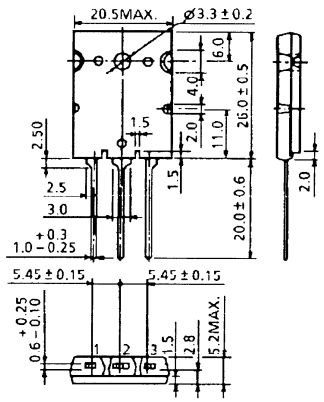
TOSHIBA Insulated Gate Bipolar Transistor Silicon N Channel IGBT

GT40T301

Parallel Resonance Inverter Switching Applications

Unit: mm



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

JEDEC	—
JEITA	—
TOSHIBA	2-21F2C

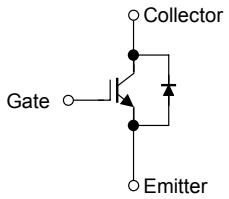
Weight: 9.75 g (typ.)

- FRD included between emitter and collector
- Enhancement mode type
- High speed IGBT : t_f = 0.25 μs (typ.) (I_C = 40 A)
  FRD : t_{rr} = 0.7 μs (typ.) (di/dt = −20 A/μs)
- Low saturation voltage: $V_{CE\ (sat)}$ = 3.7 V (typ.) (I_C = 40 A)

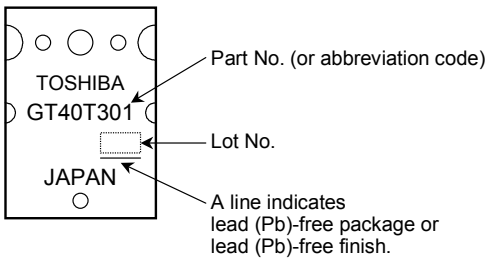
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CES}	1500	V
Gate-emitter voltage		V_{GES}	±25	V
Collector current	DC	I_C	40	A
	1 ms	I_{CP}	80	
Emitter-collector forward current	DC	I_{ECF}	30	A
	1 ms	I_{ECPF}	80	
Collector power dissipation (Tc = 25°C)		P_C	200	W
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55~150	°C

