

TOSHIBA INTEGRATED IGBT MODULE SILICON N CHANNEL IGBT

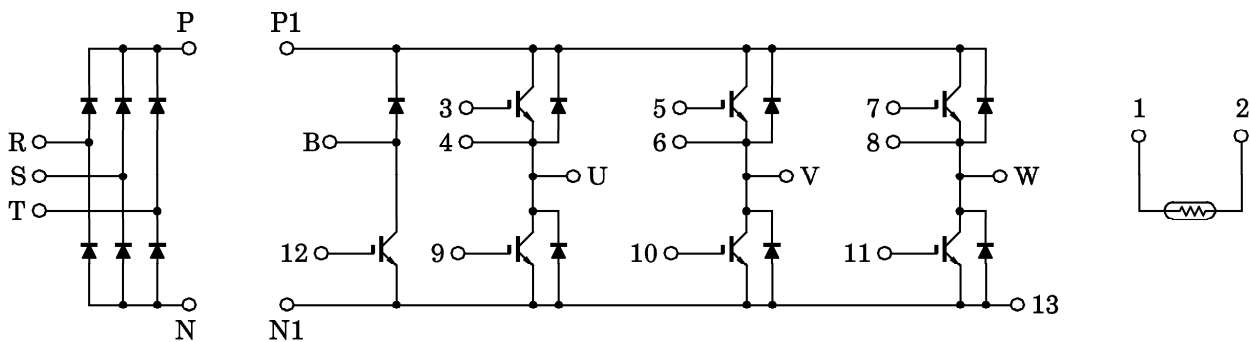
MIG10Q906H, MIG10Q906HA

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Converter and Brake Power Circuits and Thermistor in One Package.
- Output (Inverter Stage) : 3 ϕ 10 A / 1200 V IGBT
- Input (Converter Stage) : 3 ϕ 15 A / 1600 V Silicon Rectifier
- The Electrodes are Isolated from Case.
- Outline
 - MIG10Q906H : 2-108E5A
 - MIG10Q906HA : 2-108E6A
- Weight : 190 g

EQUIVALENT CIRCUIT



961001EAA2

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MAXIMUM RATINGS (Ta = 25°C)

STAGE		CHARACTERISTIC		SYMBOL	RATING	UNIT	
Inverter	Collector-Emitter Voltage			V _{CES}	1200	V	
	Gate-Emitter Voltage			V _{GES}	±20	V	
	Collector Current	DC	I _C	15 / 10	A	(25°C / 80°C)	
		1 ms	I _{CP}	30 / 20	A	(25°C / 80°C)	
	Forward Current	DC	I _F	10	A		
		1 ms	I _{FM}	20	A		
Collector Power Dissipation (Tc = 25°C)			P _C	82	W		
Converter	Repetitive Peak Reverse Voltage			V _R RM	1600	V	
	Average Output Rectified Current			I _O	15	A	
	Peak One Cycle Surge Forward Current (50 Hz, Non-Repetitive)			I _{FSM}	250	A	
Brake	IGBT	Collector-Emitter Voltage		V _{CES}	1200	V	
		Gate-Emitter Voltage		V _{GES}	±20	V	
		Collector Current	DC	I _C	15 / 10	A	(25°C / 80°C)
			1 ms	I _{CP}	30 / 20	A	(25°C / 80°C)
	Collector Power Dissipation (Tc = 25°C)			P _C	82	W	
	FWD	Reverse Voltage			V _R	1200	V
		Forward Current	DC	I _F	10	A	
			1 ms	I _{FM}	20	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 (Ta = 25°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}	$V_{CE} = 1200 \text{ V}, V_{GE} = 0$	—	—	0.5	mA
Gate-Emitter Cut-Off Voltage		$V_{GE}(\text{off})$	$I_C = 10 \text{ mA}, V_{CE} = 5 \text{ V}$	—	6.0	—	V
Collector-Emitter Saturation Voltage		$V_{CE}(\text{sat})$	$I_C = 10 \text{ A}$	—	2.8	3.2	V
			$V_{GE} = 15 \text{ V}$	—	3.1	3.7	
Input Capacitance		C_{ies}	$V_{CE} = 10 \text{ V}, V_{GE} = 0,$ $f = 1 \text{ MHz}$	—	1200	—	pF
Switching Time	Rise Time	t_r	$V_{CC} = 600 \text{ V}$	—	0.07	0.15	μs
	Turn-On Time	t_{on}	$I_C = 10 \text{ A}$	—	0.15	0.30	
	Fall Time	t_f	$V_{GE} = \pm 15 \text{ V}$ $R_G = 120 \Omega$	—	0.07	0.10	
	Turn-Off Time	t_{off}	$T_j = 125^\circ\text{C}$ (Note 1)	—	0.60	0.90	
Forward Voltage		V_F	$I_F = 10 \text{ A}, V_{GE} = 0$	—	2.0	2.8	V
Reverse Recovery Time		t_{rr}	$I_F = 10 \text{ A}, V_{GE} = -10 \text{ V},$ $di/dt = 200 \text{ A}/\mu\text{s}$	—	0.10	0.25	μs
Thermal Resistance		$R_{th(j-c)}$	Transistor	—	—	1.52	$^\circ\text{C}/\text{W}$
			Diode	—	—	1.5	

