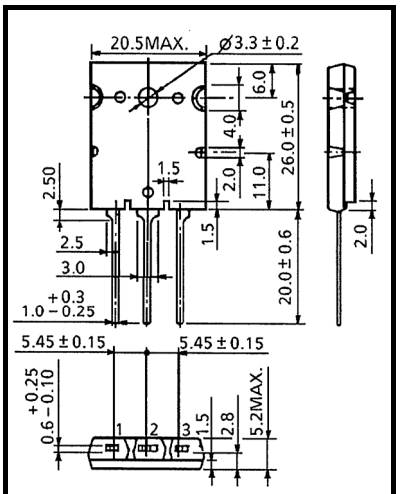
TOSHIBA INSULATED GATE BIPOLAR TRANSISTOR SILICON N CHANNEL IGBT

GT60M303

HIGH POWER SWITCHING APPLICATIONS

- Fourth generation IGBT
- FRD included between emitter and collector
- Enhancement mode type
- High speed IGBT : t_f = 0.25μs (TYP.)
  FRD : t_{rr} = 0.7μs (TYP.)
- Low saturation voltage : $V_{CE\ (sat)}$ = 2.1V (TYP.)

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-21F2C

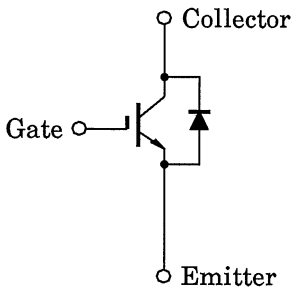
Weight: 9.75 g (typ.)

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

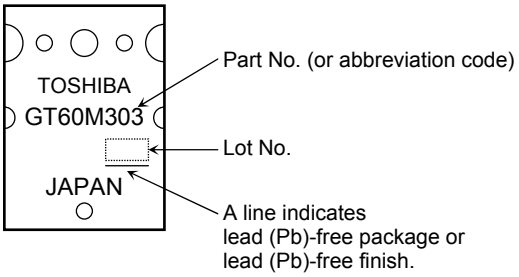
CHARACTERISTIC		SYMBOL	RATING	UNIT
Collector−Emitter Voltage		V_{CES}	900	V
Gate−Emitter Voltage		V_{GES}	±25	V
Collector Current	DC	I_C	60	A
	1ms	I_{CP}	120	
Emitter−Collector Foward Current	DC	I_{ECF}	15	A
	1ms	I_{ECFP}	120	
Collector Power Dissipation (Tc = 25°C)		P_C	170	W
Junction Temperature		T_j	150	°C
Storage Temperature Range		T_{stg}	−55~150	°C
Screw Torque		—	0.8	N·m

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).

