TOSHIBA GTR MODULE SILICON N CHANNEL IGBT

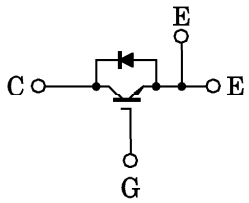
MG400J1US51

HIGH POWER SWITCHING APPLICATIONS.

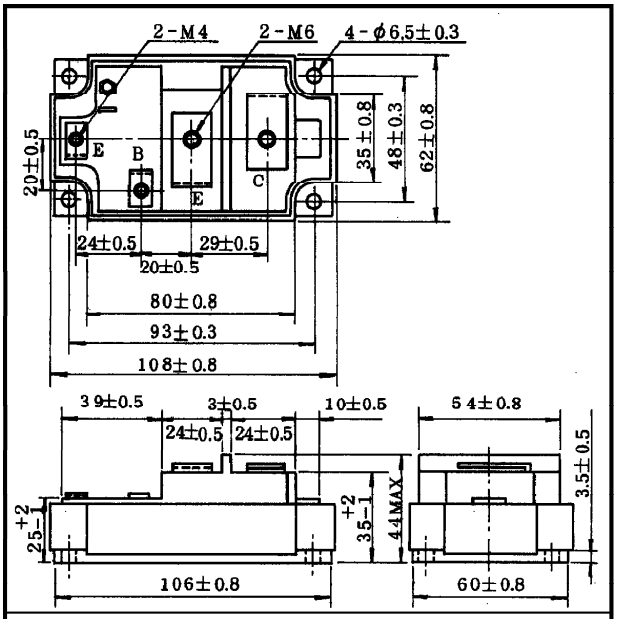
MOTOR CONTROL APPLICATIONS.

- The Electrodes are Isolated from Case.
- High Input Impedance
- Includes a Complete Half Bridge in One Package.
- Enhancement-Mode
- High Speed : $t_f = 0.30\mu s$ (Max.) ($I_C = 400A$)
  $t_{rr} = 0.15\mu s$ (Max.) ($I_F = 400A$)
- Low Saturation Voltage
  : $V_{CE\,(sat)} = 2.70V$ (Max.) ($I_C = 400A$)

EQUIVALENT CIRCUIT



Unit in mm



JEDEC	—
EIAJ	—
TOSHIBA	2-109A4A

Weight : 465g (Typ.)

MAXIMUM RATINGS (Ta = 25°C)

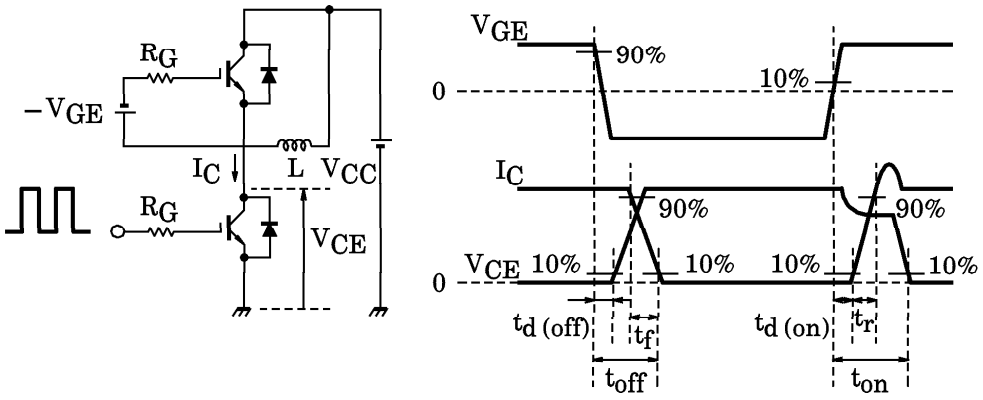
CHARACTERISTIC		SYMBOL	RATING	UNIT
Collector-Emitter Voltage		V_{CES}	600	V
Gate-Emitter Voltage		V_{GES}	±20	V
Collector Current	DC	I_C	400	A
	1ms	I_{CP}	800	
Forward Current	DC	I_F	400	A
	1ms	I_{FM}	800	
Collector Power Dissipation (Tc = 25°C)		P_C	1500	W
Junction Temperature		T_j	150	°C
Storage Temperature Range		T_{stg}	−40~125	°C
Isolation Voltage		V_{Isol}	2500 (AC 1 min.)	V
Screw Torque (Terminal / M4 / M6 / Mounting)		—	2 / 3 / 3	N·m

