TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

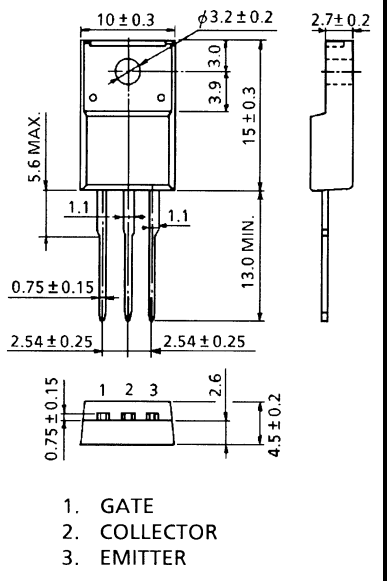
GT15J321

High Power Switching Applications

Fast Switching Applications

- The 4th generation
- FS (fast switching)
- Enhancement-mode
- High speed: t_f = 0.03 μs (typ.)
- Low saturation Voltage: $V_{CE\ (sat)}$ = 1.90 V (typ.)
- FRD included between emitter and collector.

Unit: mm



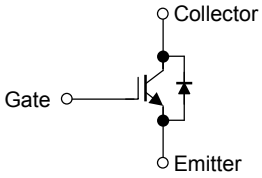
JEDEC	—
JEITA	—
TOSHIBA	2-10R1C

Weight: 1.7 g

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	15	A
	1 ms	I_{CP}	30	
Emitter-collector forward current	DC	I_F	15	A
	1 ms	I_{FM}	30	
Collector power dissipation (Tc = 25°C)		P_C	30	W
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55~150	°C

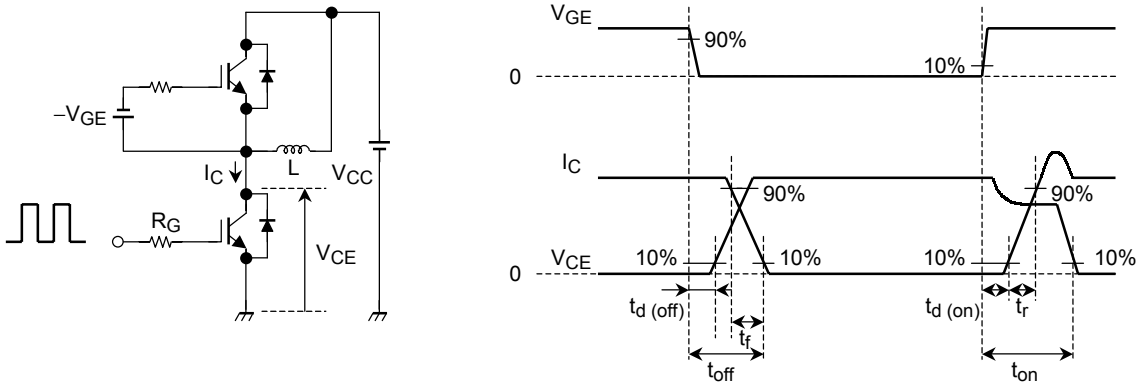
Equivalent Circuit



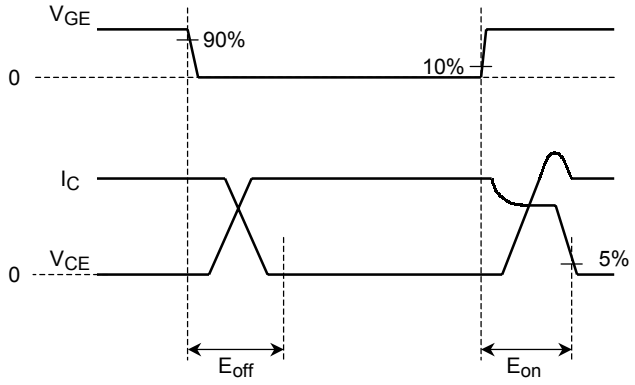
Electrical Characteristics (Ta = 25°C)

