TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

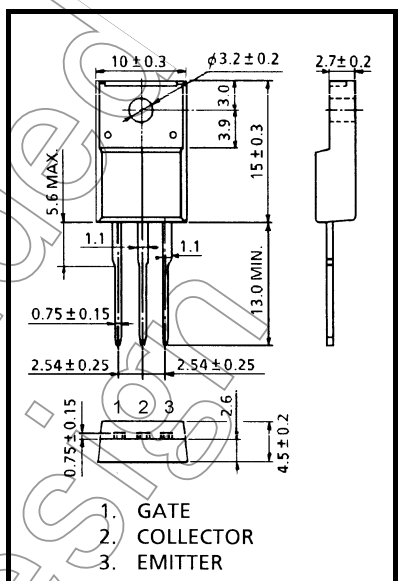
GT20J321

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 μs (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

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-10R1C

Weight: 1.7 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

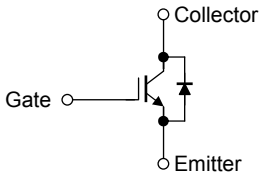
Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	600	V
Gate-emitter voltage		V_{GES}	±20	V
Collector current	DC	I_C	20	A
	1 ms	I_{CP}	40	
Emitter-collector forward current	DC	I_F	20	A
	1 ms	I_{FM}	40	
Collector power dissipation (Tc = 25°C)		P_C	45	W
Junction temperature		T_j	150	°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).

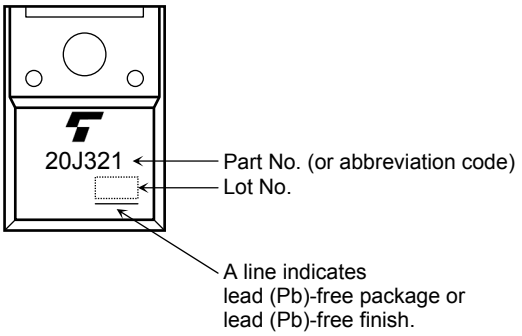
Thermal Characteristics

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

Equivalent Circuit



Marking

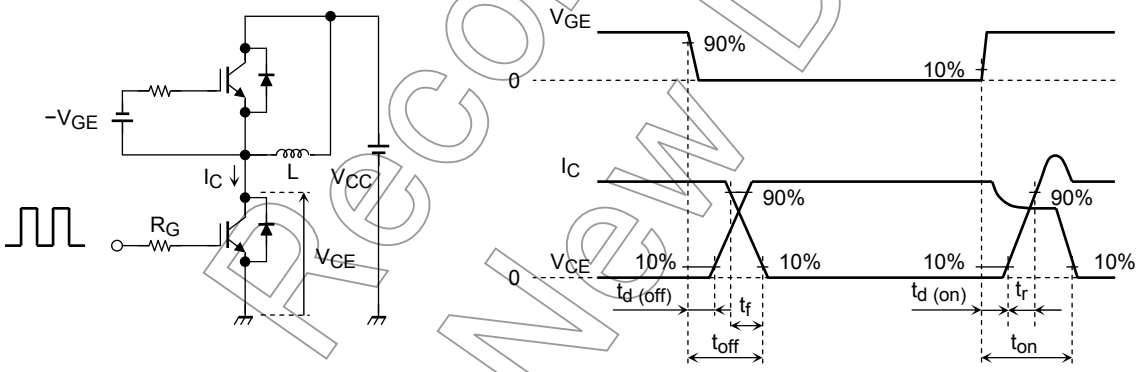


Not Recommended for New Design

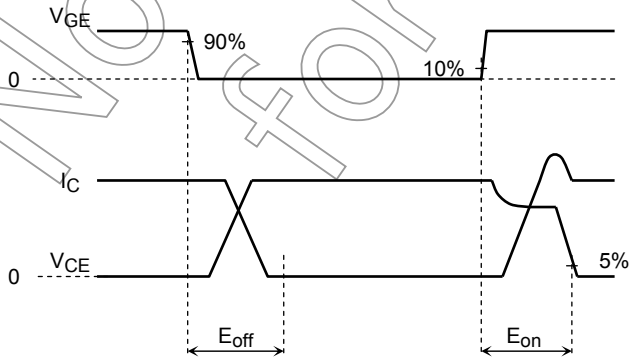
Electrical Characteristics (Ta = 25°C)