b. Converter stage

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Repetitive Peak Reverse Current		I_{RRM}	$V_{RRM} = 1600 \text{ V}$	—	—	50	μA
Peak Forward Voltage		V_{FM}	$I_{FM} = 15 \text{ A}$	—	1.05	1.20	V
Peak One Cycle Surge Forward Current		I_{FSM}	50 Hz sine-half-wave	250	—	—	A
Thermal Resistance		$R_{th(j-c)}$	—	—	—	1.90	$^\circ\text{C}/\text{W}$

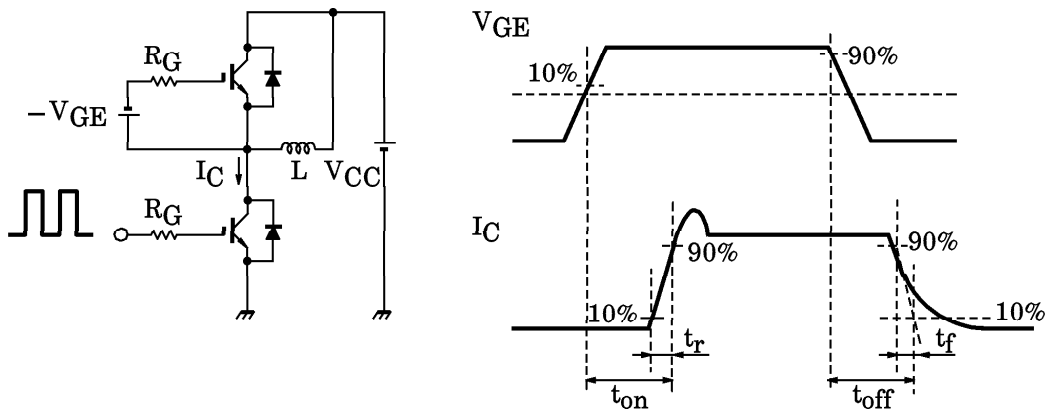
c. Brake stage

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}	$V_{CE} = 1200\text{ V}, V_{GE} = 0$	—	—	0.5	mA
Reverse Current		I_R	$V_R = 1200\text{ V}, V_{GE} = 0$	—	—	0.5	mA
Gate-Emitter Cut-Off Voltage		$V_{GE}(\text{off})$	$I_C = 10\text{ mA}, V_{CE} = 5\text{ V}$	—	6.0	—	V
Collector-Emitter Saturation Voltage		$V_{CE}(\text{sat})$	$I_C = 10\text{ A}$	—	2.8	3.2	V
			$V_{GE} = 15\text{ V}$	—	3.1	3.7	
Input Capacitance		C_{ies}	$V_{CE} = 10\text{ V}, V_{GE} = 0,$ $f = 1\text{ MHz}$	—	1200	—	pF
Switching Time	Rise Time	t_r	$V_{CC} = 600\text{ V}$	—	0.07	0.15	μs
	Turn-On Time	t_{on}	$I_C = 10\text{ A}$	—	0.15	0.30	
	Fall Time	t_f	$V_{GE} = \pm 15\text{ V}$ $R_G = 120\ \Omega$	—	0.07	0.10	
	Turn-Off Time	t_{off}	$T_j = 125^\circ\text{C}$ (Note 1)	—	0.60	0.90	
Forward Voltage		V_F	$I_F = 10\text{ A}, V_{GE} = 0$	—	2.0	2.8	V
Thermal Resistance		$R_{th(j-c)}$	Transistor	—	—	1.52	$^\circ\text{C/W}$
			Diode	—	—	1.5	