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 = 1.5 mA, V_{CE} = 5 V	3.5	—	6.5	V
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_C = 15 A, V_{GE} = 15 V	—	1.90	2.45	V
Input capacitance		C_{ies}	V_{CE} = 20 V, V_{GE} = 0, f = 1 MHz	—	2300	—	pF
Switching time	Rise time	t_r	Inductive Load	—	0.04	—	µs
	Turn-on time	t_{on}	V_{CC} = 300 V, I_C = 15 A	—	0.17	—	
	Fall time	t_f	V_{GG} = 15 V, R_G = 43 Ω	—	0.03	0.15	
	Turn-off time	t_{off}	(Note 1)	—	0.34	—	
Peak forward voltage		V_F	I_F = 15 A, V_{GE} = 0	—	—	2.0	V
Reverse recovery time		t_{rr}	I_F = 15 A, di/dt = −100 A/µs	—	—	200	ns
Thermal resistance (IGBT)		$R_{th\ (j\text{-}c)}$	—	—	—	4.16	°C/W
Thermal resistance (Diode)		$R_{th\ (j\text{-}c)}$	—	—	—	4.63	°C/W

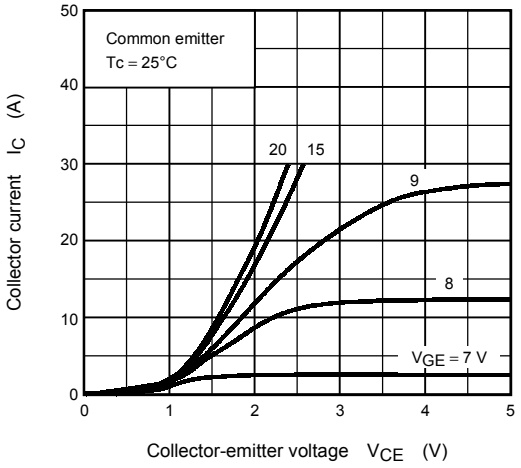
Note 1: Switching time measurement circuit and input/output waveforms



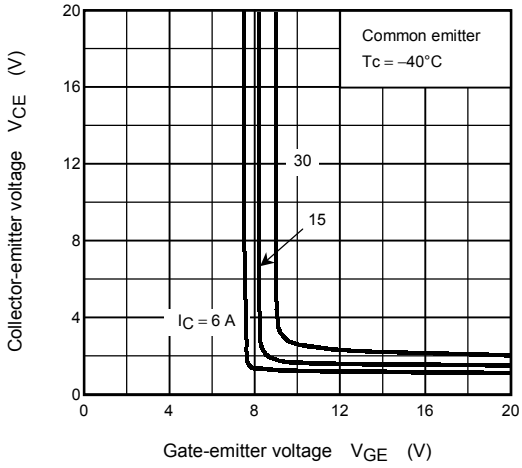
Note 2: Switching loss measurement waveforms



