

TOSHIBA INTEGRATED IGBT MODULE SILICON N CHANNEL IGBT

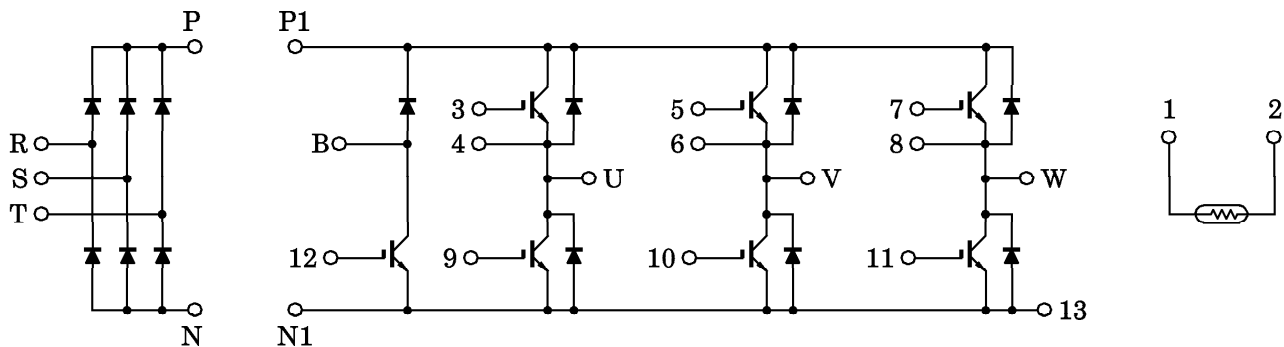
MIG50J906H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Converter and Brake Power Circuits and Thermistor in One Package.
- Output (Inverter Stage) : 3 ϕ 50 A / 600 V IGBT
- Input (Converter Stage) : 3 ϕ 30 A / 800 V Silicon Rectifier
- The Electrodes are Isolated from Case.
- Outline
MIG50J906H : 2-108E5A
- Weight : 190 g

EQUIVALENT CIRCUIT

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Unit : mm

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MAXIMUM RATINGS (Ta = 25°C)

STAGE		CHARACTERISTIC		SYMBOL	RATING	UNIT	
Inverter		Collector-Emitter Voltage		V _{CES}	600	V	(25°C / 40°C) (25°C / 40°C)
		Gate-Emitter Voltage		V _{GES}	±20	V	
		Collector Current	DC	I _C	75 / 50	A	
			1 ms	I _{CP}	150 / 100	A	
		Forward Current	DC	I _F	50	A	
			1 ms	I _{FM}	100	A	
Collector Power Dissipation (T _c = 25°C)		P _C	200	W			
Converter		Repetitive Peak Reverse Voltage		V _R RM	800	V	(25°C / 40°C) (25°C / 40°C)
		Average Output Rectified Current		I _O	30	A	
		Peak One Cycle Surge Forward Current (50Hz, Non-Repetitive)		I _F SM	400	A	
Brake	IGBT	Collector-Emitter Voltage		V _{CES}	600	V	
		Gate-Emitter Voltage		V _{GES}	±20	V	
		Collector Current	DC	I _C	75 / 50	A	
			1 ms	I _{CP}	150 / 100	A	
		Collector Power Dissipation (T _c = 25°C)		P _C	200	W	
	FWD	Reverse Voltage		V _R	600	V	
		Forward Current	DC	I _F	50	A	
			1 ms	I _{FM}	100	A	
Module		Junction Temperature		T _j	150	°C	
		Storage Temperature Range		T _{stg}	−40~125	°C	
		Isolation Voltage		V _{Isol}	2500 (AC 1 minute)	V	
		Screw Torque		—	6	N·m	

