

TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

# GT20J321

High Power Switching Applications

Fast Switching Applications

- The 4th generation
- Enhancement-mode
- Fast switching (FS): Operating frequency up to 50 kHz (reference)

High speed:  $t_f = 0.04 \mu\text{s}$  (typ.)Low switching loss :  $E_{on} = 0.40 \text{ mJ}$  (typ.):  $E_{off} = 0.43 \text{ mJ}$  (typ.)

- Low saturation voltage:  $V_{CE(sat)} = 2.0 \text{ V}$  (typ.)
- FRD included between emitter and collector

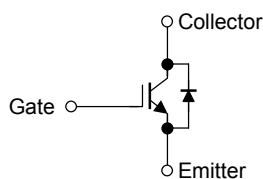
## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		$V_{CES}$	600	V
Gate-emitter voltage		$V_{GES}$	$\pm 20$	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 ( $T_c = 25^\circ\text{C}$ )		$P_C$	45	W
Junction temperature		$T_j$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

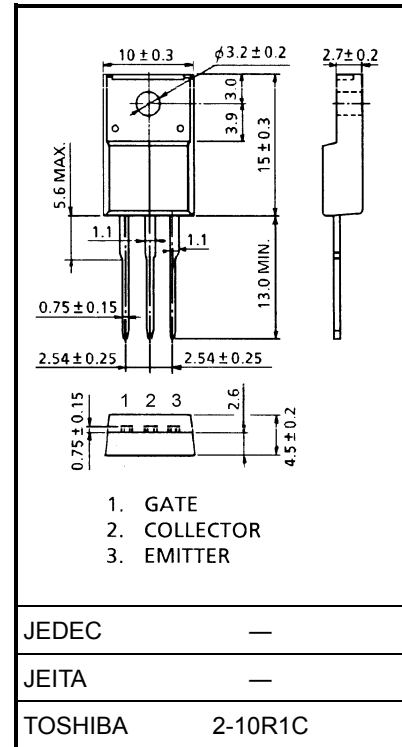
## Thermal Characteristics

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

## Equivalent Circuit



Unit: mm

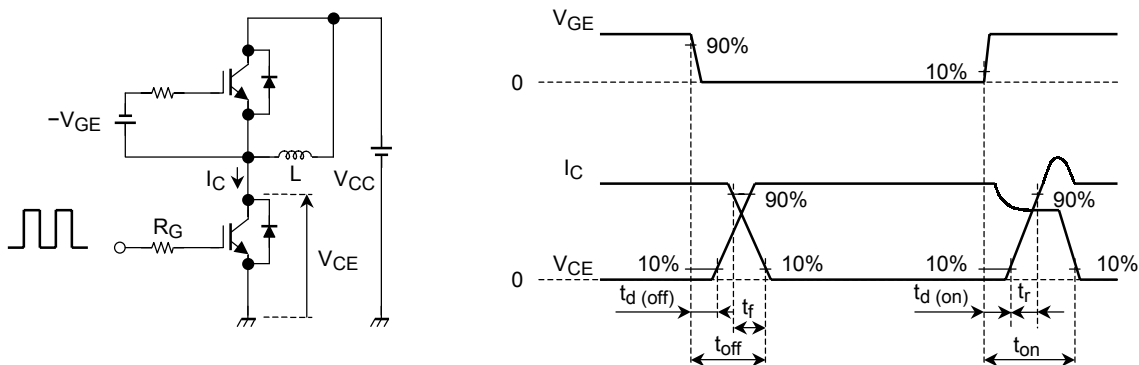


Weight: 1.7 g (typ.)

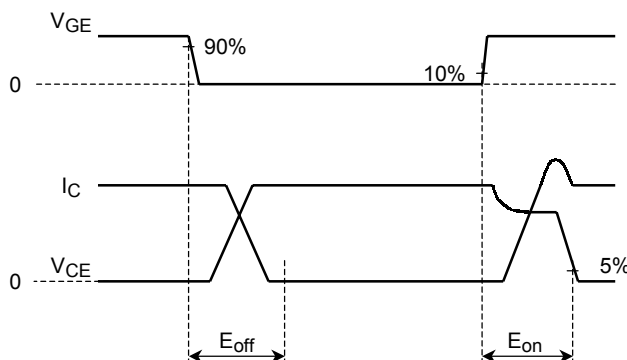
## Electrical Characteristics (Ta = 25°C)