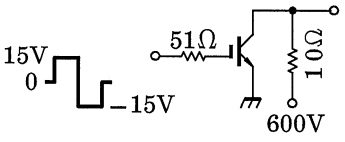
EQUIVALENT CIRCUIT



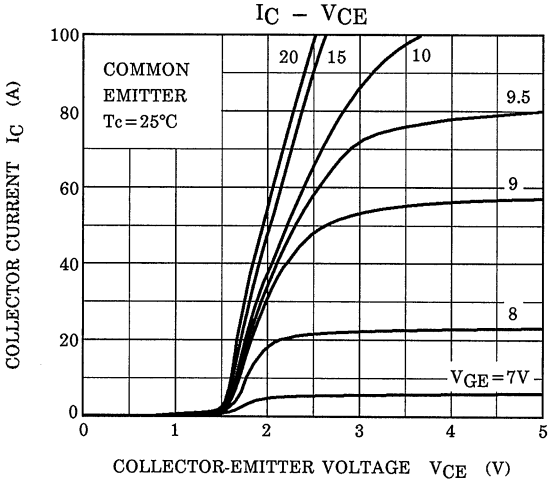
MARKING



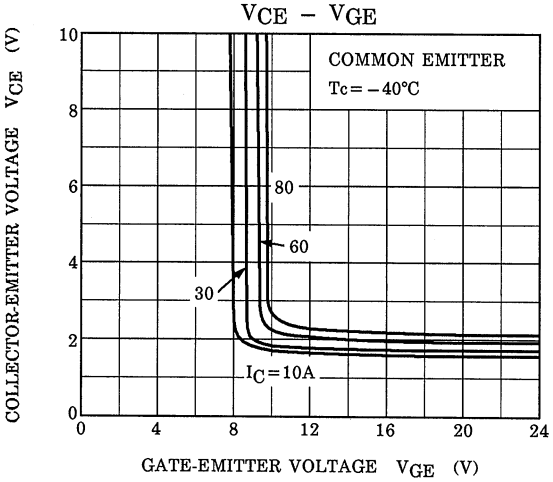
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Gate Leakage Current		I_{GES}	V_{GE} = ±25V, V_{CE} = 0	—	—	±500	nA
Collector Cut−off Current		I_{CES}	V_{CE} = 900V, V_{GE} = 0	—	—	1.0	mA
Gate−Emitter Cut−off Voltage		$V_{GE\ (OFF)}$	I_C = 60mA, V_{CE} = 5V	3.0	—	6.0	V
Collector−Emitter Saturation Voltage		$V_{CE\ (sat)\ (1)}$	I_C = 10A, V_{GE} = 15V	—	1.6	2.2	V
Collector−Emitter Saturation Voltage		$V_{CE\ (sat)\ (2)}$	I_C = 60A, V_{GE} = 15V	—	2.1	2.7	V
Input Capacitance		C_{ies}	V_{CE} = 10V, V_{GE} = 0, f = 1MHz	—	3800	—	pF
Switching Time	Rise Time	t_r		—	0.35	0.60	µs
	Turn−On Time	t_{on}		—	0.46	0.75	
	Fall Time	t_f		—	0.25	0.40	
	Turn−Off Time	t_{off}		—	0.60	0.70	
Emitter-Collector Forward Voltage		V_{ECF}	I_{EC} = 15A, V_{GE} = 0	—	1.5	2.0	V
Reverse Recovery Time		t_{rr}	I_F = 15A, V_{GE} = 0 di / dt = −20A / µs	—	0.7	2.5	µs
Thermal Resistance		$R_{th\ (j-c)}$	IGBT	—	—	0.74	°C / W
Thermal Resistance		$R_{th\ (j-c)}$	Diode	—	—	4.0	°C / W

