TOSHIBA INSULATED GATE BIPOLAR TRANSISTOR SILICON N CHANNEL IGBT

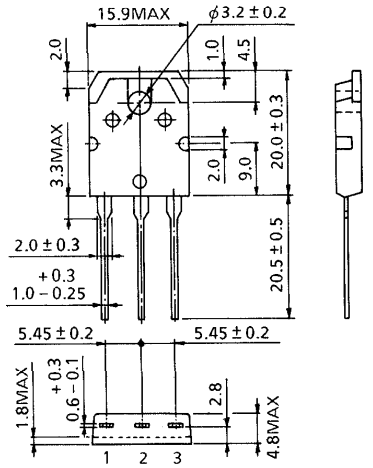
GT10Q301

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- The 3rd Generation
- Enhancement-Mode
- High Speed : $t_f = 0.32\ \mu s$ (Max.)
- Low Saturation Voltage : $V_{CE\ (sat)} = 2.7\ V$ (Max.)
- FRD included between Emitter and Collector

Unit in mm



1. GATE
2. COLLECTOR (HEAT SINK)
3. EMITTER

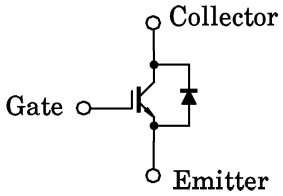
JEDEC	—
JEITA	—
TOSHIBA	2-16C1C

Weight : 4.6 g

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Collector-Emitter Voltage		V_{CES}	1200	V
Gate-Emitter Voltage		V_{GES}	±20	V
Collector Current	DC	I_C	10	A
	1 ms	I_{CP}	20	A
Emitter-Collector Forward Current	DC	I_F	10	A
	1 ms	I_{FM}	20	A
Collector Power Dissipation (Tc = 25°C)		P_C	140	W
Junction Temperature		T_j	150	°C
Storage Temperature Range		T_{stg}	−55~150	°C

