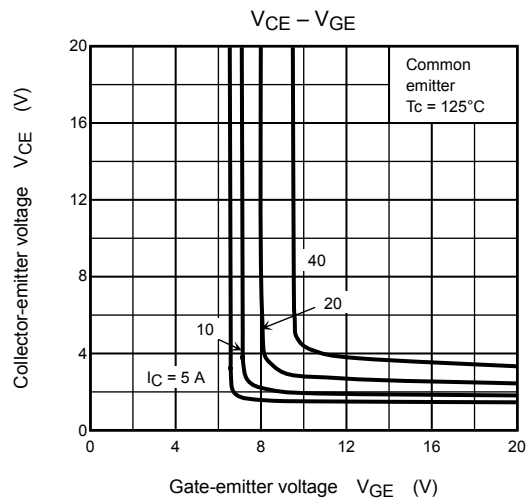
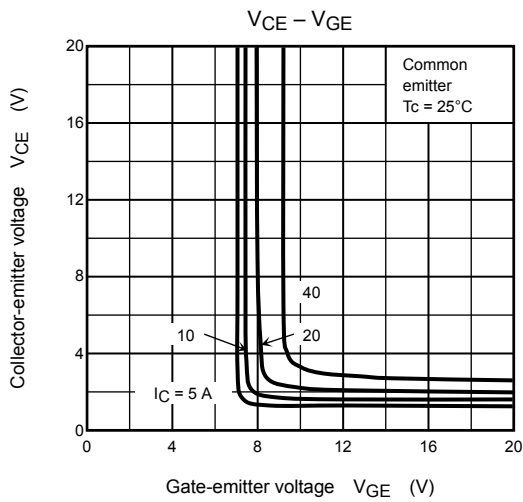
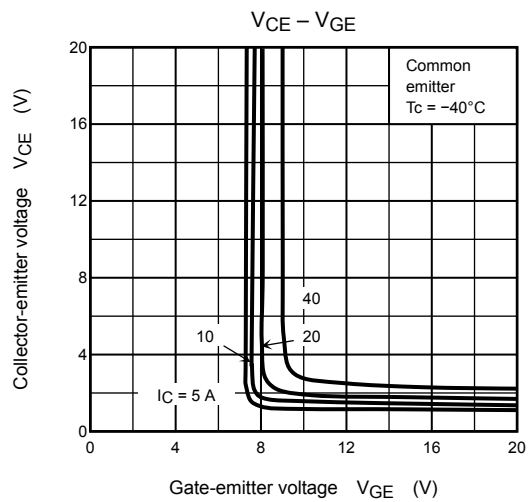
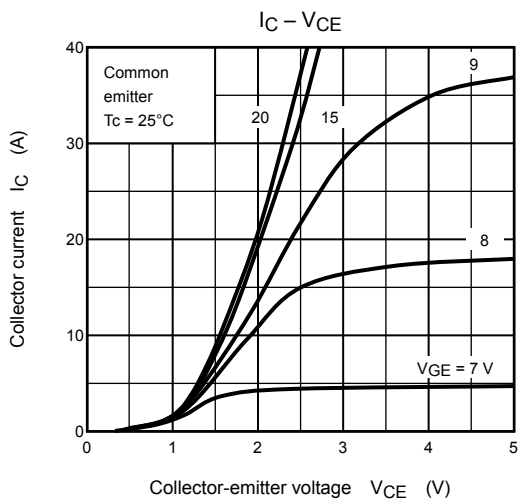
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GES}	$V_{GE} = \pm 20 \text{ V}, V_{CE} = 0$	—	—	± 500	nA
Collector cut-off current		I_{CES}	$V_{CE} = 600 \text{ V}, V_{GE} = 0$	—	—	1.0	mA
Gate-emitter cut-off voltage		$V_{GE}(\text{OFF})$	$I_C = 2 \text{ mA}, V_{CE} = 5 \text{ V}$	3.5	—	6.5	V