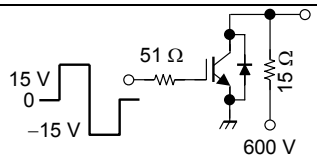
Equivalent Circuit

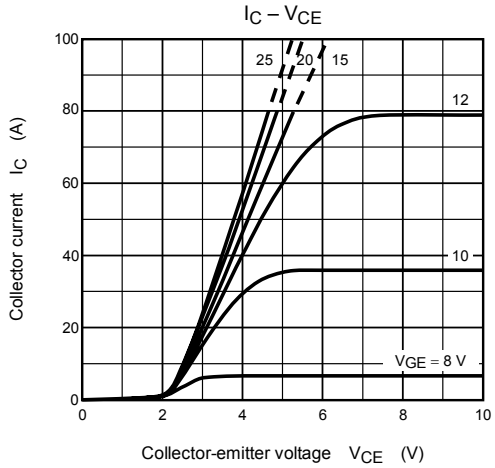


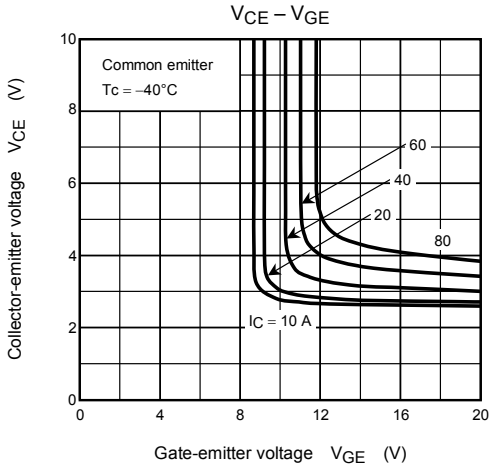
Marking

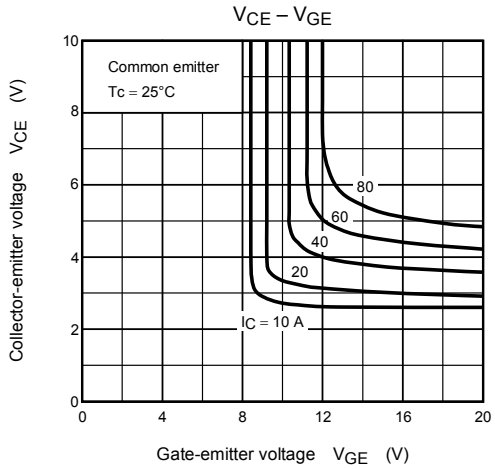


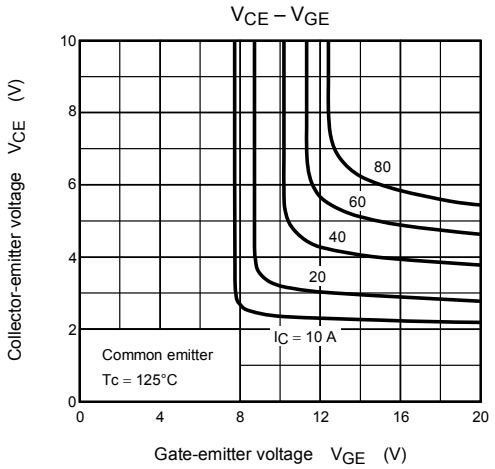
Electrical Characteristics (Ta = 25°C)

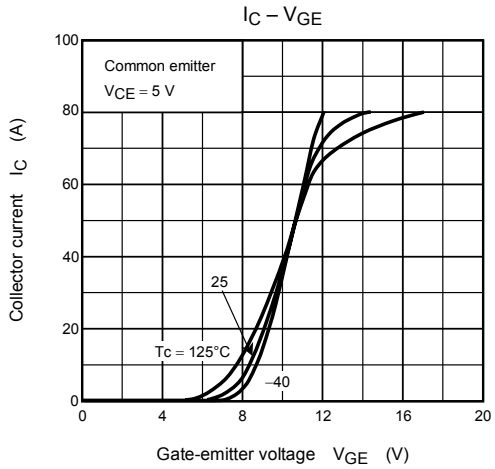
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GES}	V_{GE} = ±25 V, V_{CE} = 0	—	—	±500	nA
Collector cut-off current		I_{CES}	V_{CE} = 1500 V, V_{GE} = 0	—	—	1.0	mA
Gate-emitter cut-off voltage		$V_{GE\ (OFF)}$	I_C = 40 mA, V_{CE} = 5 V	4.0	—	7.0	V
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_C = 40 A, V_{GE} = 15 V	—	3.7	5.0	V
Input capacitance		C_{ies}	V_{CE} = 10 V, V_{GE} = 0, f = 1 MHz	—	2900	—	pF
Switching time	Rise time	t_r		—	0.40	—	μs
	Turn-on time	t_{on}		—	0.45	—	
	Fall time	t_f		—	0.23	0.40	
	Turn-off time	t_{off}		—	0.6	—	
Emitter-collector forward voltage		V_{ECF}	I_{ECF} = 30 A, V_{GE} = 0	—	1.9	2.5	V
Reverse recovery time		t_{rr}	I_{ECF} = 30 A, V_{GE} = 0, di/dt = −20 A/μs	—	0.7	3.0	μs
Thermal resistance		$R_{th\ (j-c)}$	IGBT	—	—	0.625	°C/W
			Diode	—	—	1.25	

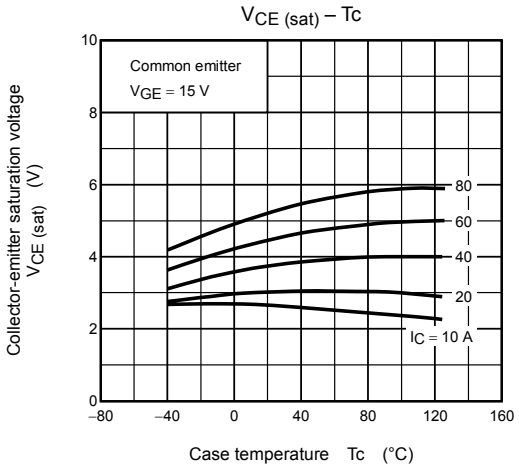

IC – VCE
Collector current IC (A)
Collector-emitter voltage VCE (V)
25
20
15
12
10
VGE = 8 V


VCE – VGE
Common emitter
Tc = –40°C
Collector-emitter voltage VCE (V)
Gate-emitter voltage VGE (V)
60
40
20
80
IC = 10 A