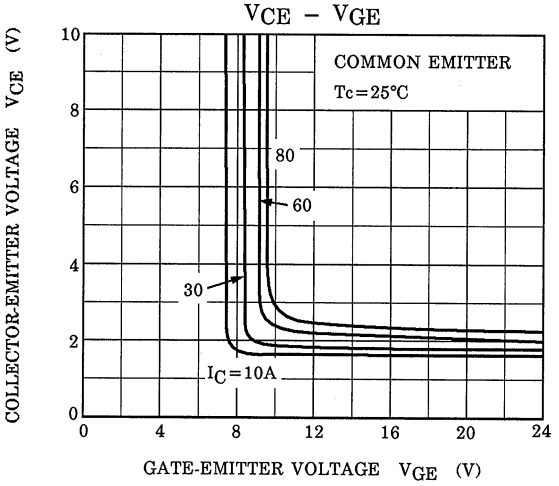
I_C – V_{CE}



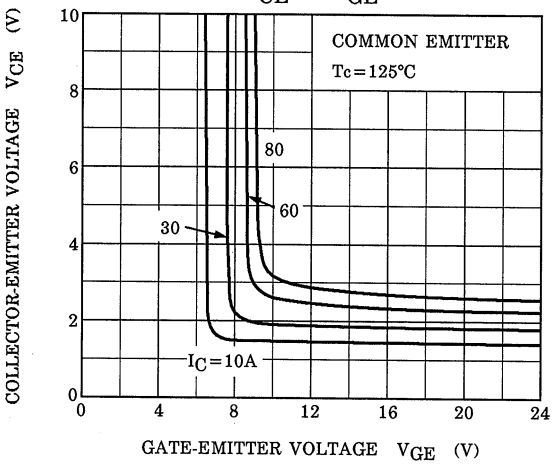
V_{CE} – V_{GE}



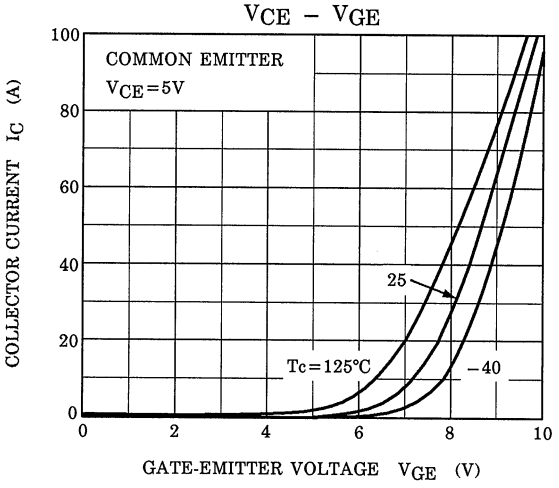
V_{CE} – V_{GE}



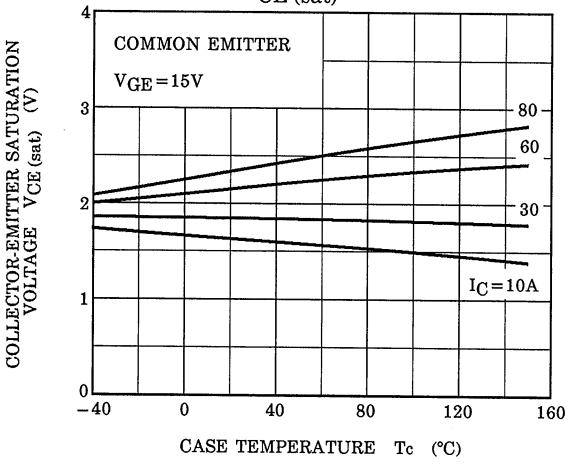
V_{CE} – V_{GE}

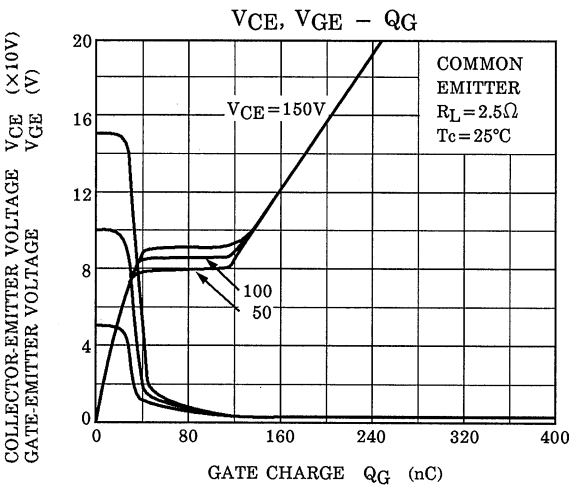


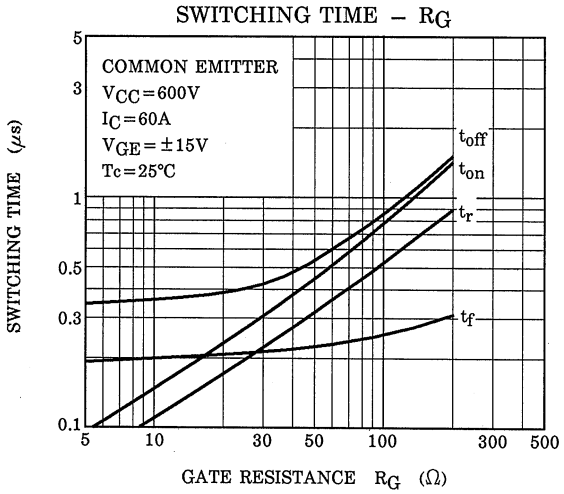
V_{CE} – V_{GE}

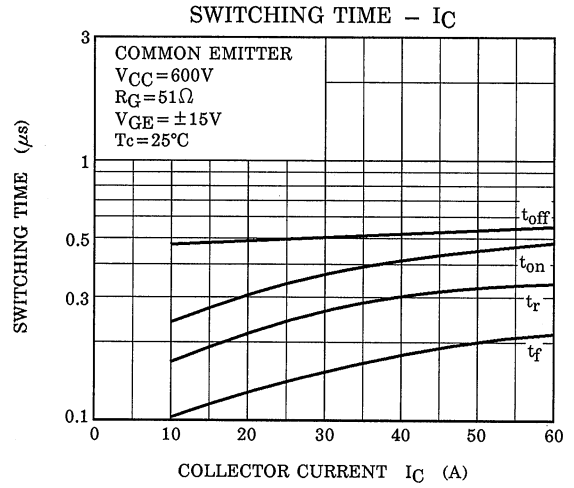


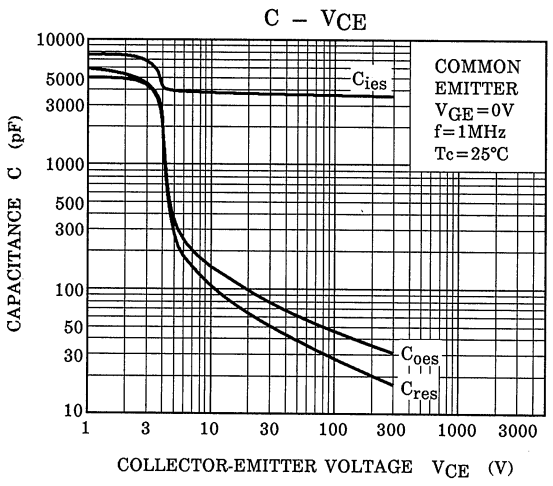
$V_{CE\,(sat)}$ – Tc

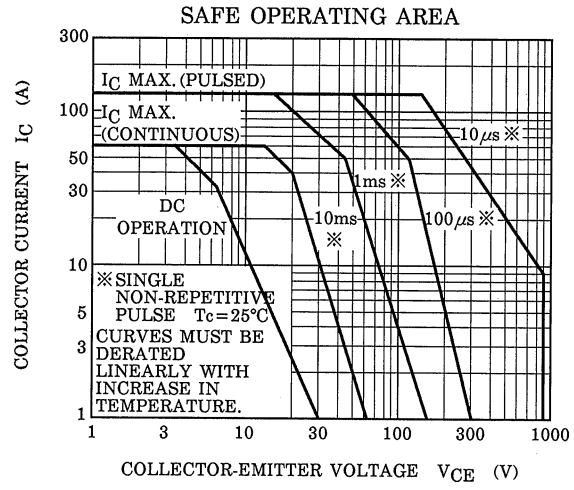