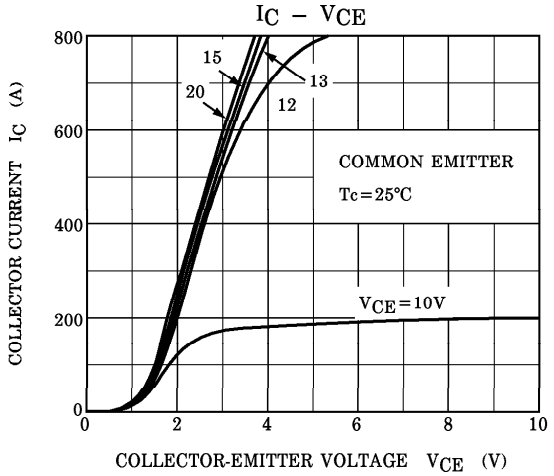
961001EAA2

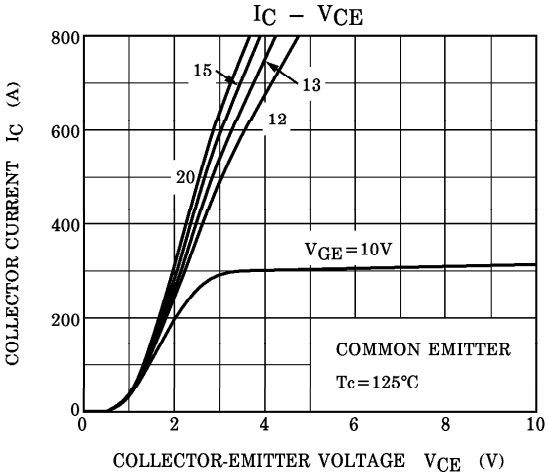
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

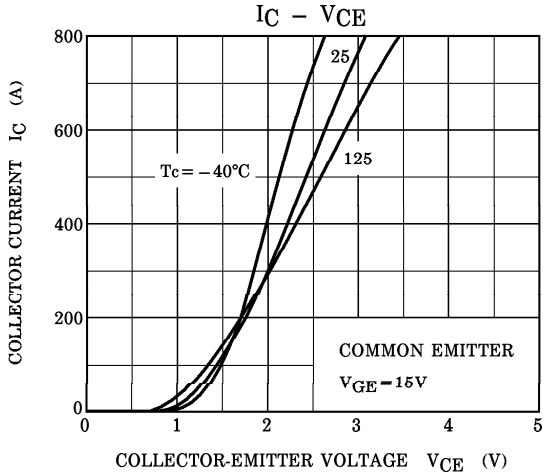
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GES}	$V_{GE} = \pm 20V$, $V_{CE} = 0$	—	—	±500	nA
Collector Cut-off Current		I_{CES}	$V_{CE} = 600V$, $V_{GE} = 0$	—	—	4.0	mA
Gate-Emitter Cut-off Voltage		$V_{GE\ (off)}$	$I_C = 40mA$, $V_{CE} = 5V$	5.0	7.0	8.0	V
Collector-Emitter Saturation Voltage		$V_{CE\ (sat)}$	$I_C = 400A$, $V_{GE} = 15V$	—	2.10	2.70	V
Input Capacitance		C_{ies}	$V_{CE} = 10V$, $V_{GE} = 0$, f = 1MHz	—	36000	—	pF
Switching Time	Turn-on Delay Time	$t_{d\ (on)}$	Inductive Load $V_{CC} = 300V$ $I_C = 400A$ $V_{GE} = \pm 15V$ $R_G = 2\Omega$ (Note 1)	—	0.20	0.40	μs
	Rise Time	t_r		—	0.15	0.30	
	Turn-on Time	t_{on}		—	0.60	1.20	
	Turn-off Delay Time	$t_{d\ (off)}$		—	0.20	0.40	
	Fall Time	t_f		—	0.15	0.30	
	Turn-off Time	t_{off}		—	0.50	1.00	
Forward Voltage		V_F	$I_F = 400A$, $V_{GE} = 0$	—	2.30	3.00	V
Reverse Recovery Time		t_{rr}	$I_F = 400A$, $V_{GE} = -10V$ $di/dt = 400A/\mu s$	—	0.08	0.15	μs
Thermal Resistance		$R_{th\ (j-c)}$	Transistor Stage	—	—	0.083	°C / W
			Diode Stage	—	—	0.20	