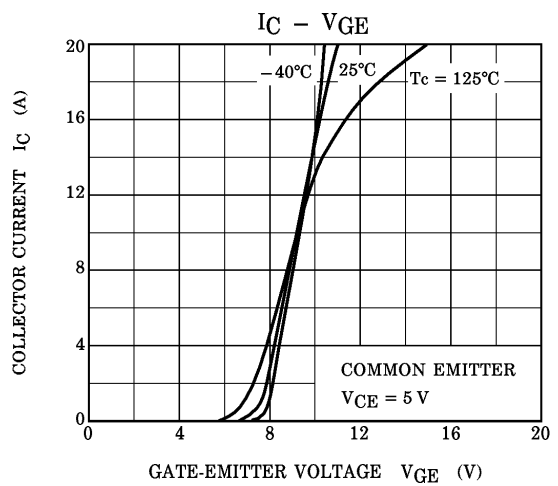
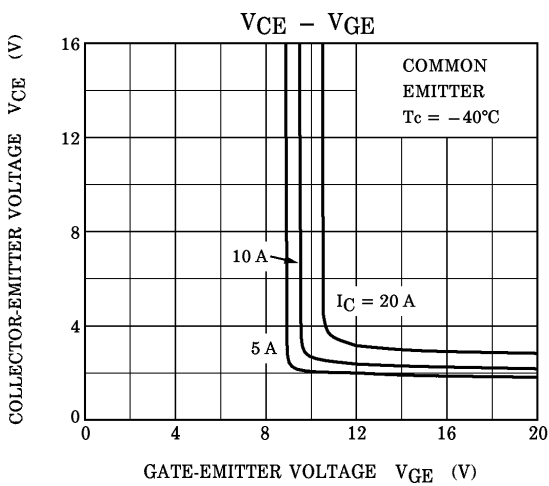
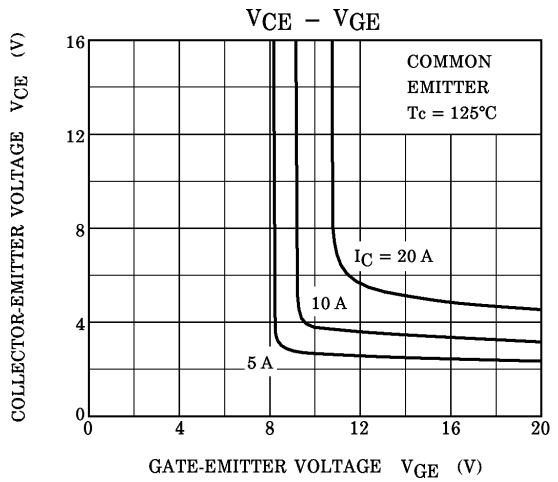
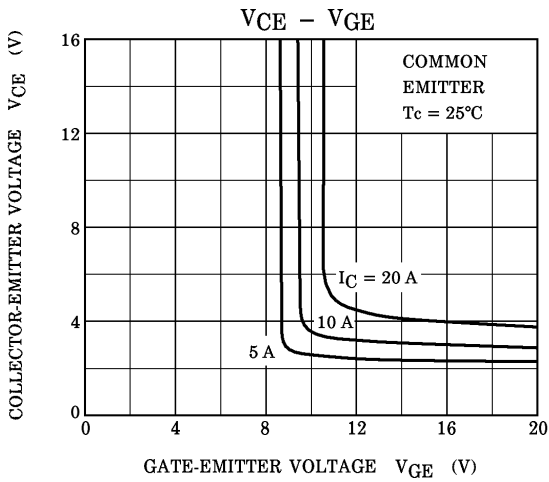
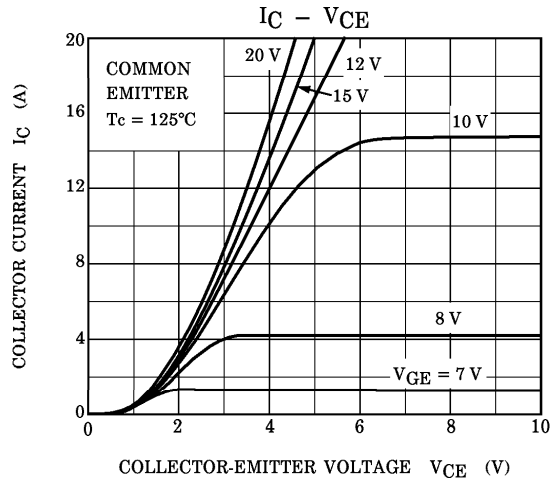
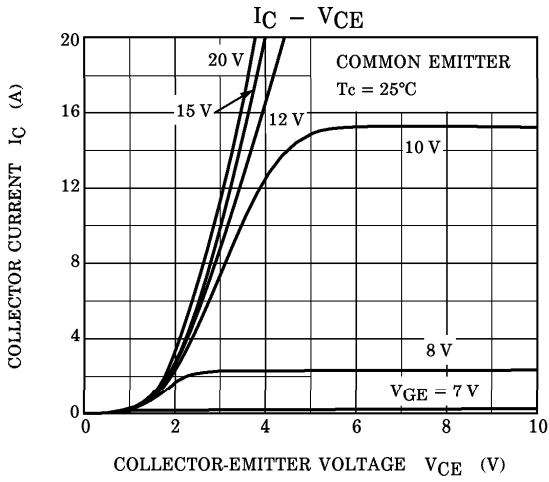
d. Thermistor