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

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



Note 2: Switching loss measurement waveforms



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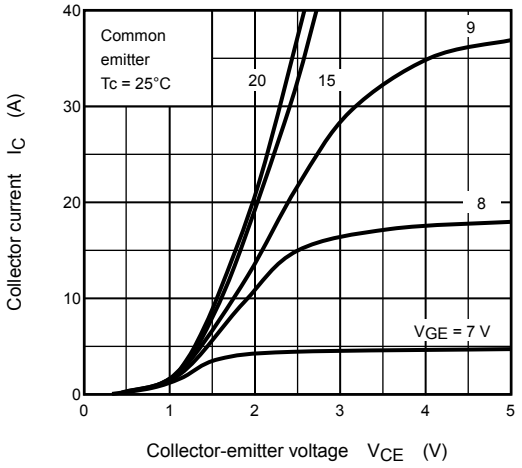
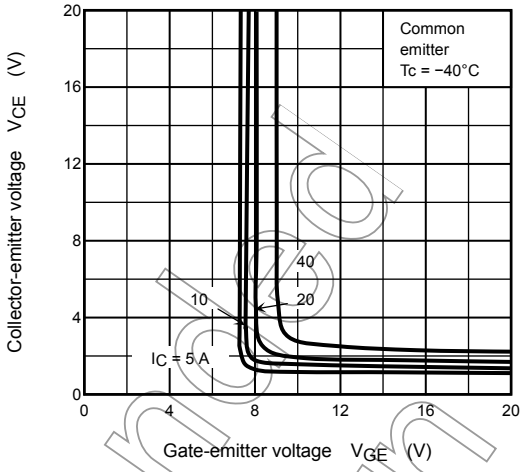
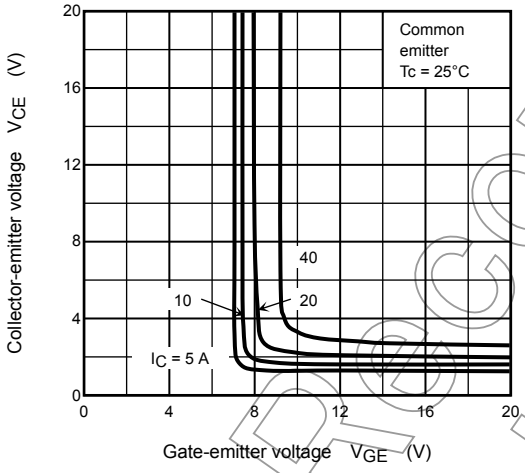
$I_C - V_{CE}$