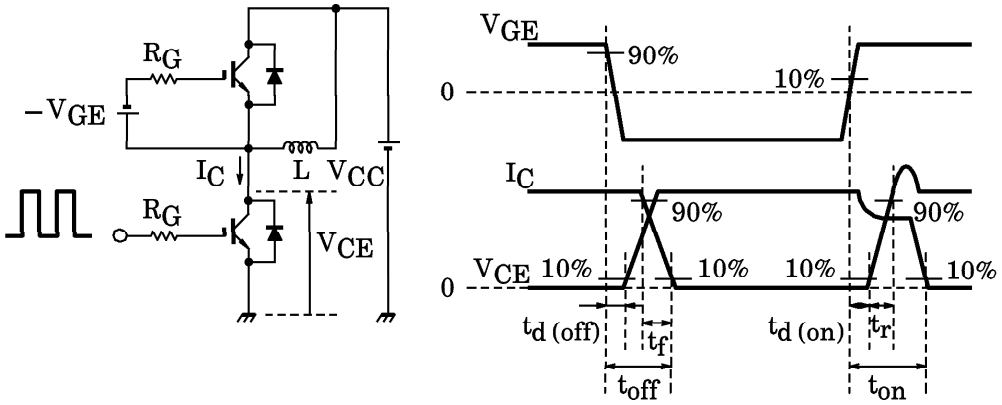
EQUIVALENT CIRCUIT



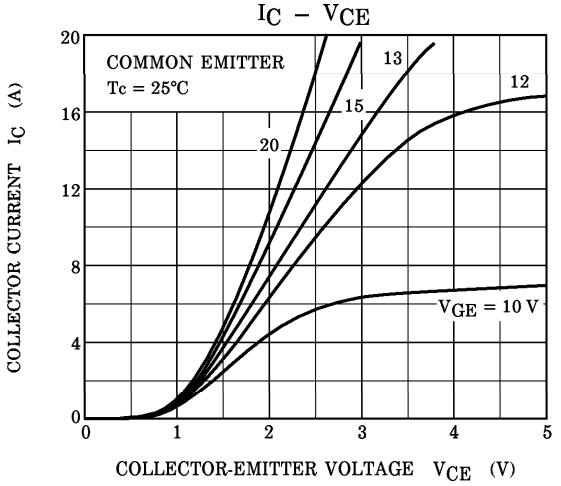
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		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} = 1200 V, V_{GE} = 0	—	—	1.0	mA
Gate-Emitter Cut-Off Voltage		$V_{GE\ (OFF)}$	I_C = 1 mA, V_{CE} = 5 V	4.0	—	7.0	V
Collector-Emitter Saturation Voltage		$V_{CE\ (sat)}$	I_C = 10 A, V_{GE} = 15 V	—	2.1	2.7	V
Input Capacitance		C_{ies}	V_{CE} = 50 V, V_{GE} = 0, f = 1 MHz	—	600	—	pF
Switching Time	Rise Time	t_r	Inductive Load	—	0.07	—	μs
	Turn-On Time	t_{on}	V_{CC} = 600 V, I_C = 10 A	—	0.30	—	
	Fall Time	t_f	V_{GG} = ±15 V, R_G = 75 Ω (Note)	—	0.16	0.32	
	Turn-Off Time	t_{off}		—	0.50	—	
Peak Forward Voltage		V_F	I_F = 10 A, V_{GE} = 0	—	—	3.0	V
Reverse Recovery Time		t_{rr}	I_F = 10 A, di / dt = −200 A / μs	—	—	350	ns
Thermal Resistance (IGBT)		$R_{th\ (j\text{-}c)}$	—	—	—	0.89	°C / W
Thermal Resistance (Diode)		$R_{th\ (j\text{-}c)}$	—	—	—	1.79	°C / W

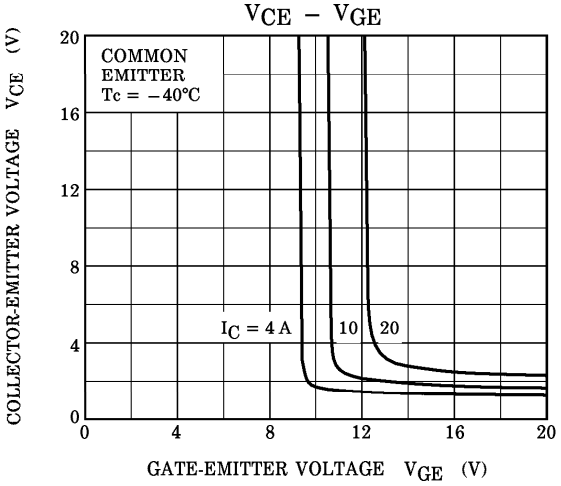
(Note) : Switching time measurement circuit and input / output waveforms