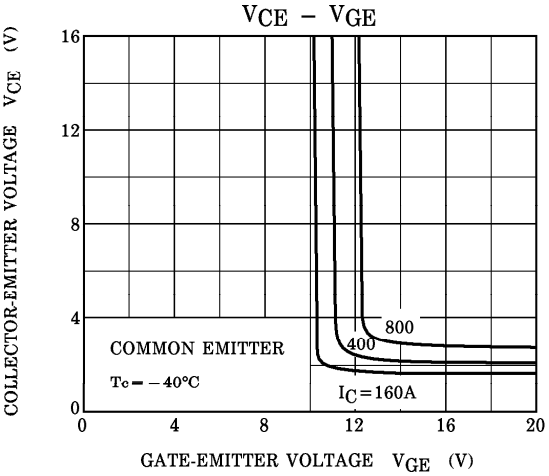
Note 1 Switching Time Test Circuit & Timing Chart

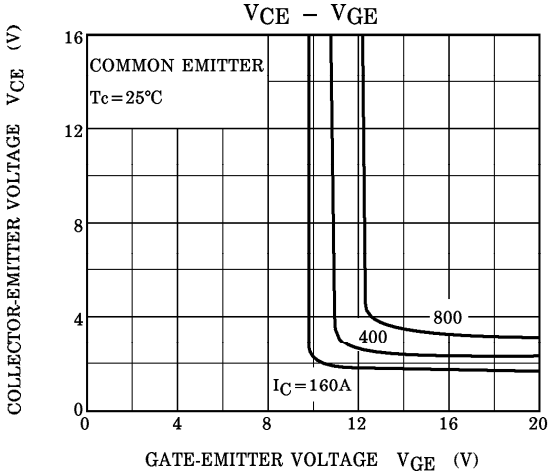


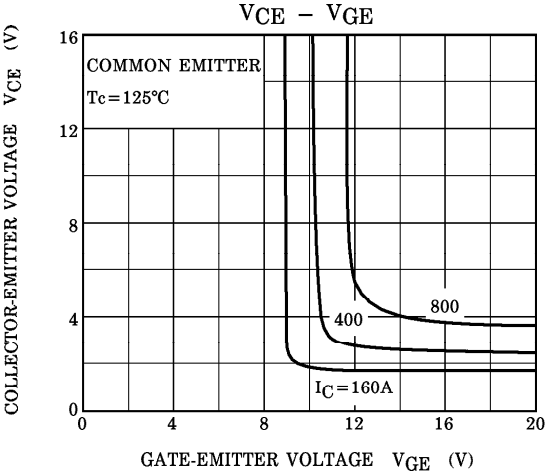

I_C – V_{CE}
COLLECTOR CURRENT I_C (A)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)
COMMON EMITTER
Tc = 25°C
V_{CE} = 10V
15
20
13
12
0
200
400
600
800
0
2
4
6
8
10