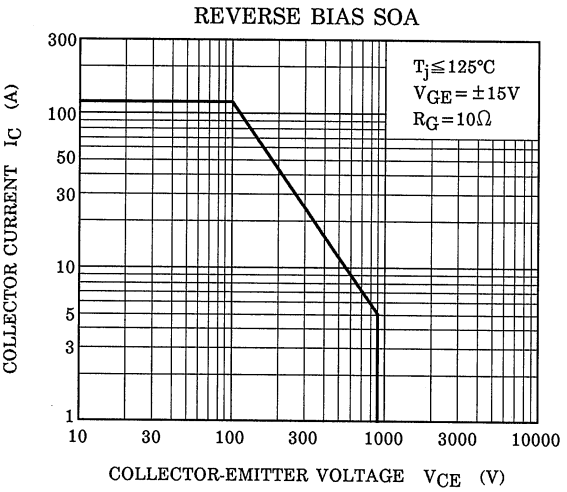

VCE, VGE – QG
COMMON EMITTER
RL=2.5Ω
Tc=25°C
VCE=150V
100
50
COLLECTOR-EMITTER VOLTAGE VCE (×10V)
GATE-EMITTER VOLTAGE VGE (V)
GATE CHARGE QG (nC)


SWITCHING TIME – RG
COMMON EMITTER
VCC=600V
IC=60A
VGE=±15V
Tc=25°C
toff
ton
tr
tf
SWITCHING TIME (μs)
GATE RESISTANCE RG (Ω)

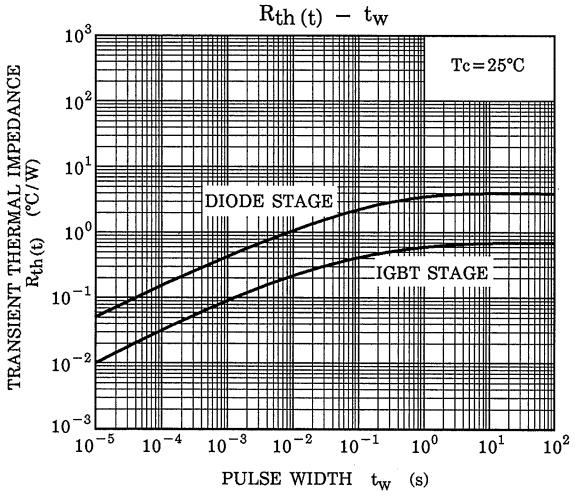

SWITCHING TIME – IC
COMMON EMITTER
VCC=600V
RG=51Ω
VGE=±15V
Tc=25°C
toff
ton
tr
tf
SWITCHING TIME (μs)
COLLECTOR CURRENT IC (A)