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

a. Inverter stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GES}	$V_{GE} = \pm 20\text{ V}$, $V_{CE} = 0$	—	—	± 500	nA
Collector Cut-Off Current		I_{CES}	$V_{CE} = 600\text{ V}$, $V_{GE} = 0$	—	—	1.0	mA
Gate-Emitter Cut-Off Voltage		$V_{GE}(\text{off})$	$I_C = 5\text{ mA}$, $V_{CE} = 5\text{ V}$	5.0	—	8.0	V
Collector-Emitter Saturation Voltage		$V_{CE}(\text{sat})$	$I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$	—	2.1	2.7	V
			$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	—	2.2	2.8	
Input Capacitance		C_{ies}	$V_{CE} = 10\text{ V}$, $V_{GE} = 0$, $f = 1\text{ MHz}$	—	4800	—	pF
Switching Time	Rise Time	t_r	$V_{CC} = 300\text{ V}$ $I_C = 50\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 24\ \Omega$ (Note 1)	—	0.13	0.20	μs
	Turn-On Time	t_{on}		—	0.30	0.50	
	Fall Time	t_f		—	0.15	0.30	
	Turn-Off Time	t_{off}		—	0.50	0.80	
Forward Voltage		V_F	$I_F = 50\text{ A}$, $V_{GE} = 0$	—	2.3	3.0	V
Reverse Recovery Time		t_{rr}	$I_F = 50\text{ A}$, $V_{GE} = -10\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$	—	0.08	0.15	μs
Thermal Resistance		$R_{th(j-c)}$	Transistor	—	—	0.6	$^\circ\text{C}/\text{W}$
			Diode	—	—	1.5	

b. Converter stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Repetitive Peak Reverse Current		I_{RRM}	$V_{RRM} = 800\text{ V}$	—	—	50	μA
Peak Forward Voltage		V_{FM}	$I_{FM} = 30\text{ A}$	—	1.05	1.20	V
Peak One Cycle Surge Forward Current		I_{FSM}	50 Hz sine-half-wave	400	—	—	A
Thermal Resistance		$R_{th(j-c)}$	—	—	—	1.56	$^\circ\text{C}/\text{W}$