I_C – V_{CE}
COLLECTOR CURRENT I_C (A)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)
COMMON EMITTER
Tc = 125°C
V_{GE} = 10V
15
13
12
20
0
200
400
600
800
0
2
4
6
8
10

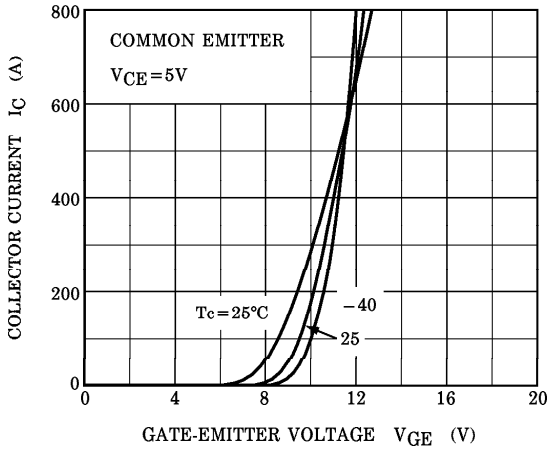

I_C – V_{CE}
COLLECTOR CURRENT I_C (A)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)
COMMON EMITTER
V_{GE} = 15V
Tc = −40°C
25
125
0
200
400
600
800
0
1
2
3
4
5


V_{CE} – V_{GE}
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)
GATE-EMITTER VOLTAGE V_{GE} (V)
COMMON EMITTER
Tc = −40°C
I_C = 160A
800
400
0
4
8
12
16
0
4
8
12
16
20

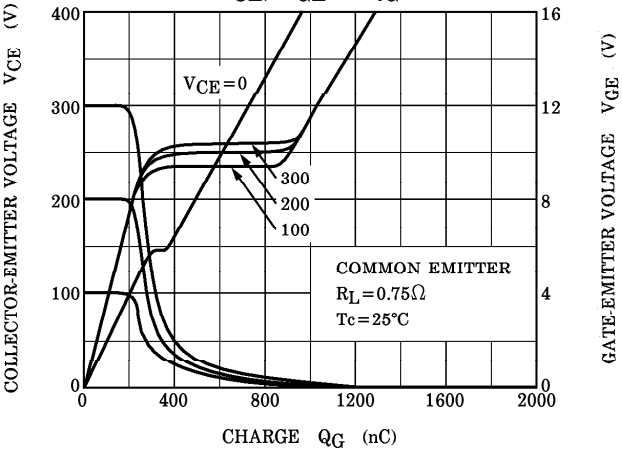

V_{CE} – V_{GE}
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)
GATE-EMITTER VOLTAGE V_{GE} (V)
COMMON EMITTER
Tc = 25°C
I_C = 160A
800
400
0
4
8
12
16
0
4
8
12
16
20


V_{CE} – V_{GE}
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)
GATE-EMITTER VOLTAGE V_{GE} (V)
COMMON EMITTER
Tc = 125°C
I_C = 160A
800
400
0
4
8
12
16
0
4
8
12
16
20