C – VCE
COMMON EMITTER
VGE=0V
f=1MHz
Tc=25°C
Cies
Coes
Cres
CAPACITANCE C (pF)
COLLECTOR-EMITTER VOLTAGE VCE (V)

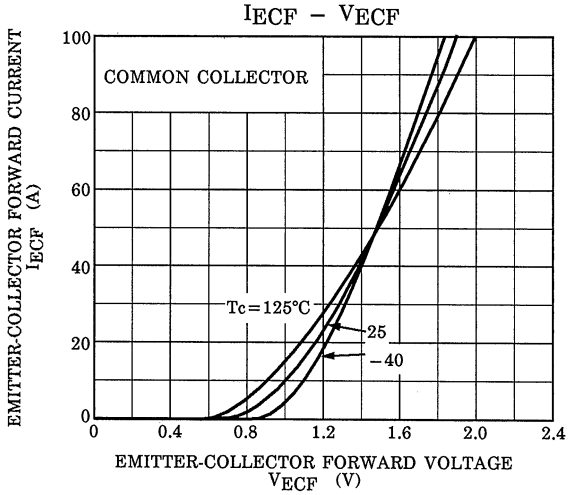

SAFE OPERATING AREA
IC MAX. (PULSED)
IC MAX. (CONTINUOUS)
DC OPERATION
10μs※
1ms※
10ms※
100μs※
※SINGLE NON-REPETITIVE PULSE Tc=25°C
CURVES MUST BE DERATED LINEARLY WITH INCREASE IN TEMPERATURE.
COLLECTOR CURRENT IC (A)
COLLECTOR-EMITTER VOLTAGE VCE (V)


REVERSE BIAS SOA
Tj≦125°C
VGE=±15V
RG=10Ω
COLLECTOR CURRENT IC (A)
COLLECTOR-EMITTER VOLTAGE VCE (V)

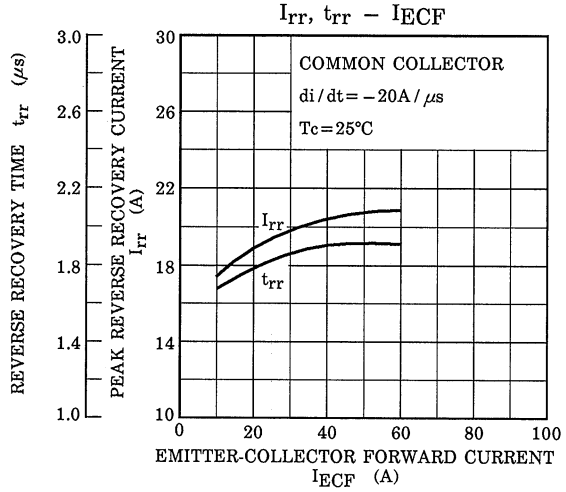
$R_{th}(t) - t_w$



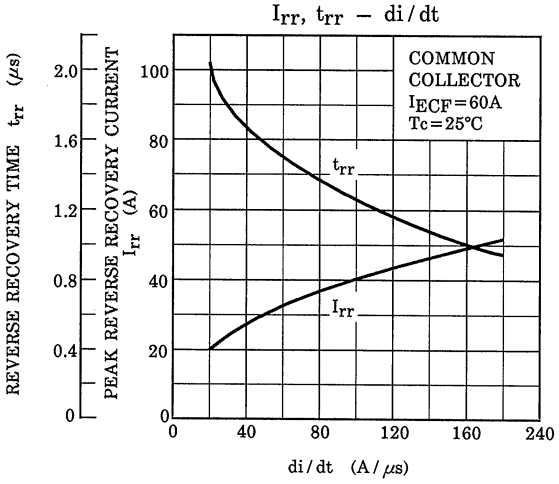
$I_{ECF} - V_{ECF}$



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



$I_{rr}, t_{rr} - di/dt$



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20070701-EN

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