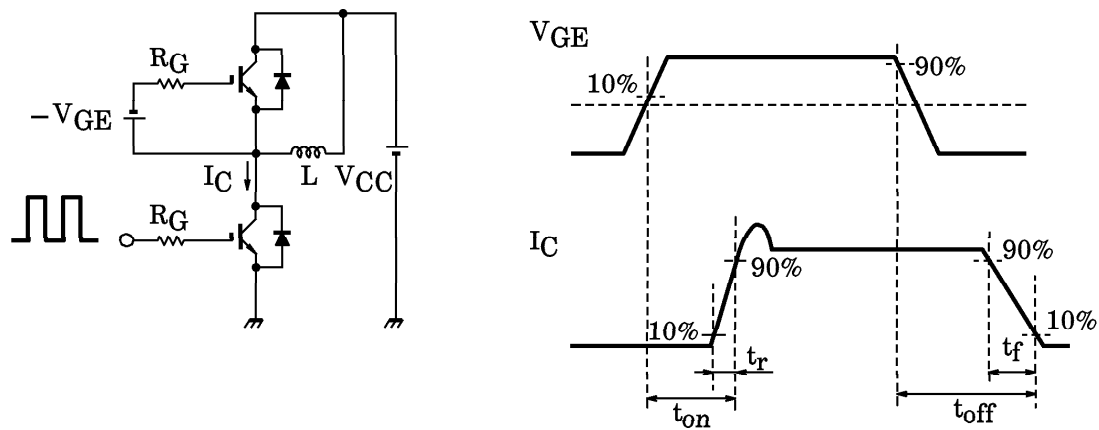
c. Brake stage

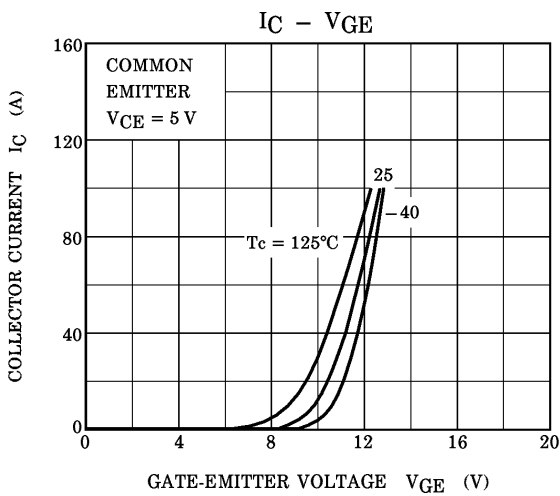
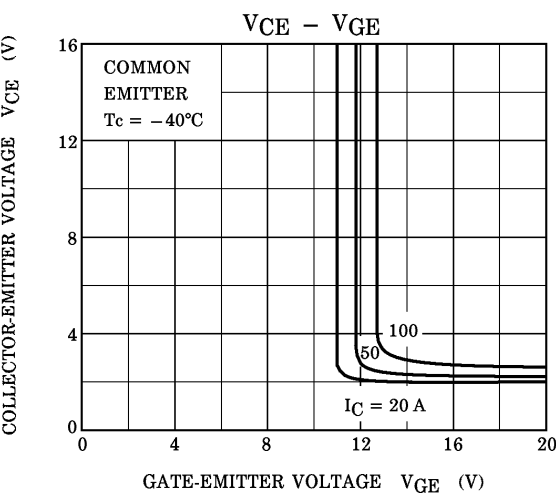
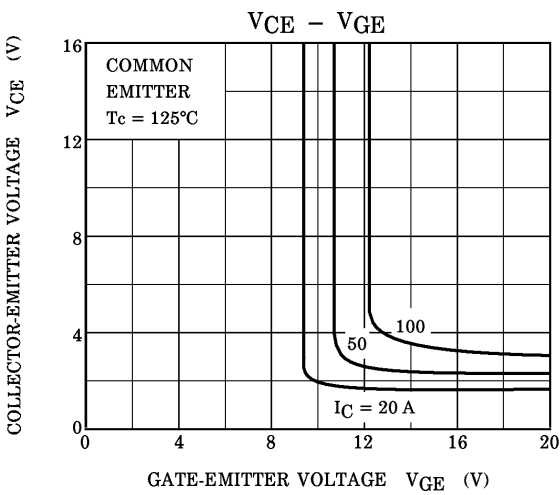
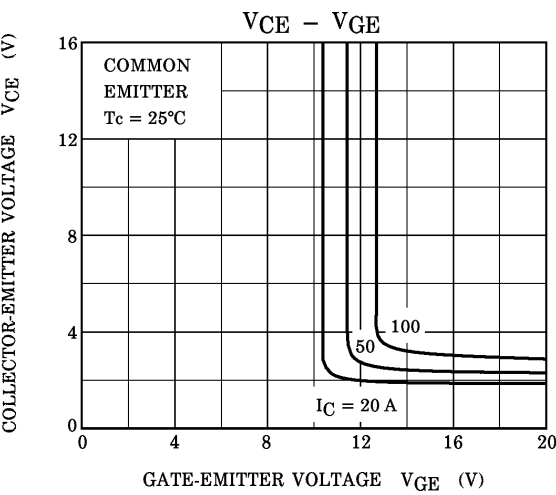
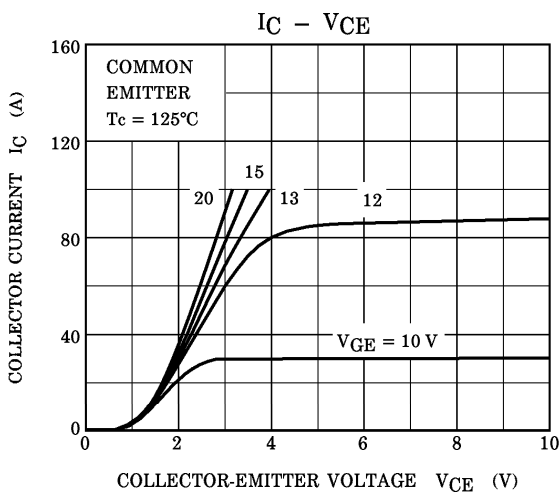
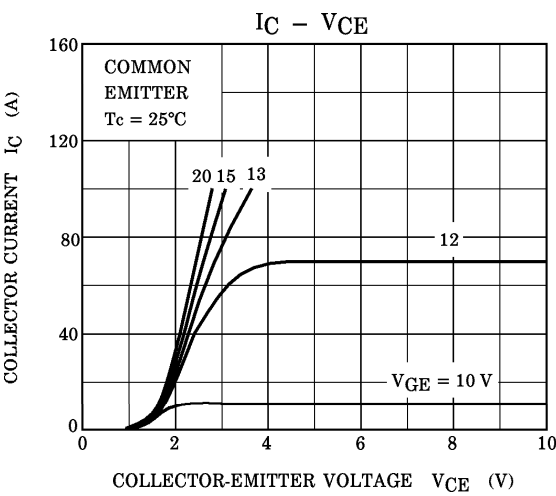
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GES}	$V_{GE} = \pm 20\text{ V}, V_{CE} = 0$	—	—	± 500	nA
Collector Cut-Off Current		I_{CES}	$V_{CE} = 600\text{ V}, V_{GE} = 0$	—	—	1.0	mA
Reverse Current		I_R	$V_R = 600\text{ V}$	—	—	1.0	mA
Gate-Emitter Cut-Off Voltage		$V_{GE}(\text{off})$	$I_C = 5\text{ mA}, V_{CE} = 5\text{ V}$	5.0	—	8.0	V
Collector-Emitter Saturation Voltage		$V_{CE}(\text{sat})$	$I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$	—	2.1	2.7	V
			$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	—	2.2	2.8	
Input Capacitance		C_{ies}	$V_{CE} = 10\text{ V}, V_{GE} = 0,$ $f = 1\text{ MHz}$	—	4800	—	pF
Switching Time	Rise Time	t_r	$V_{CC} = 600\text{ V}$ $I_C = 50\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 24\ \Omega$ (Note 1)	—	0.13	0.20	μs
	Turn-On Time	t_{on}		—	0.30	0.50	
	Fall Time	t_f		—	0.15	0.30	
	Turn-Off Time	t_{off}		—	0.50	0.80	
Forward Voltage		V_F	$I_F = 50\text{ A}, V_{GE} = 0$	—	2.3	3.0	V
Thermal Resistance		$R_{th(j-c)}$	Transistor	—	—	0.6	$^\circ\text{C/W}$
			Diode	—	—	1.5	