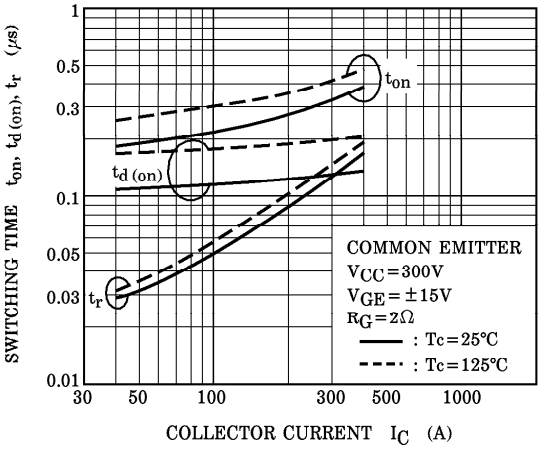
I_C – V_{GE}



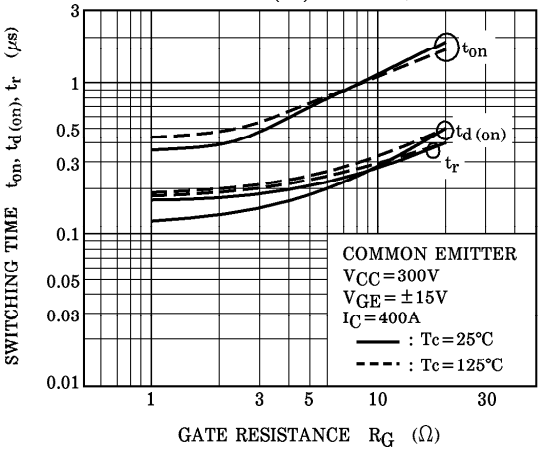
V_{CE}, V_{GE} – Q_G



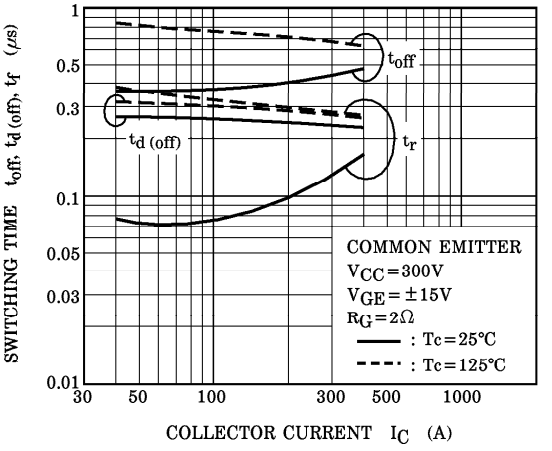
t_{on}, $t_{d\,(on)}$, t_r – I_C



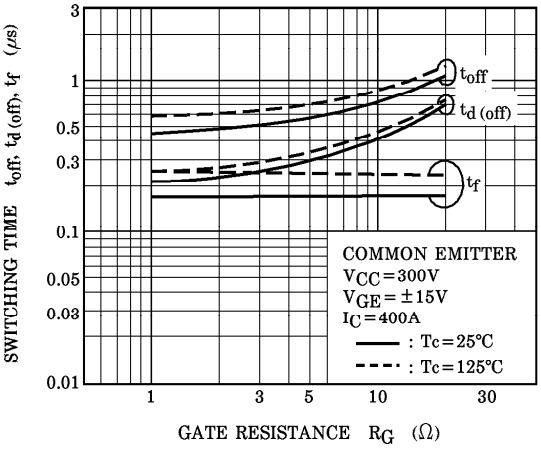
t_{on}, $t_{d\,(on)}$, t_r – R_G



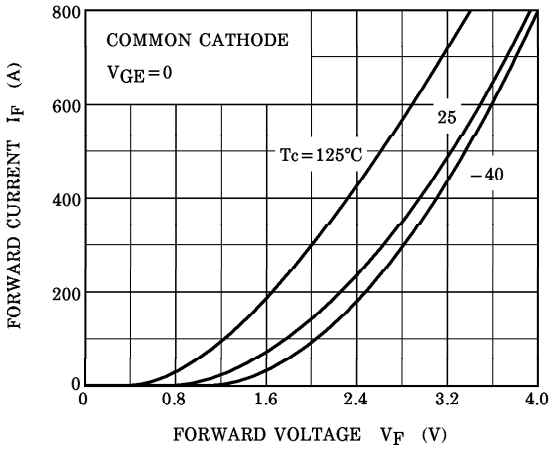
t_{off}, $t_{d\,(off)}$, t_f – I_C