Collector-emitter saturation voltage		$V_{CE}(\text{sat})$	$I_C = 20 \text{ A}, V_{GE} = 15 \text{ V}$	—	2.0	2.45	V
Input capacitance		C_{ies}	$V_{CE} = 10 \text{ V}, V_{GE} = 0, f = 1 \text{ MHz}$	—	3000	—	pF
Switching time	Turn-on delay time	$t_d(\text{on})$	Inductive Load $V_{CC} = 300 \text{ V}, I_C = 20 \text{ A}$ $V_{GG} = +15 \text{ V}, R_G = 33 \Omega$ (Note 1) (Note 2)	—	0.06	—	μs
	Rise time	t_r		—	0.04	—	
	Turn-on time	t_{on}		—	0.17	—	
	Turn-off delay time	$t_d(\text{off})$		—	0.24	—	
	Fall time	t_f		—	0.04	—	
	Turn-off time	t_{off}		—	0.34	—	
Switching loss	Turn-on switching loss	E_{on}		—	0.40	—	mJ
	Turn-off switching loss	E_{off}		—	0.43	—	
Peak forward voltage		V_F	$I_F = 20 \text{ A}, V_{GE} = 0$	—	—	2.1	V
Reverse recovery time		t_{rr}	$I_F = 20 \text{ A}, di/dt = -100 \text{ A}/\mu\text{s}$	—	100	—	ns

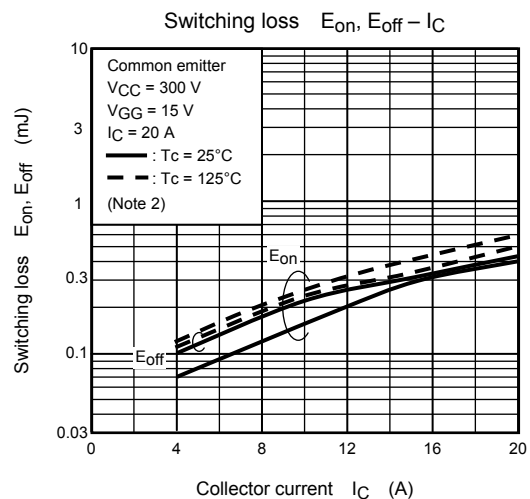
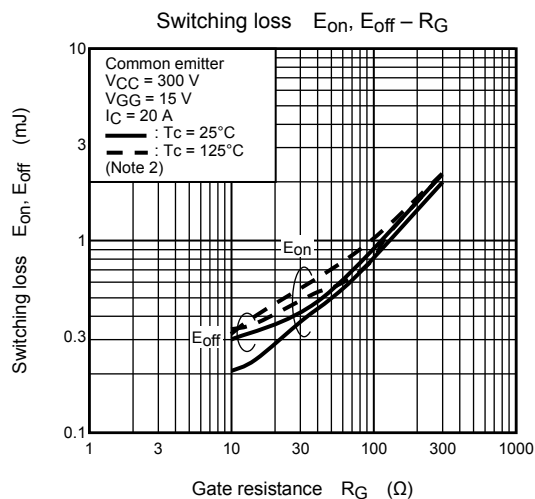
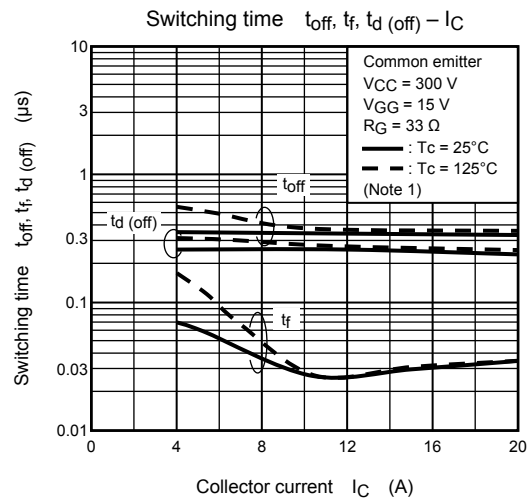
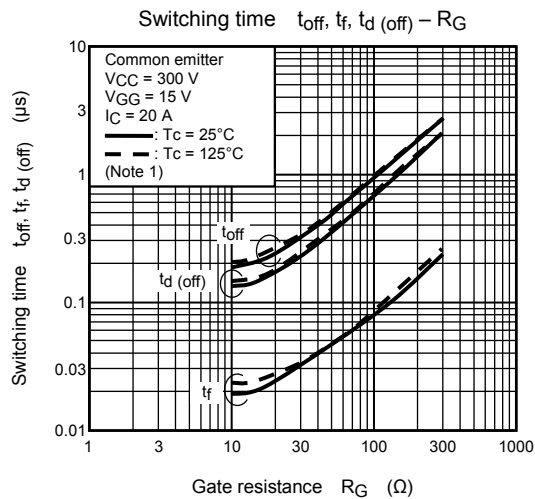
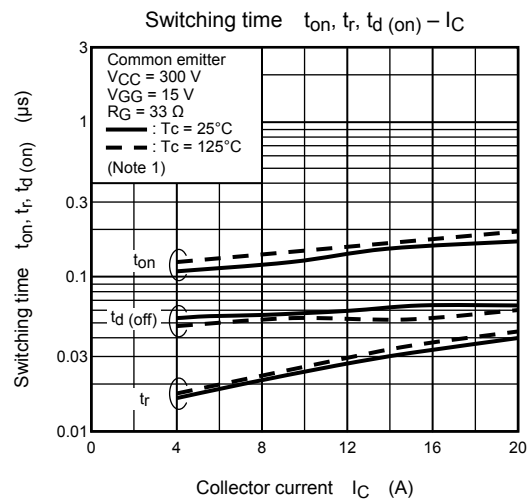