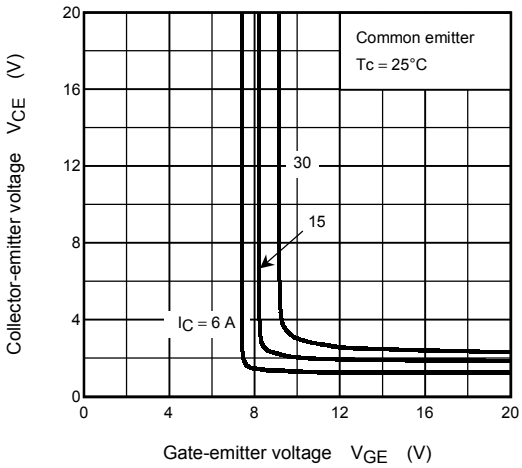
$I_C - V_{CE}$



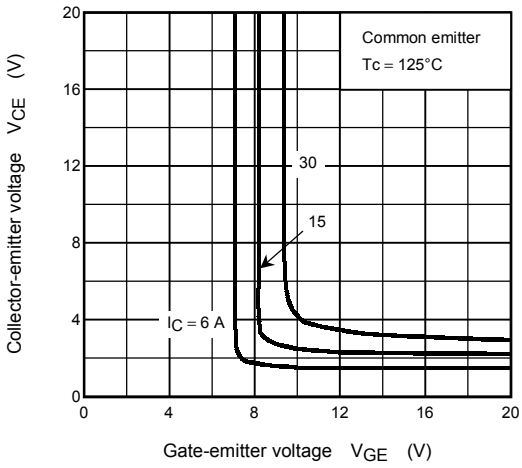
$V_{CE} - V_{GE}$



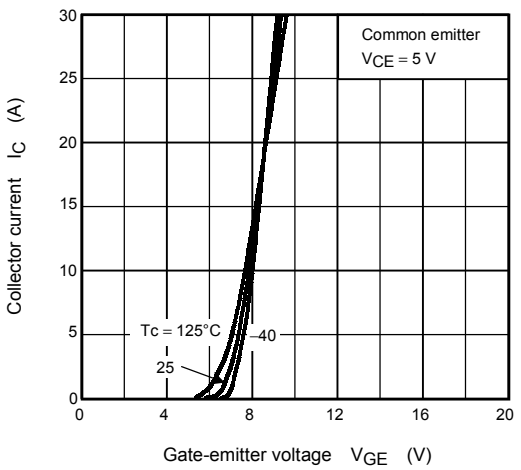
$V_{CE} - V_{GE}$



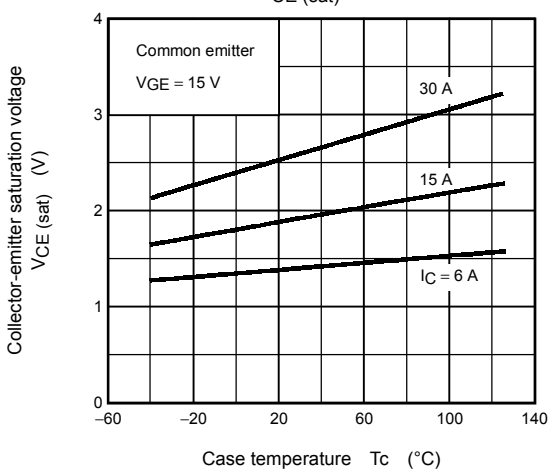
$V_{CE} - V_{GE}$



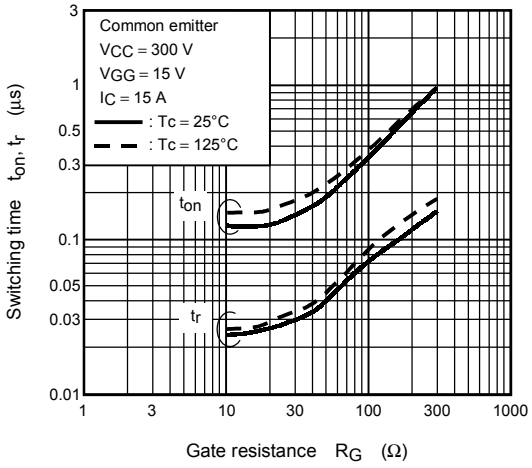
$I_C - V_{GE}$



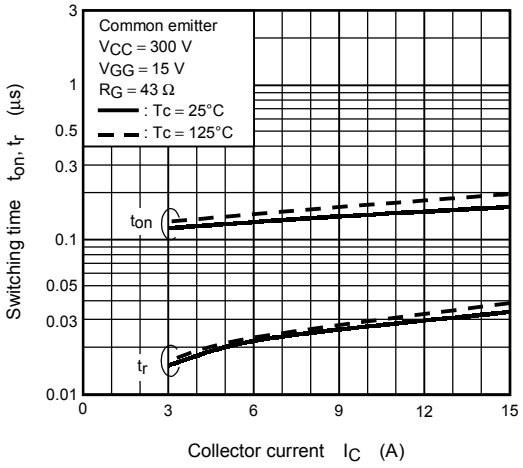
$V_{CE\ (sat)} - Tc$



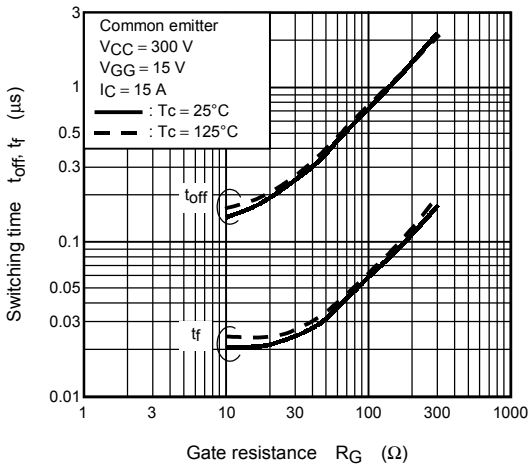
Switching time t_{on}, t_r – R_G