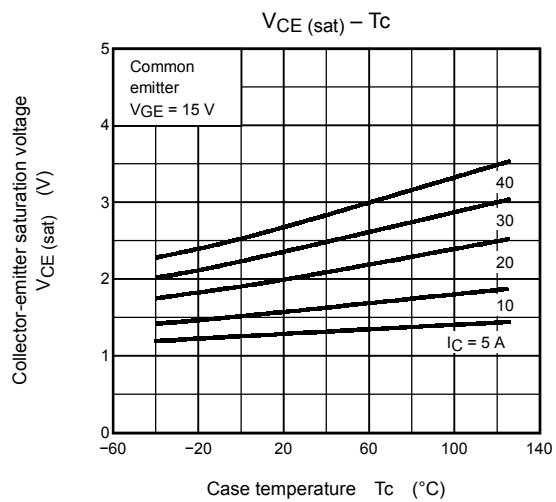
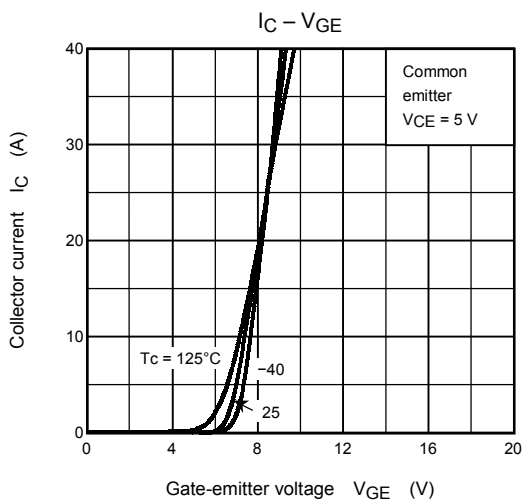
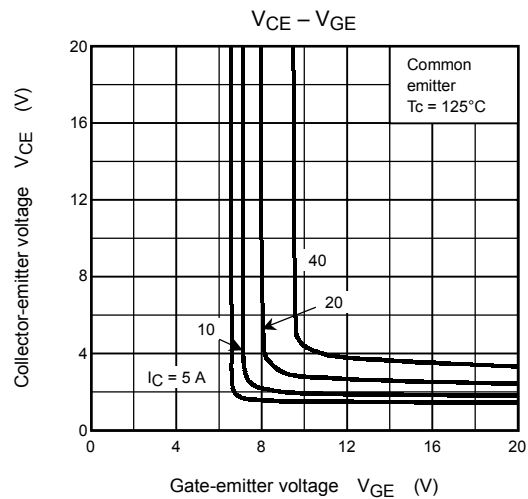
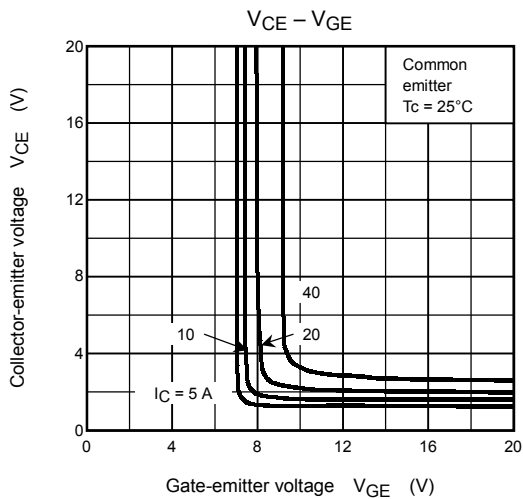
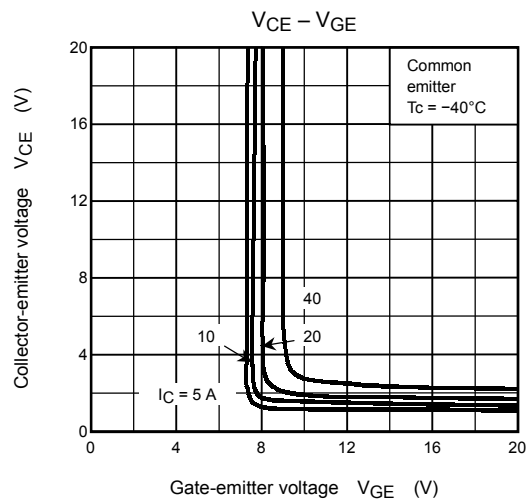
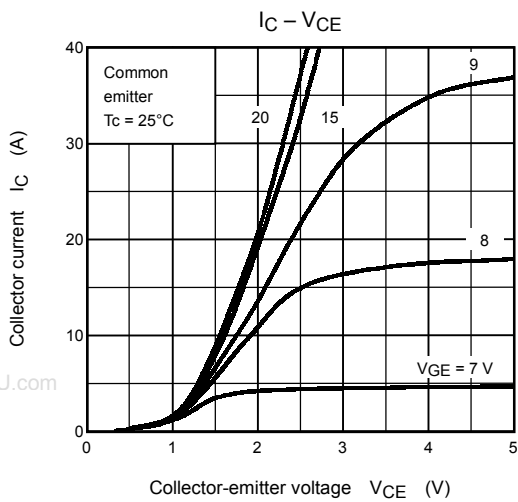
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GES}$	$V_{GE} = \pm 20\text{ V}, V_{CE} = 0$	—	—	$\pm 500$	nA
Collector cut-off current		$I_{CES}$	$V_{CE} = 600\text{ V}, V_{GE} = 0$	—	—	1.0	mA
Gate-emitter cut-off voltage		$V_{GE(OFF)}$	$I_C = 2\text{ mA}, V_{CE} = 5\text{ V}$	3.5	—	6.5	V
Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_C = 20\text{ A}, V_{GE} = 15\text{ V}$	—	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 $V_{CC} = 300\text{ V}, I_C = 20\text{ A}$ $V_{GG} = +15\text{ V}, R_G = 33\ \Omega$	—	0.06	—	$\mu\text{s}$
	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	$E_{on}$	(Note 1)	—	0.40	—	mJ
	Turn-off switching loss	$E_{off}$	(Note 2)	—	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