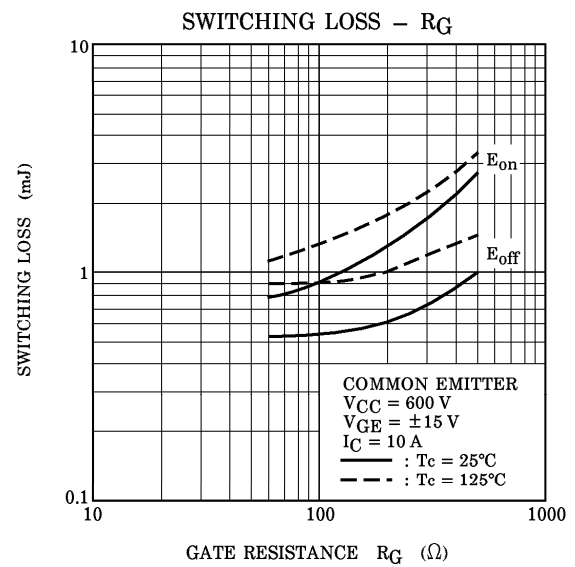
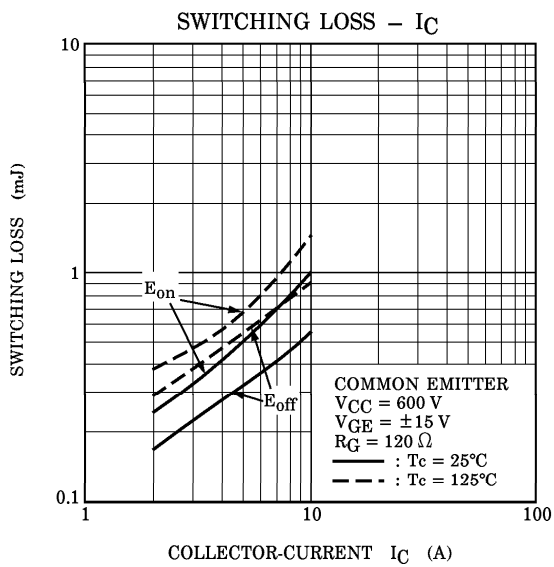
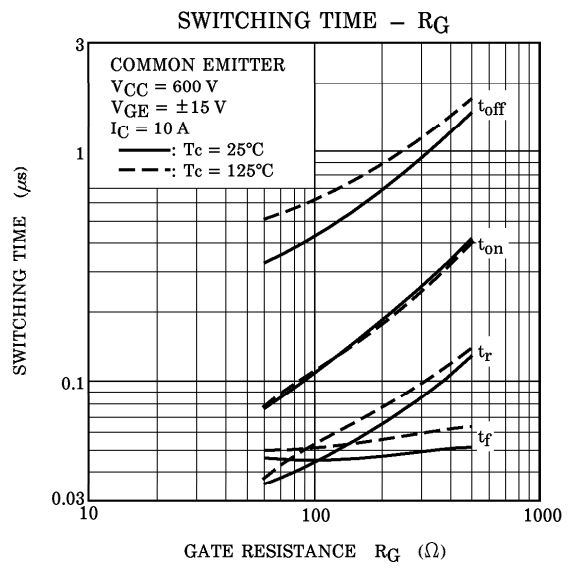
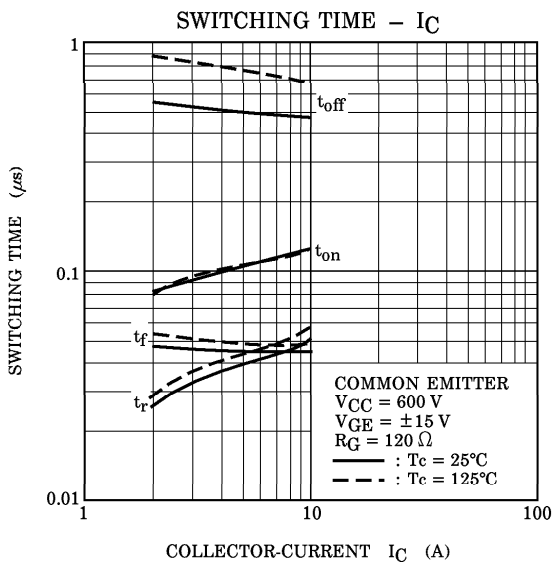
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Zero-power Resistance	R_{25}	$I_{TM} = 0.2\text{ mA}, T_c = 25^\circ\text{C}$	17.31	20	23.14	$\text{k}\Omega$
B Value	$B_{25/85}$	$T_c = 25^\circ\text{C} / T_c = 85^\circ\text{C}$	—	3760	—	K