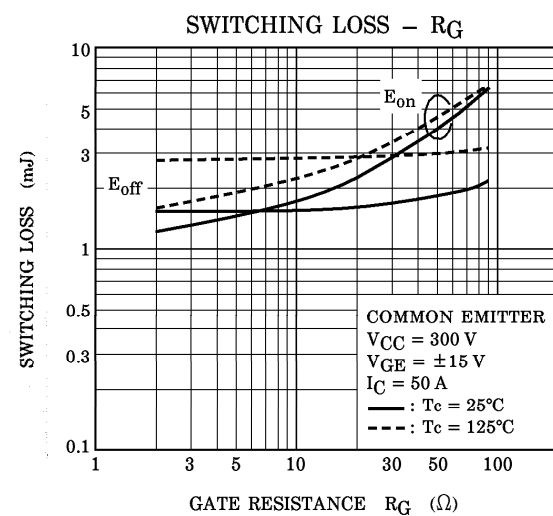
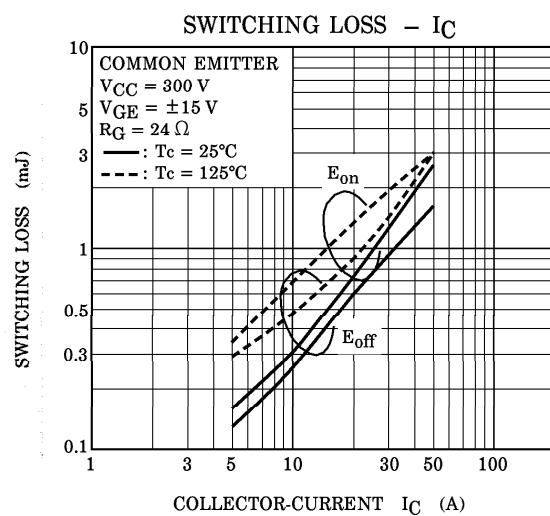
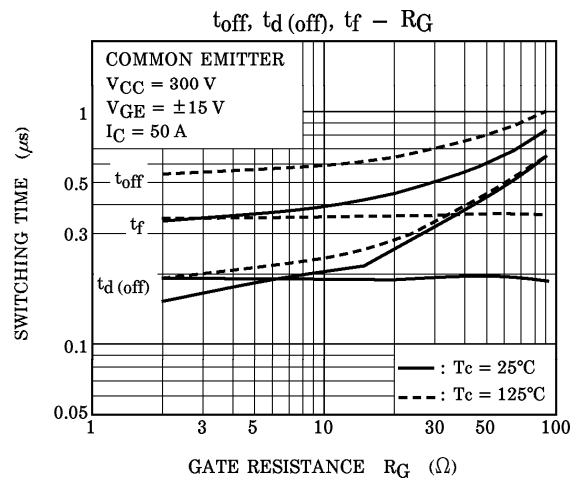
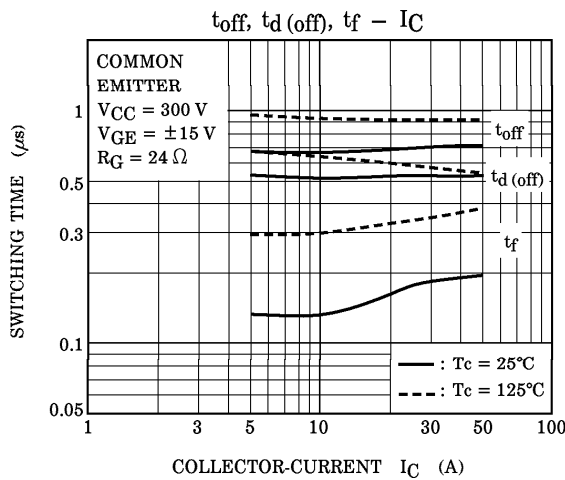
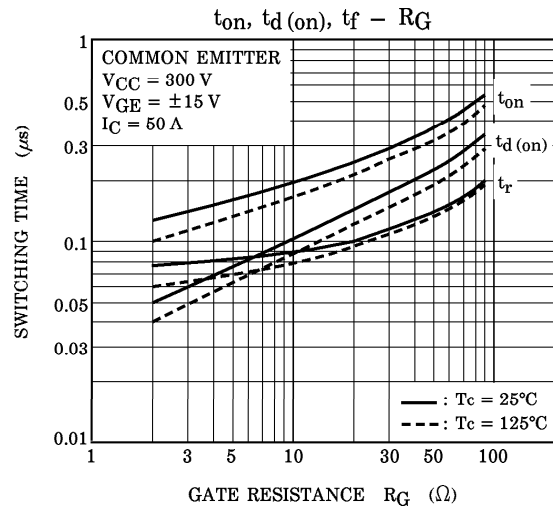
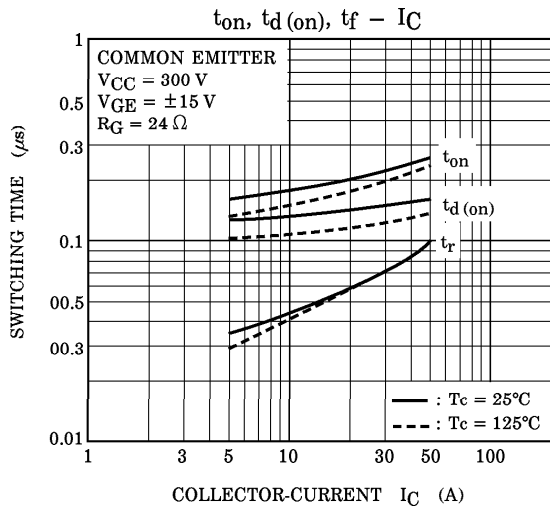
d. Thermistor