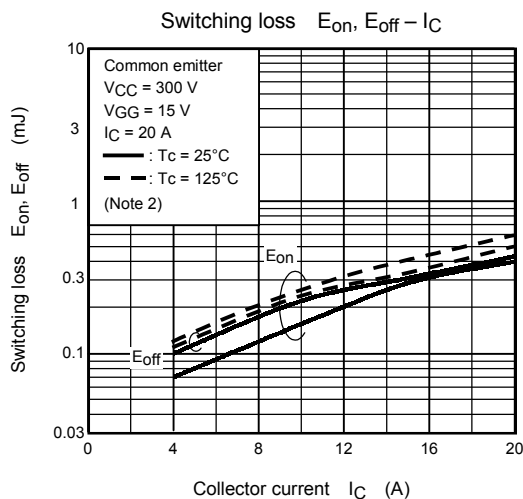
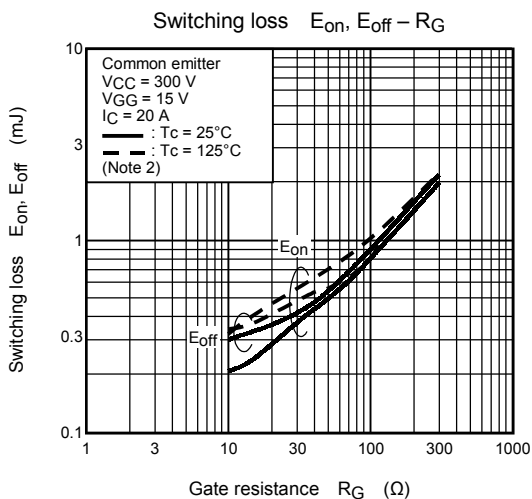
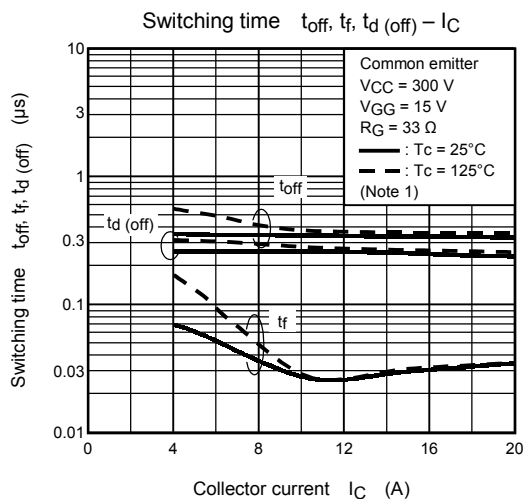
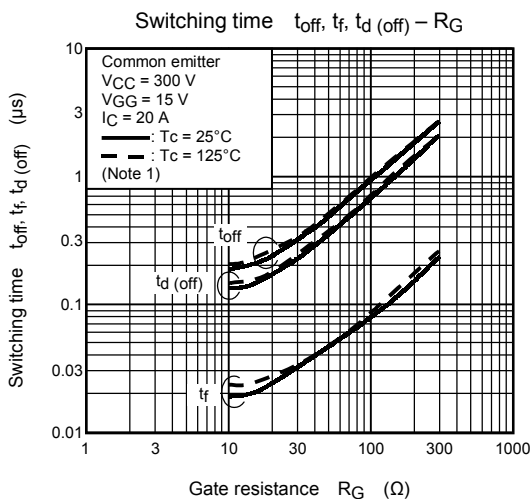
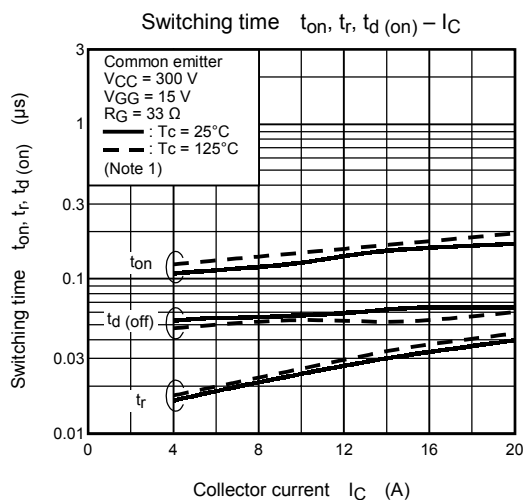
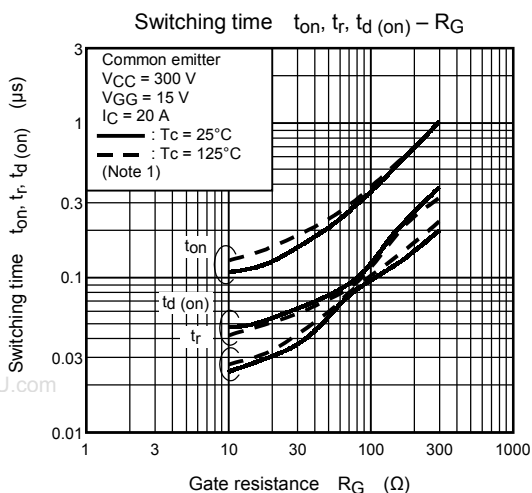