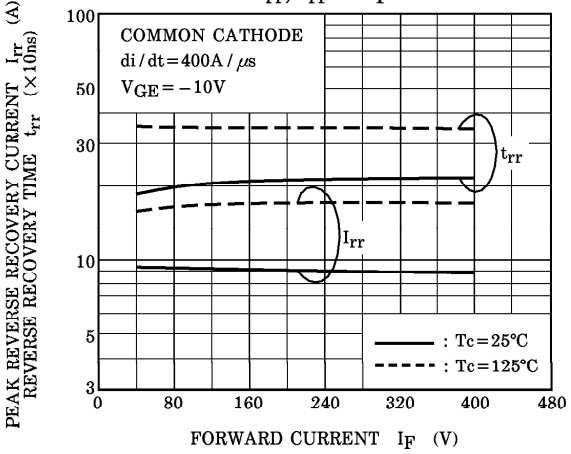
t_{off}, $t_{d\,(off)}$, t_f – R_G



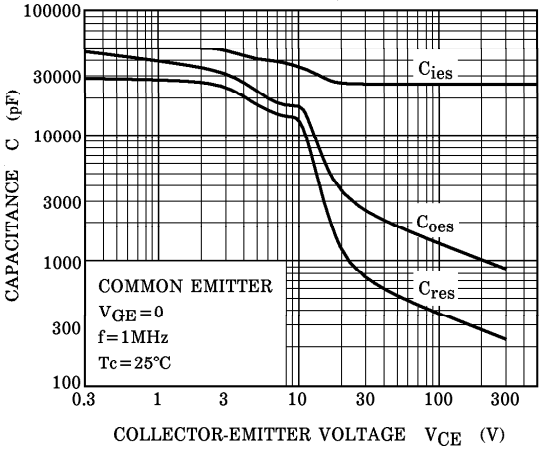
$I_F - V_F$



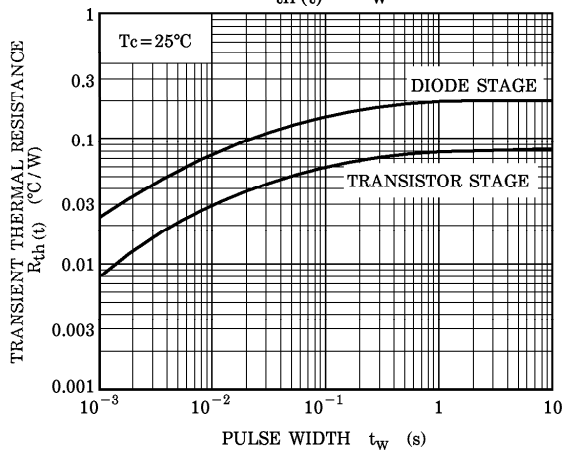
$t_{rr}, I_{rr} - I_F$



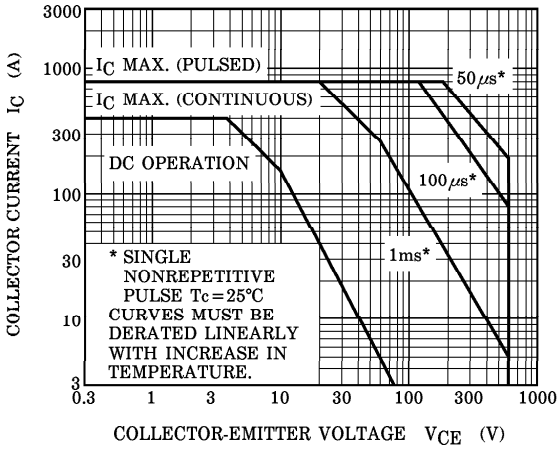
$C - V_{CE}$



$R_{th\,(t)} - t_w$



SAFE OPERATING AREA



REVERSE BIAS SOA