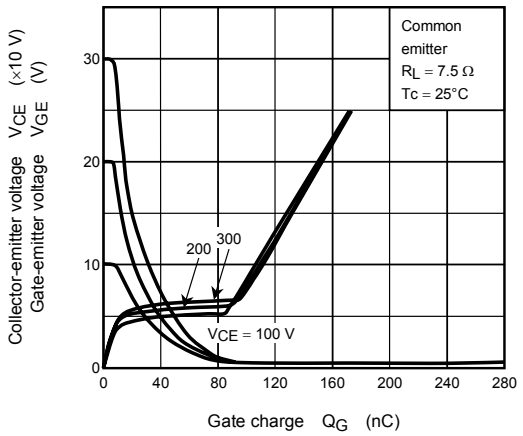

VCE – VGE
Common emitter
Tc = 25°C
Collector-emitter voltage VCE (V)
Gate-emitter voltage VGE (V)
80
60
40
20
IC = 10 A


VCE – VGE
Collector-emitter voltage VCE (V)
Gate-emitter voltage VGE (V)
80
60
40
20
IC = 10 A
Common emitter
Tc = 125°C

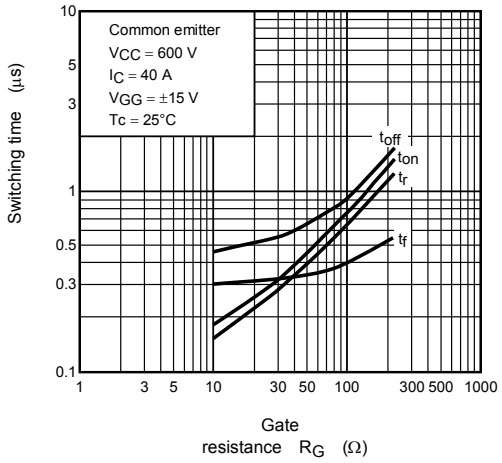

IC – VGE
Common emitter
VCE = 5 V
Collector current IC (A)
Gate-emitter voltage VGE (V)
25
Tc = 125°C
–40


VCE (sat) – Tc
Common emitter
VGE = 15 V
Collector-emitter saturation voltage VCE (sat) (V)
Case temperature Tc (°C)
80
60
40
20
IC = 10 A