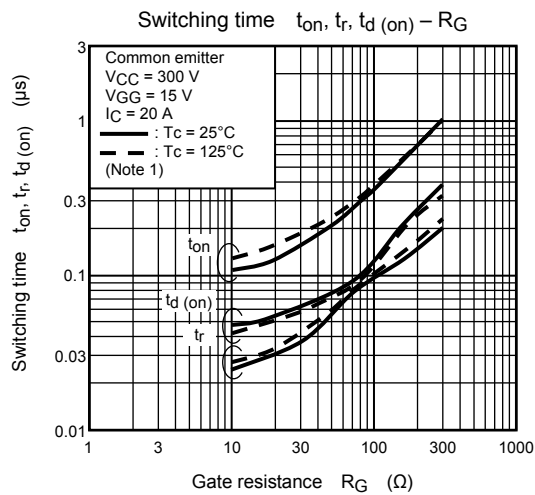
Note 1: Switching time measurement circuit and input/output waveforms

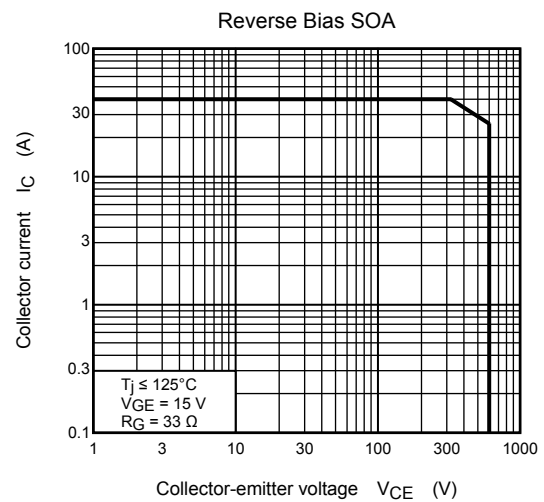
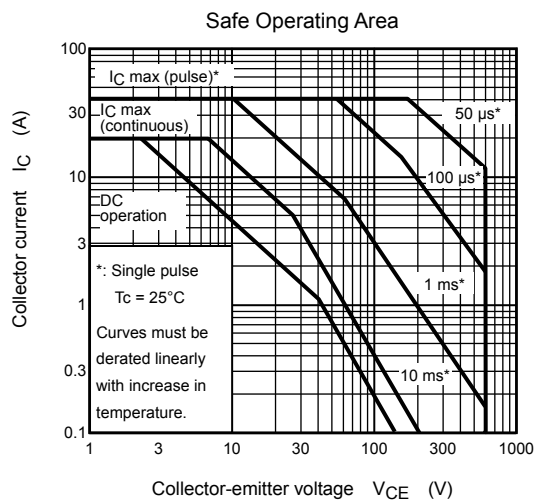
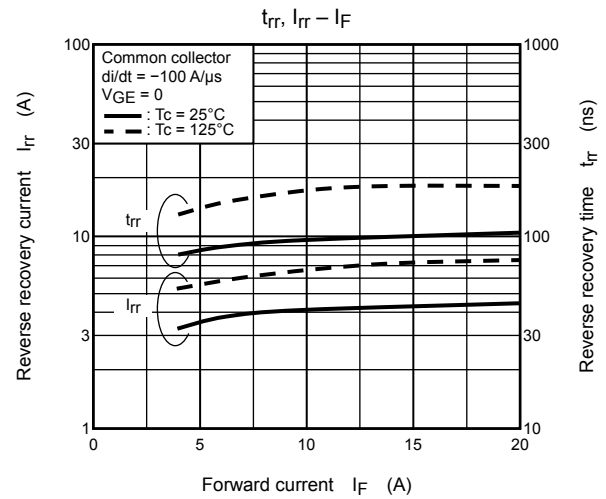
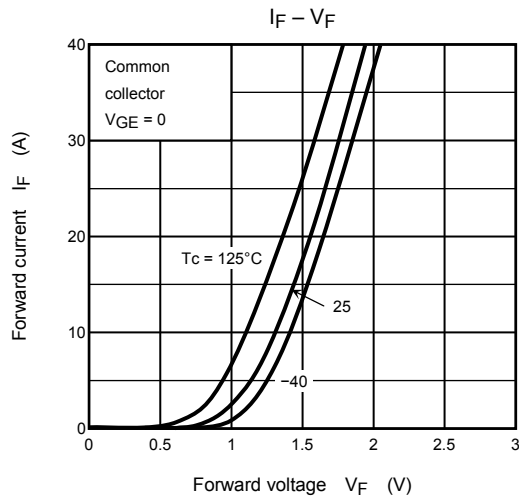
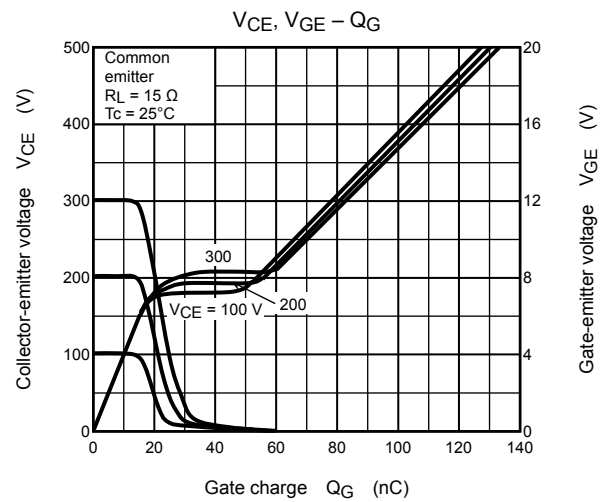
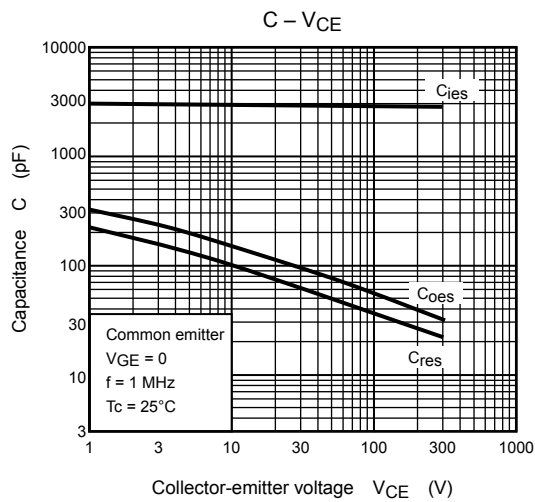


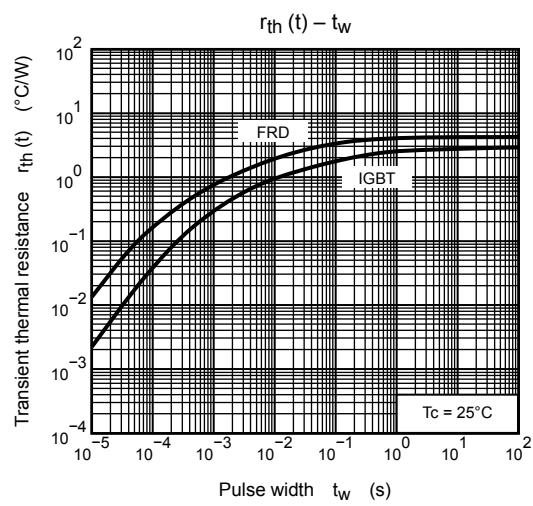
Note 2: Switching loss measurement waveforms











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