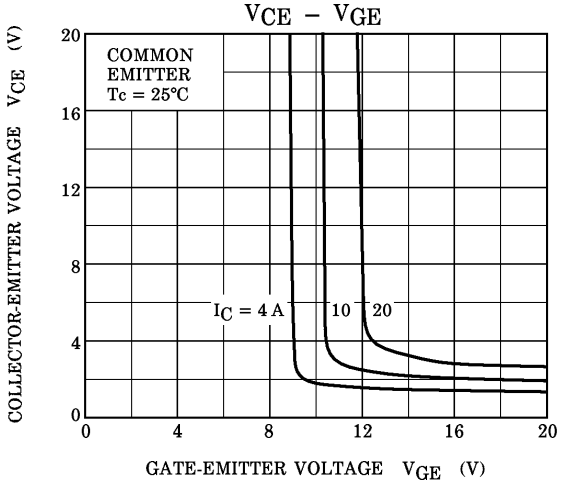
I_C – V_{CE}



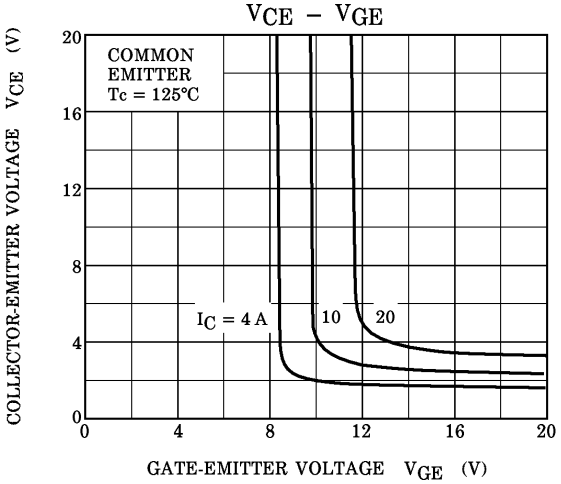
V_{CE} – V_{GE}



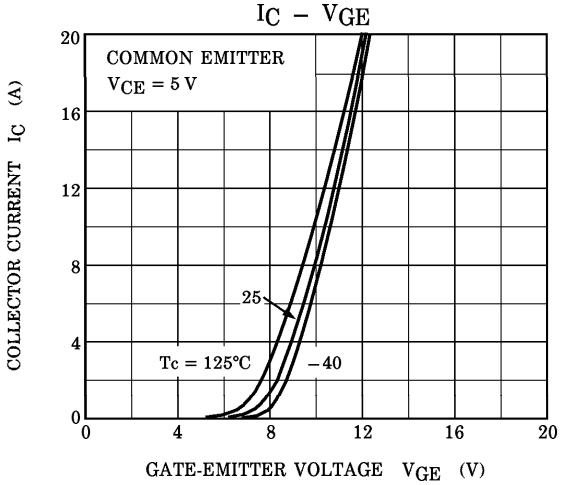
V_{CE} – V_{GE}



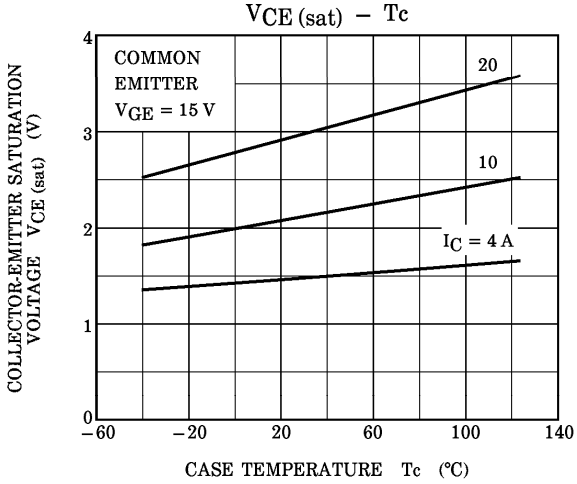
V_{CE} – V_{GE}



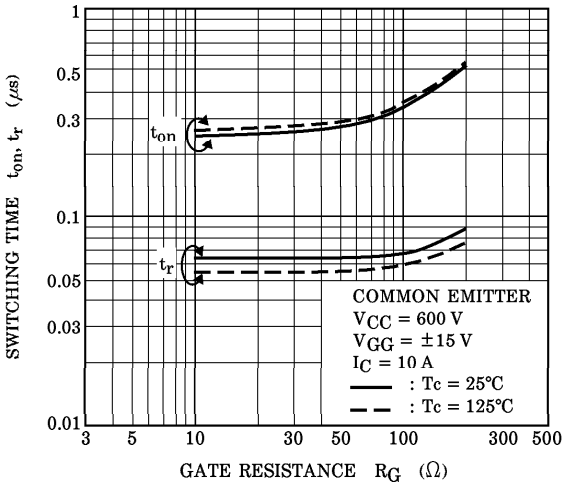
I_C – V_{GE}



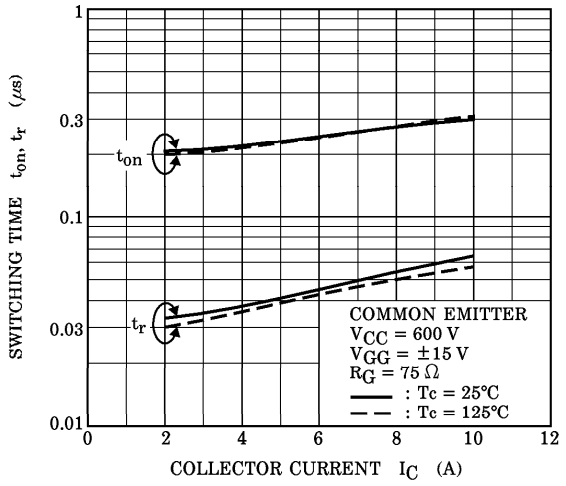