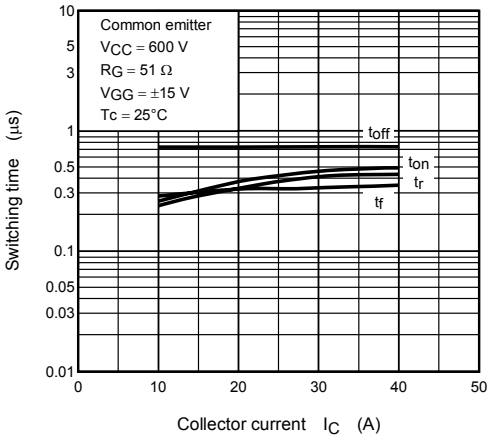
V_{CE}, V_{GE} – Q_G



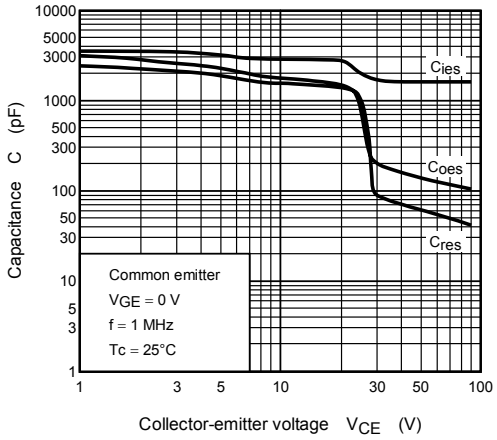
Switching time – R_G



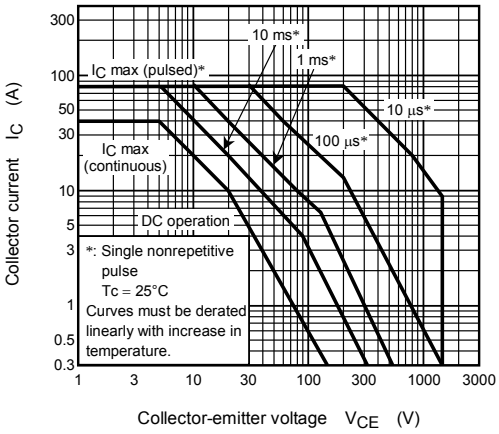
Switching time – I_C



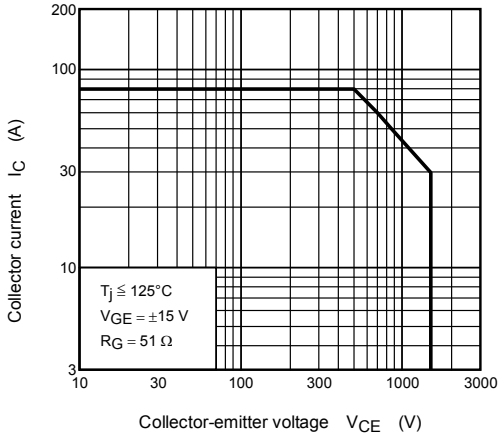
C – V_{CE}

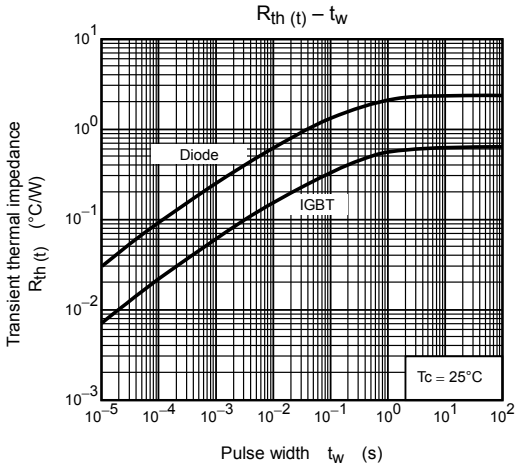


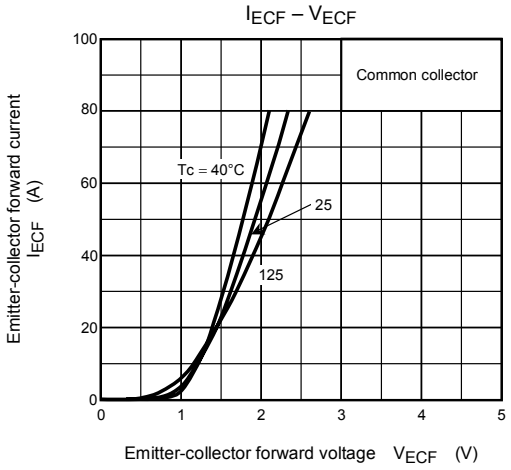
Safe operating area

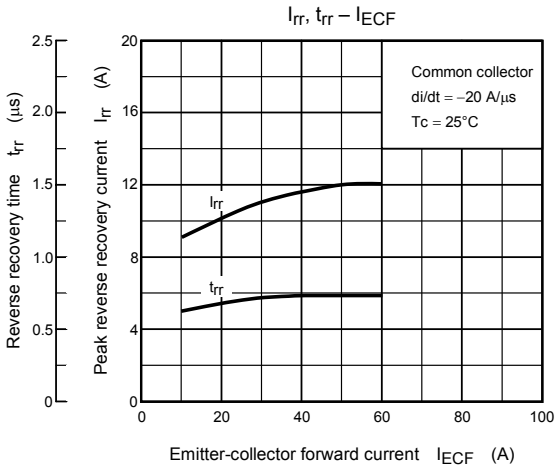


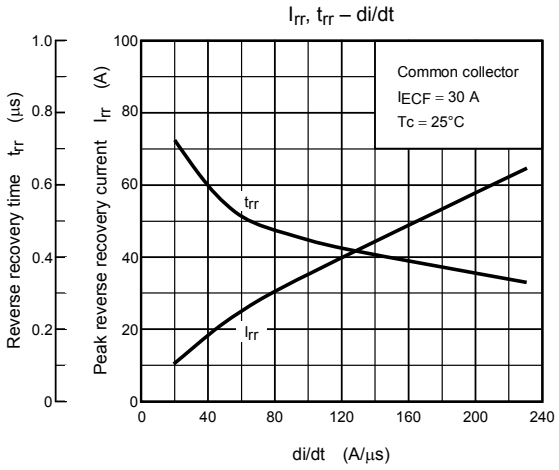
Reverse bias SOA




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


$I_{ECF} - V_{ECF}$
Common collector
Tc = 40°C
25
125
Emitter-collector forward current I_{ECF} (A)
Emitter-collector forward voltage V_{ECF} (V)


I_{rr}, t_{rr} – I_{ECF}
Common collector
di/dt = −20 A/μs
Tc = 25°C
I_{rr}
t_{rr}
Reverse recovery time t_{rr} (μs)
Peak reverse recovery current I_{rr} (A)
Emitter-collector forward current I_{ECF} (A)


I_{rr}, t_{rr} – di/dt
Common collector
I_{ECF} = 30 A
Tc = 25°C
t_{rr}
I_{rr}
Reverse recovery time t_{rr} (μs)
Peak reverse recovery current I_{rr} (A)
di/dt (A/μs)

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