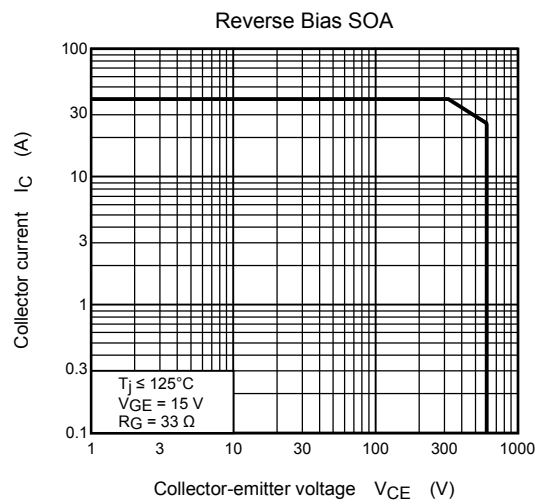
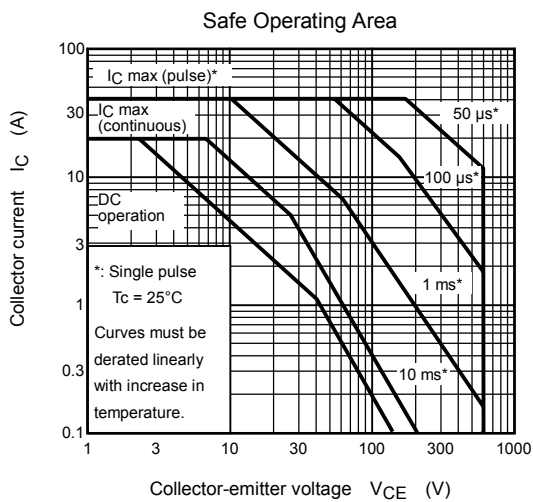
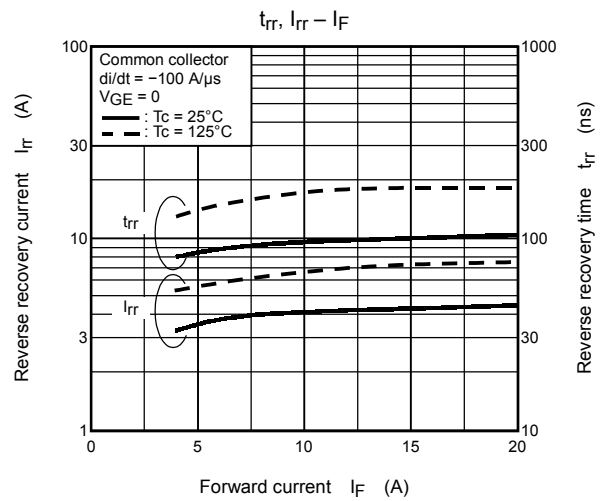
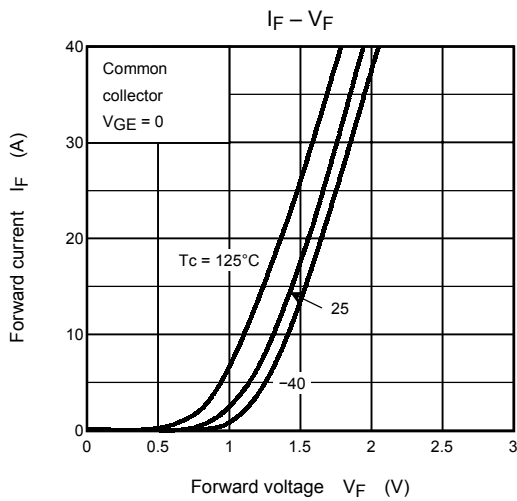