$V_{CE\,(sat)}$ – Tc



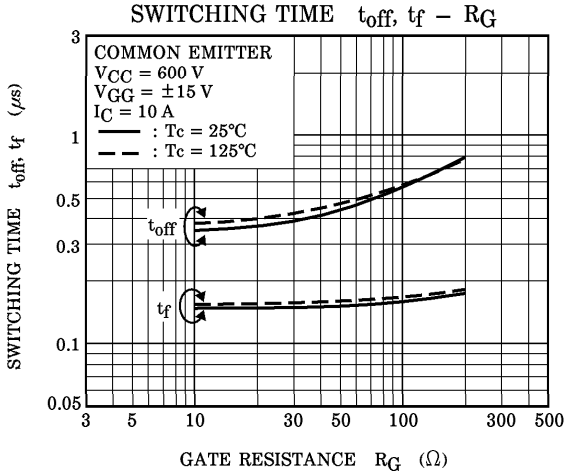
SWITCHING TIME t_{on}, t_r – R_G



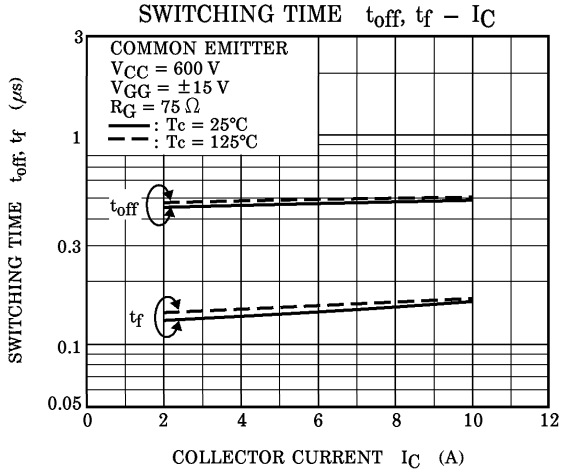
SWITCHING TIME t_{on}, t_r – I_C



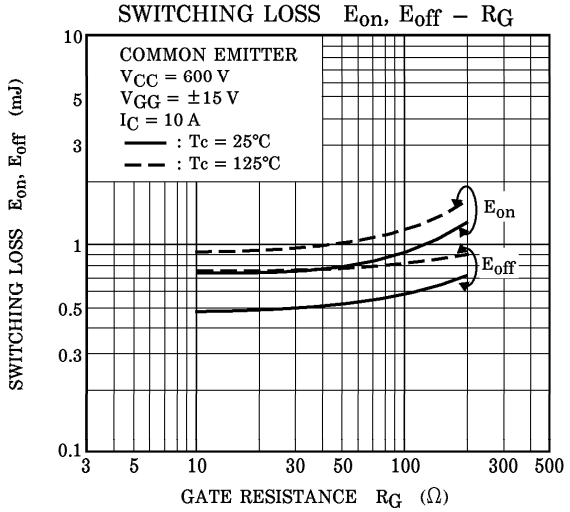
SWITCHING TIME t_{off}, t_f – R_G



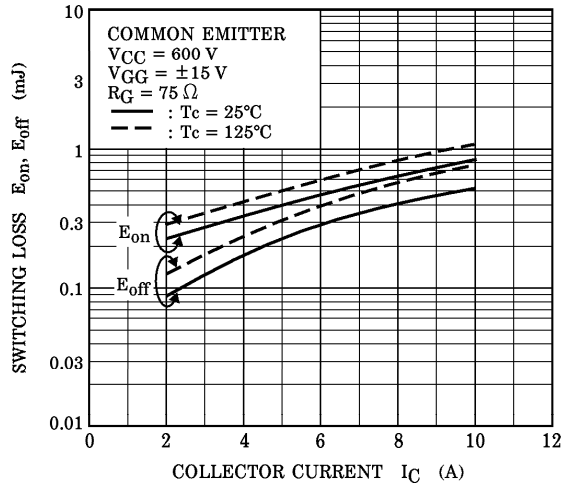
SWITCHING TIME t_{off}, t_f – I_C



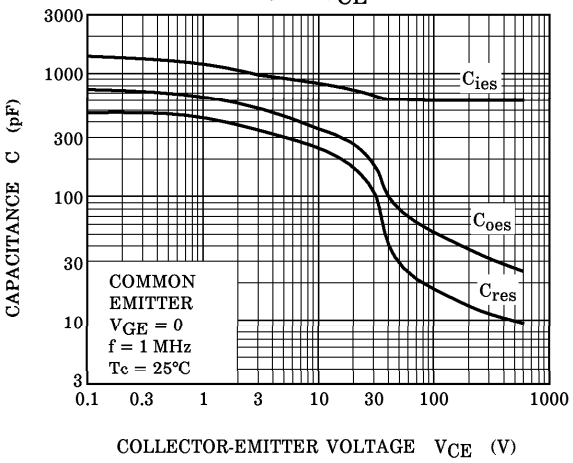