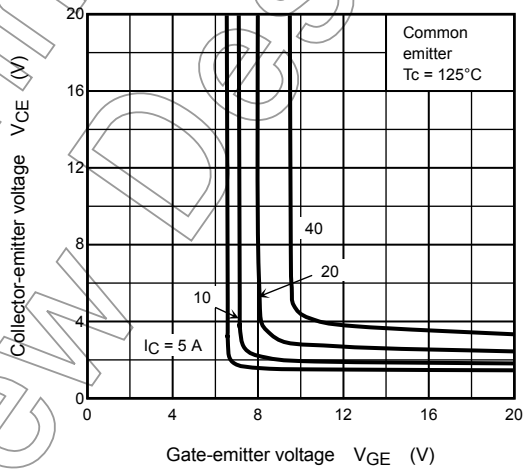
$V_{CE} - V_{GE}$



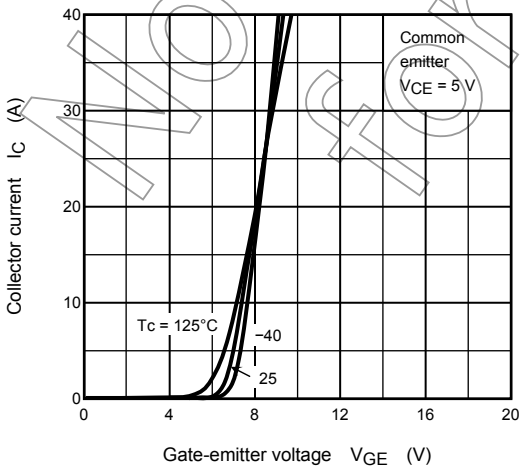
$V_{CE} - V_{GE}$



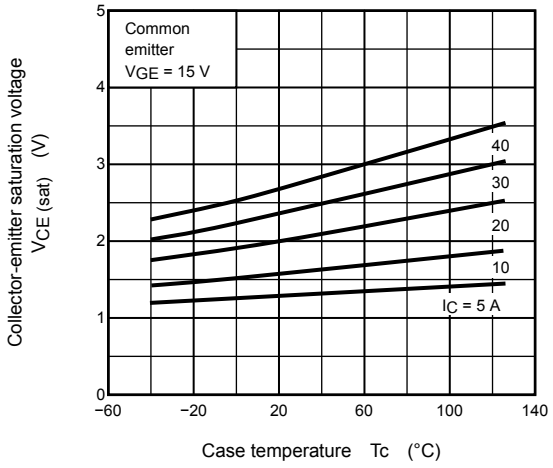
$V_{CE} - V_{GE}$



$I_C - V_{GE}$



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



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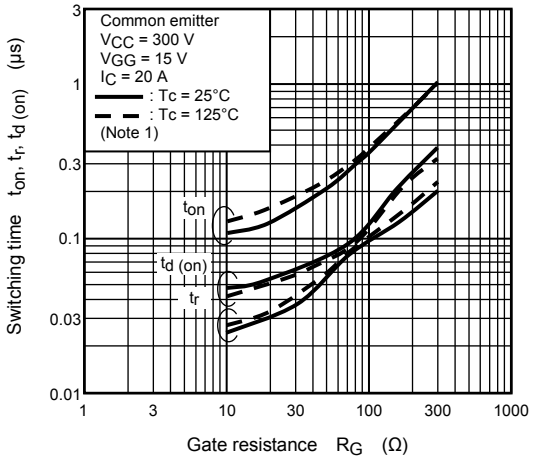
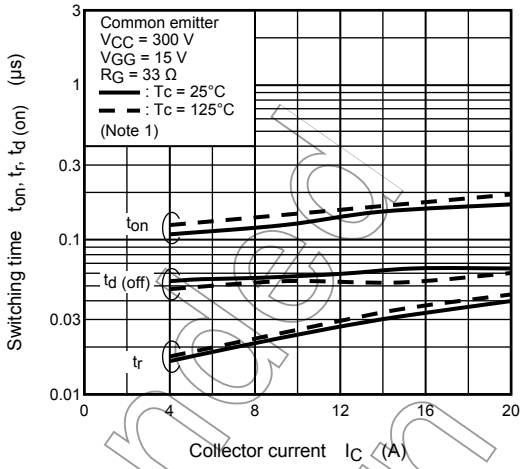
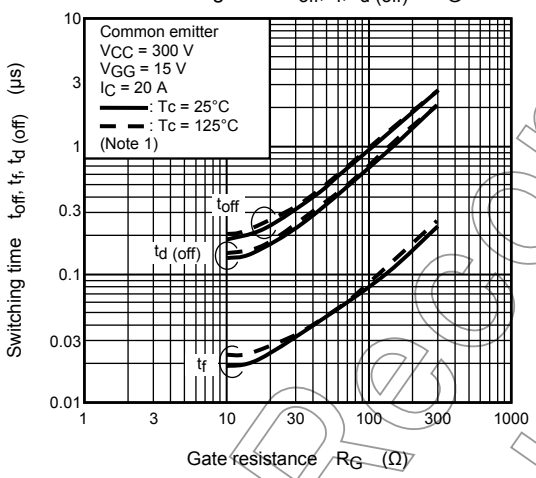
Switching time t_{on}, t_r, $t_{d\ (on)}$ – R_G



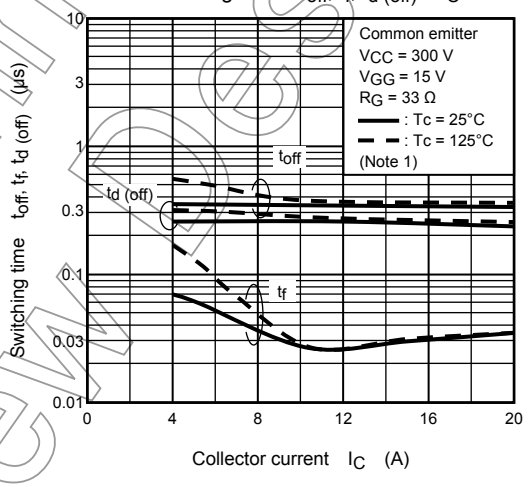
Switching time t_{on}, t_r, $t_{d\ (on)}$ – I_C