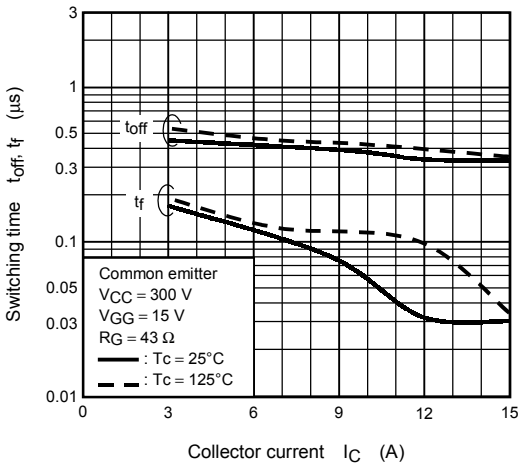
Switching time t_{on}, t_r – I_C



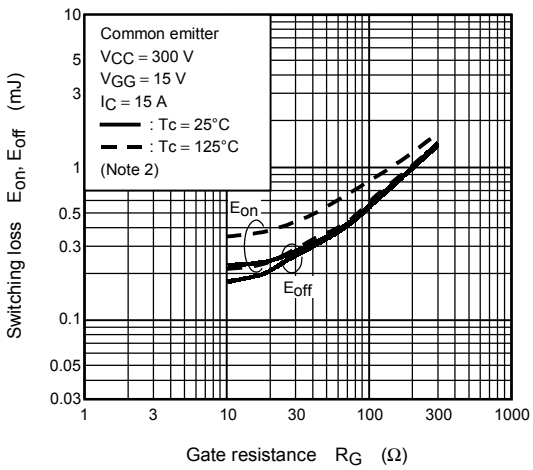
Switching time t_{off}, t_f – R_G



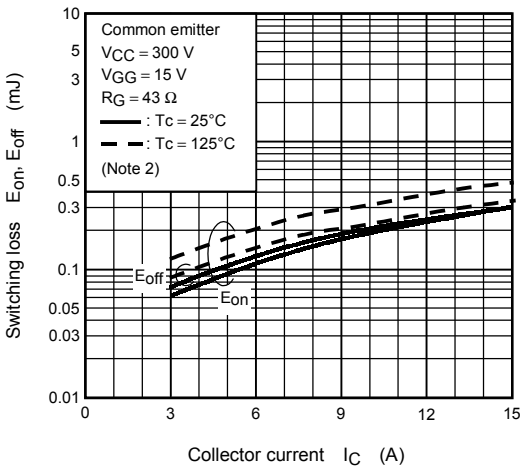
Switching time t_{off}, t_f – I_C



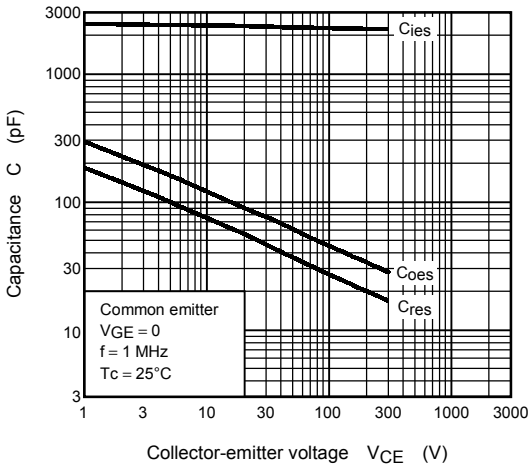
Switching loss E_{on}, E_{off} – R_G



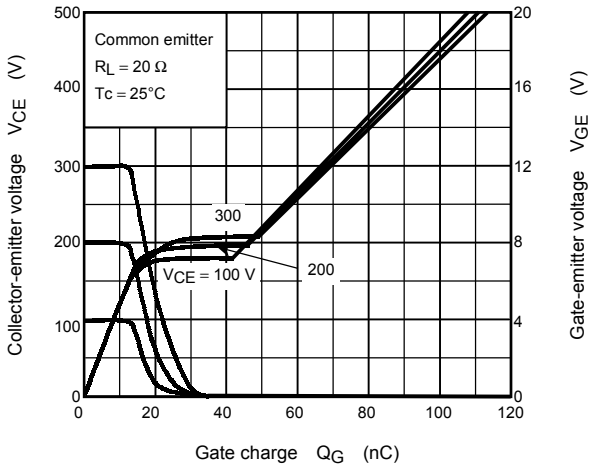
Switching loss E_{on}, E_{off} – I_C



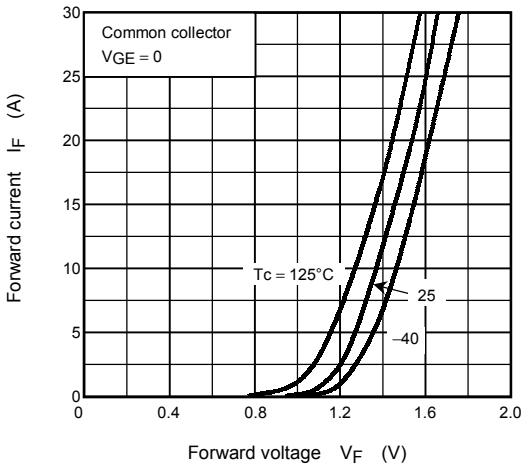