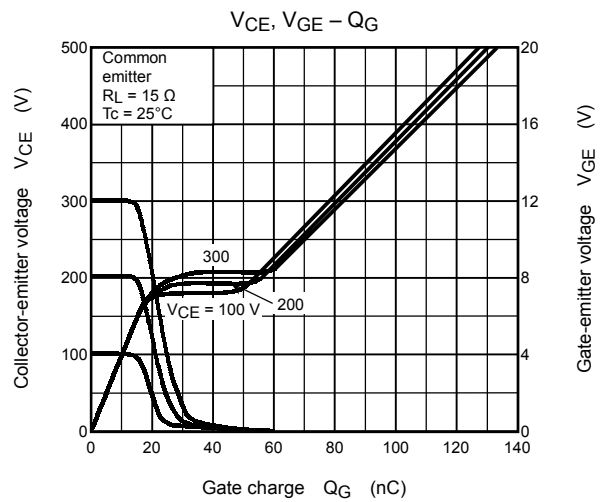
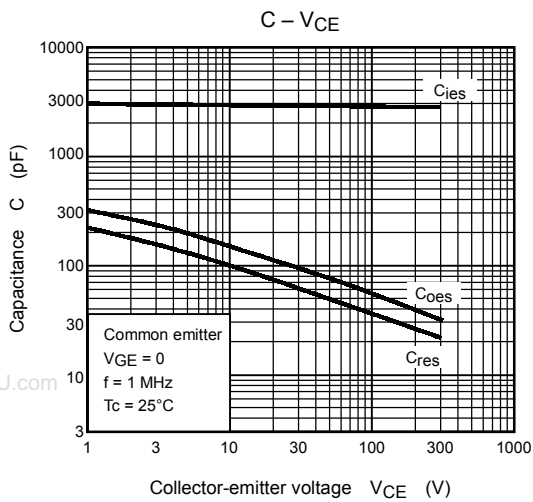


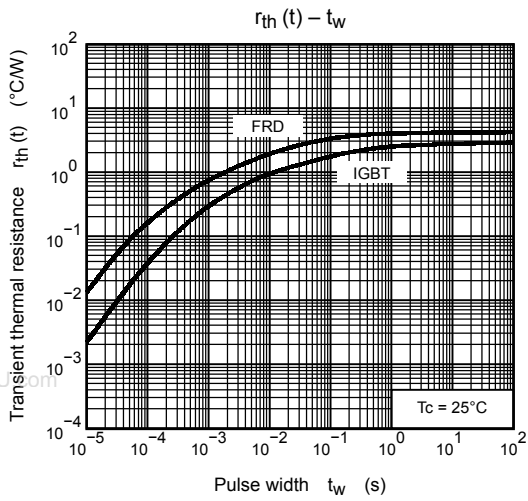
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