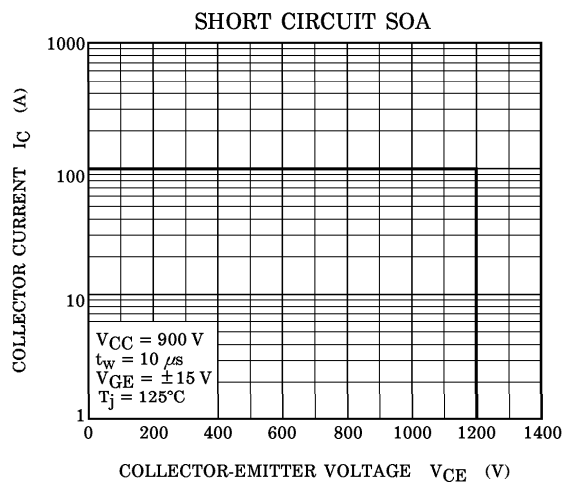
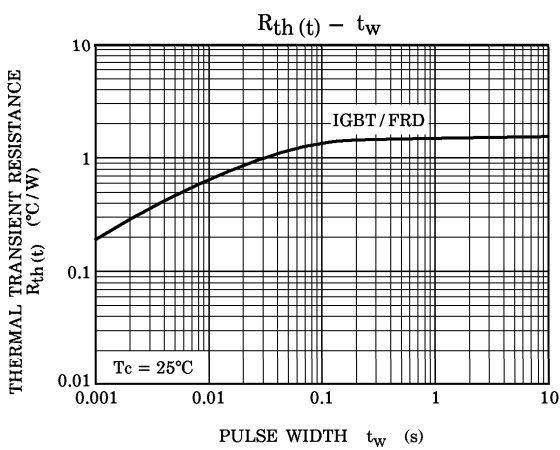
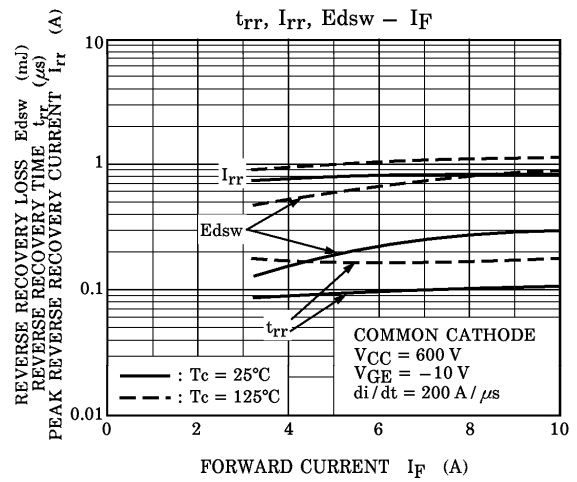
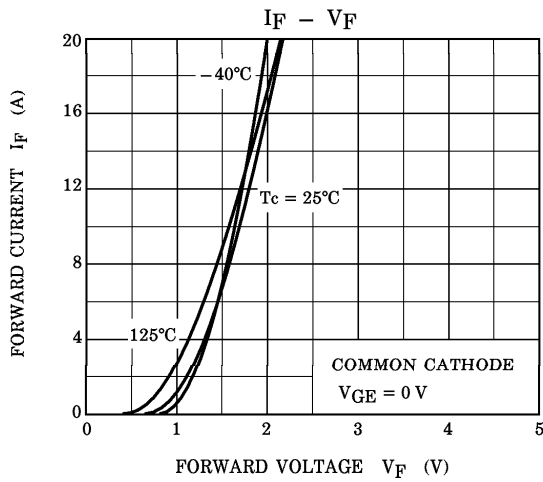
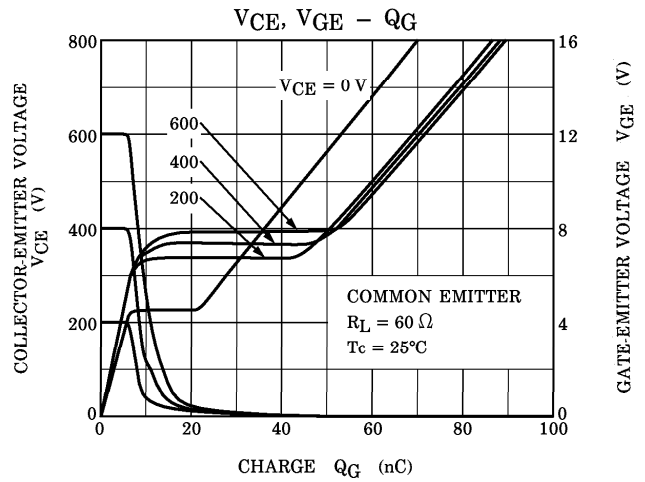