C – V_{CE}



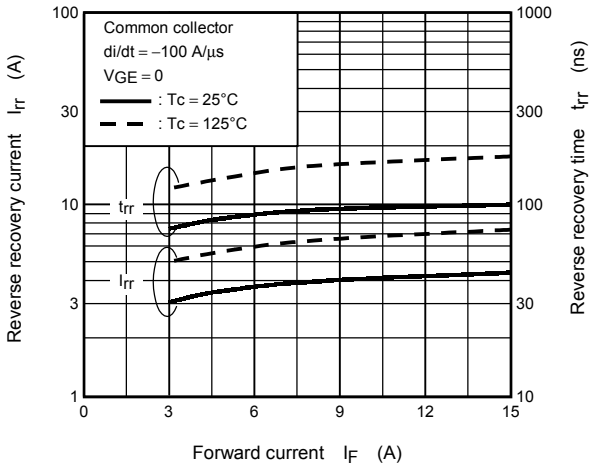
V_{CE}, V_{GE} – Q_G



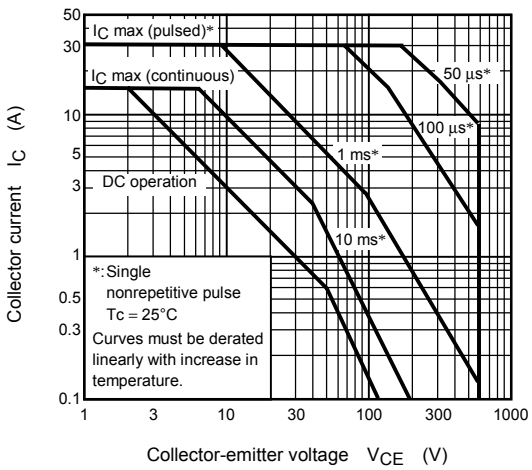
I_F – V_F



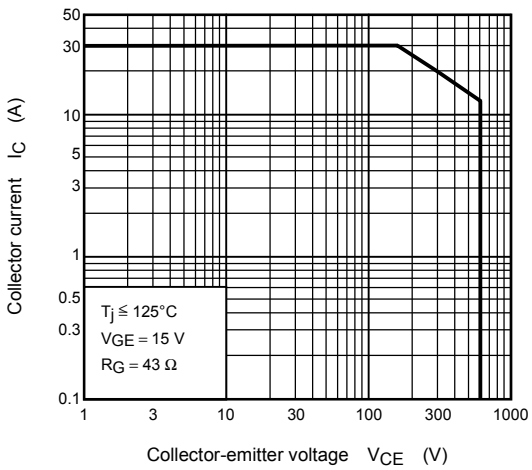
t_{rr}, I_{rr} – IF

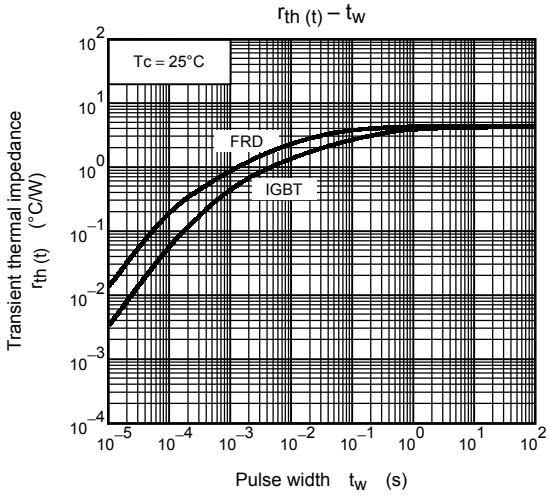


Safe operating area



Reverse bias SOA




$r_{th\ (t)} - t_w$
Tc = 25°C
FRD
IGBT
Transient thermal impedance r_{th} (t) (°C/W)
Pulse width t_w (s)

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