SWITCHING LOSS E_{on}, E_{off} – R_G



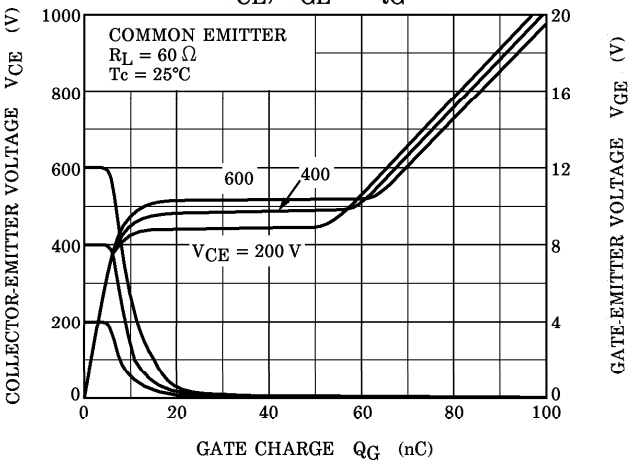
SWITCHING LOSS E_{on}, E_{off} – I_C



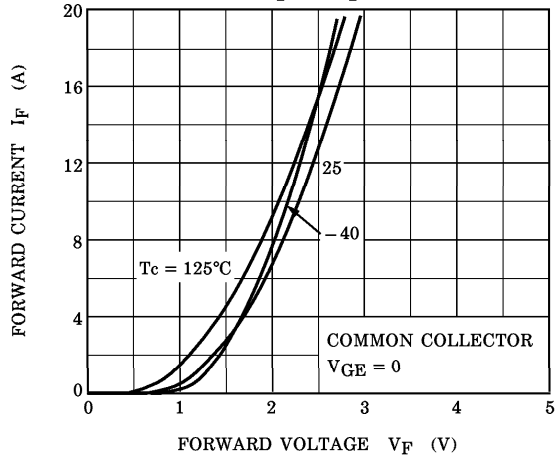
C – V_{CE}



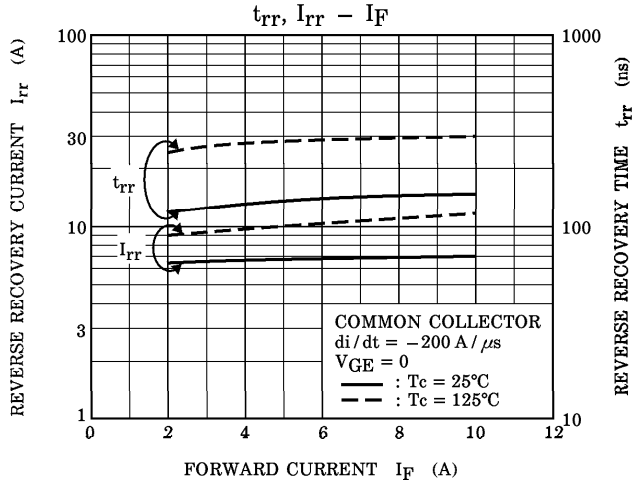
V_{CE}, V_{GE} – Q_G



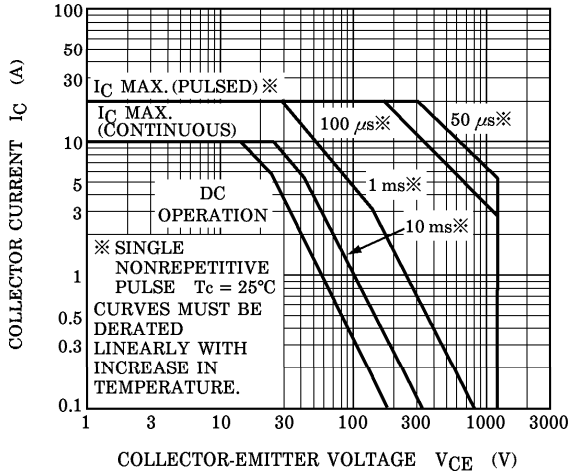
I_F – V_F



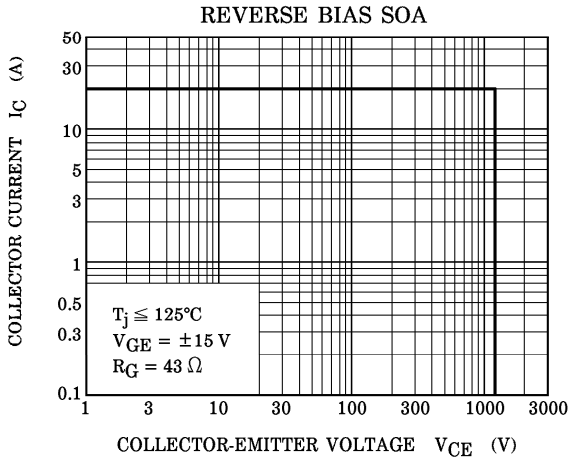