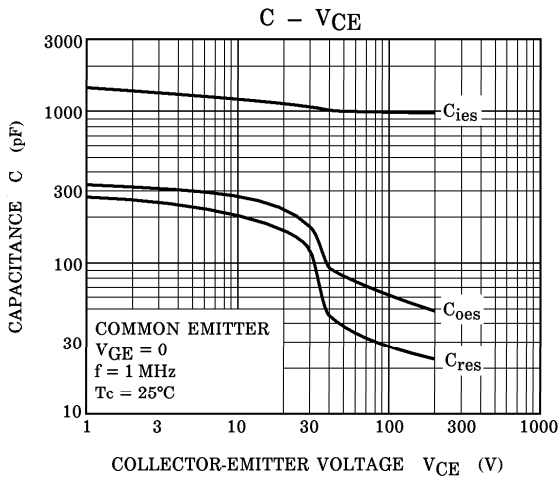
(Note 1) Switching Time Test Circuit & Timing Chart

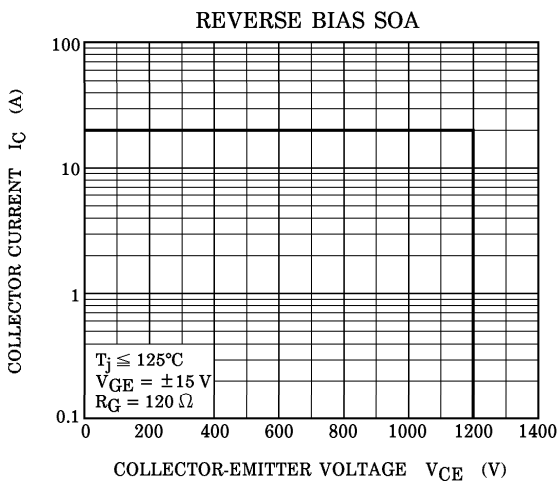


a. Inverter stage/c. Brake stage









b. Converter stage