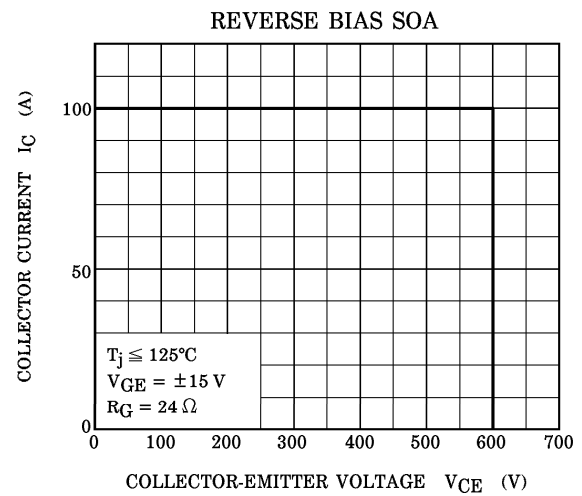
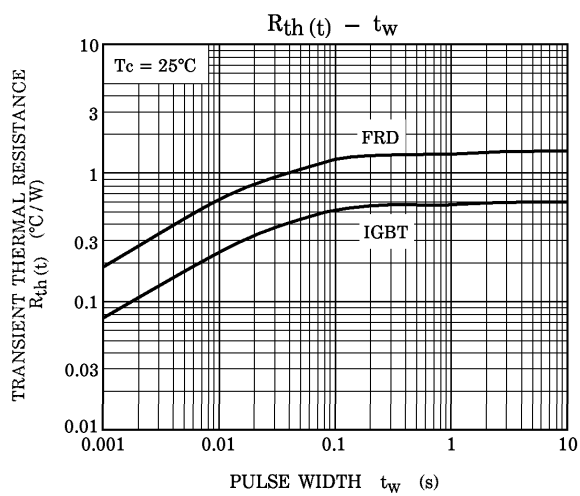
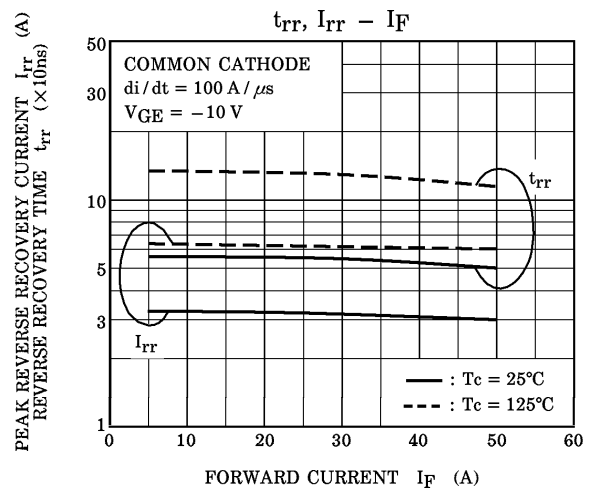
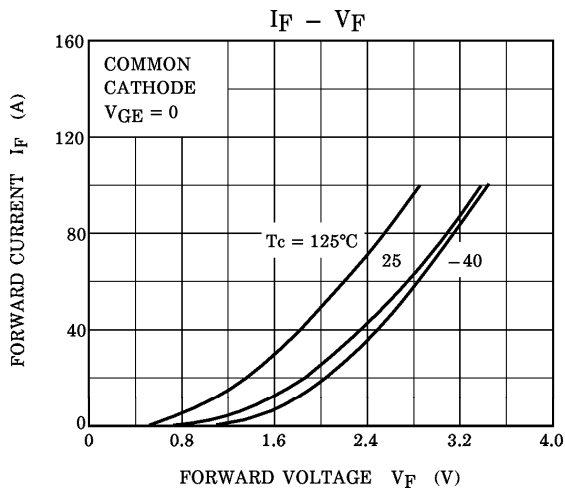
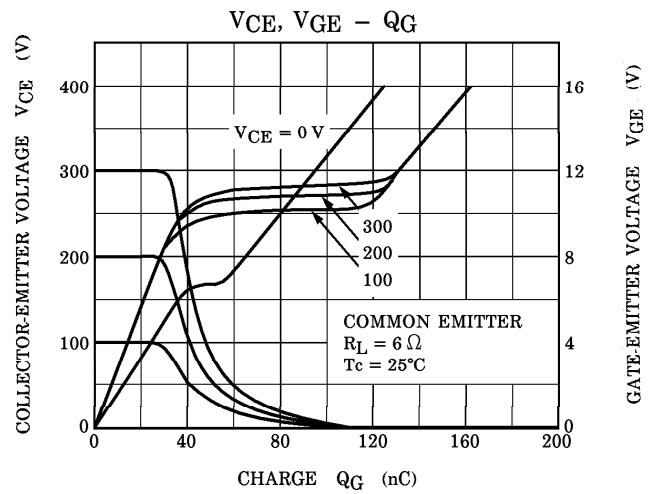
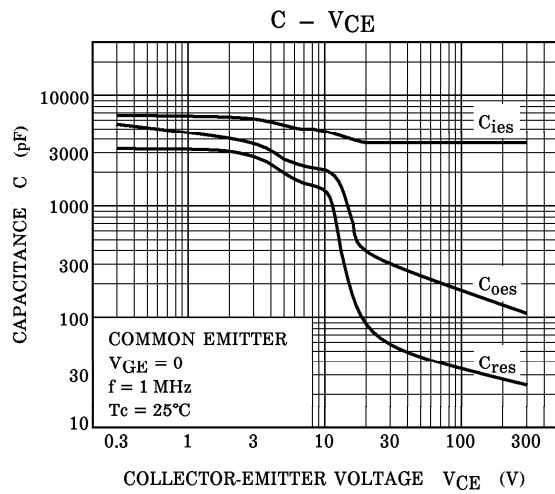
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Zero-power Resistance	R_{25}	$I_{TM} = 0.2\text{ mA}, T_c = 25^\circ\text{C}$	17.31	20	23.14	$\text{k}\Omega$
B Value	$B_{25/85}$	$T_c = 25^\circ\text{C} / T_c = 85^\circ\text{C}$	—	3760	—	K

(Note 1) : Switching Time Test Circuit & Timing Chart









b. Converter stage