t_{rr}, I_{rr} – I_F

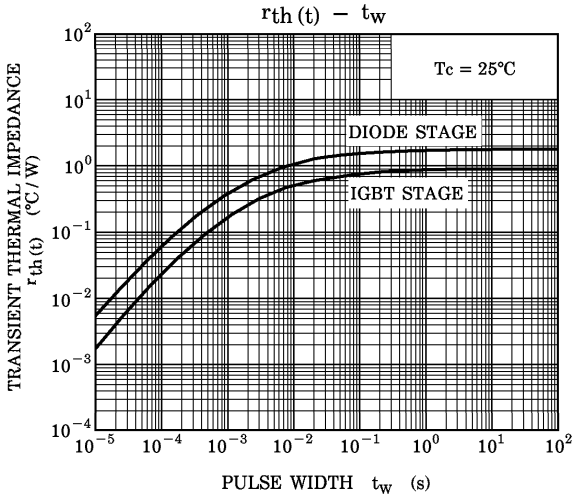


SAFE OPERATING AREA



REVERSE BIAS SOA




r_{th} (t) – t_w
Tc = 25°C
DIODE STAGE
IGBT STAGE
TRANSIENT THERMAL IMPEDANCE r_{th} (t) (°C / W)
PULSE WIDTH t_w (s)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}

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