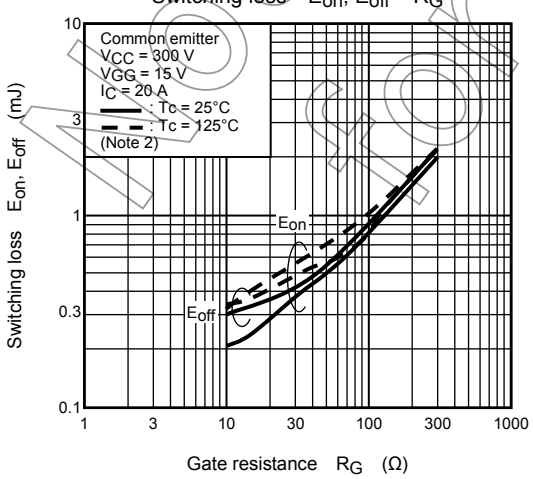
Switching time t_{off}, t_f, $t_{d\ (off)}$ – R_G



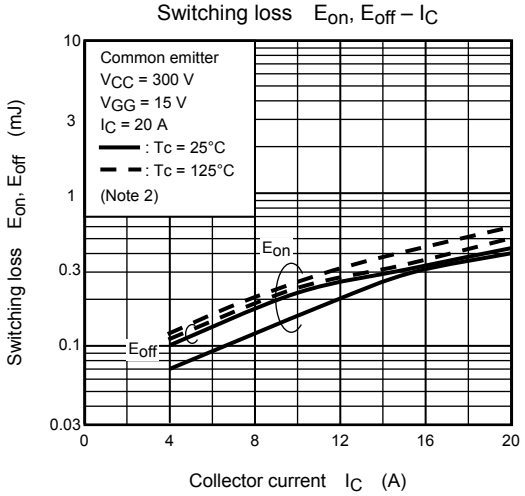
Switching time t_{off}, t_f, $t_{d\ (off)}$ – I_C



Switching loss E_{on}, E_{off} – R_G



Switching loss E_{on}, E_{off} – I_C



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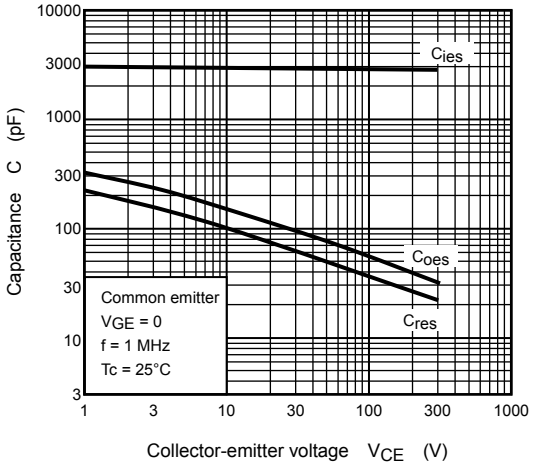
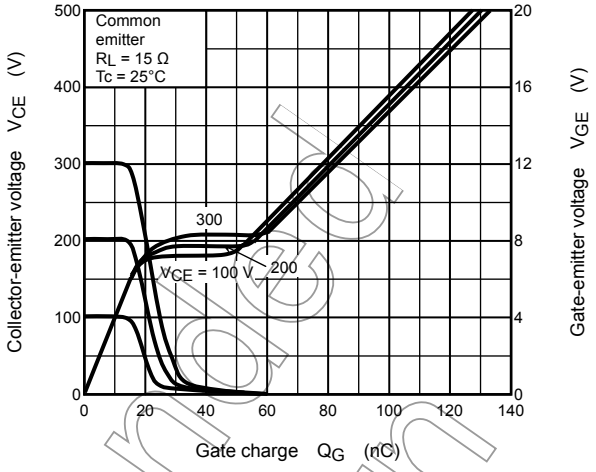
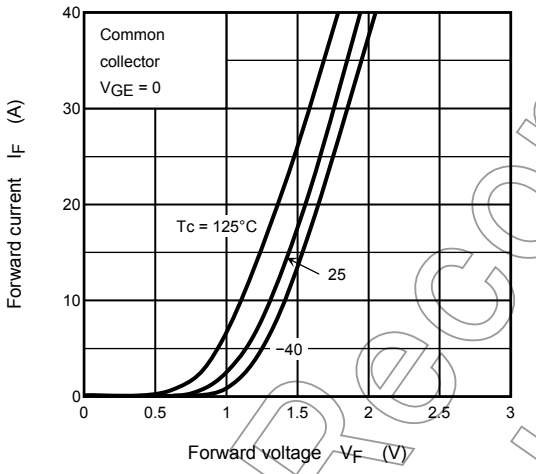
$C - V_{CE}$



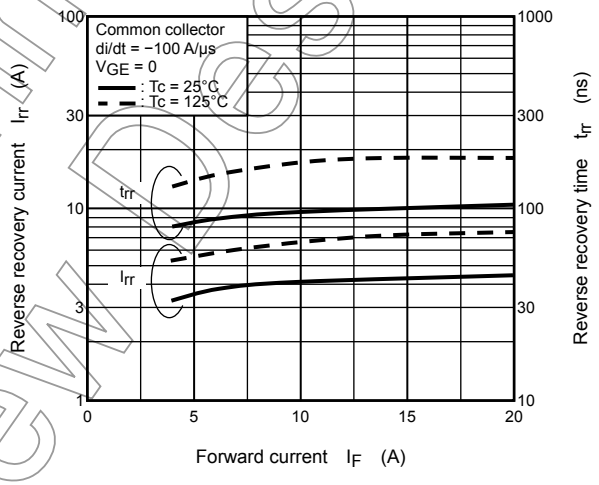
V_{CE}, $V_{GE} - Q_G$



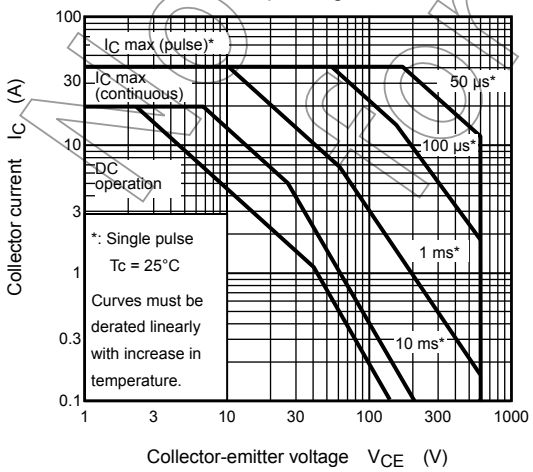
$I_F - V_F$



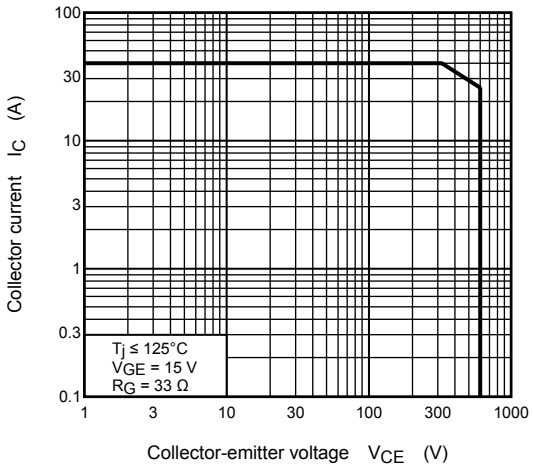
t_{rr}, $I_{rr} - I_F$



Safe Operating Area



Reverse Bias SOA



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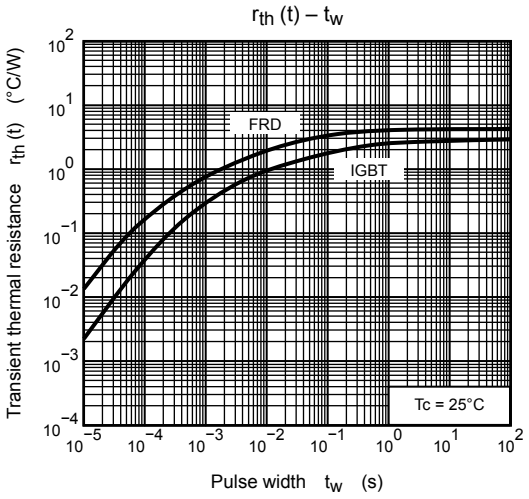

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