TOSHIBA INTEGRATED IGBT MODULE SILICON N CHANNEL IGBT

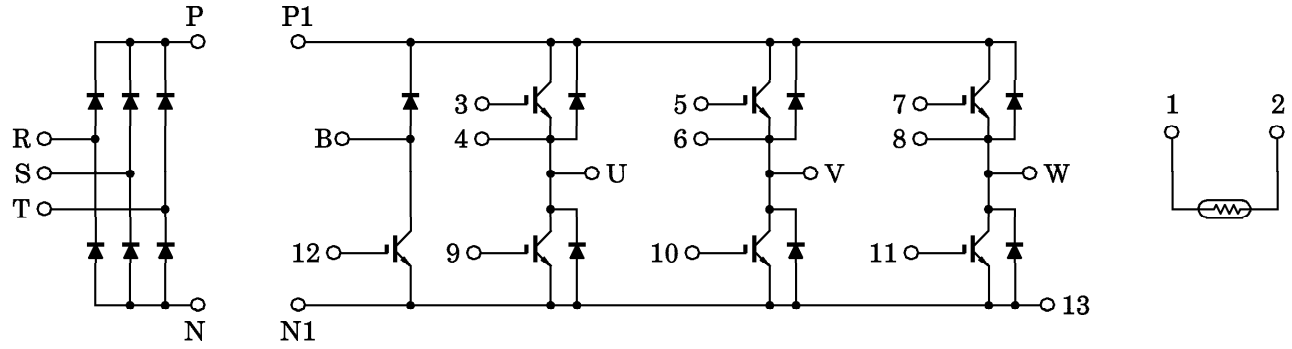
MIG50J906H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

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

EQUIVALENT CIRCUIT

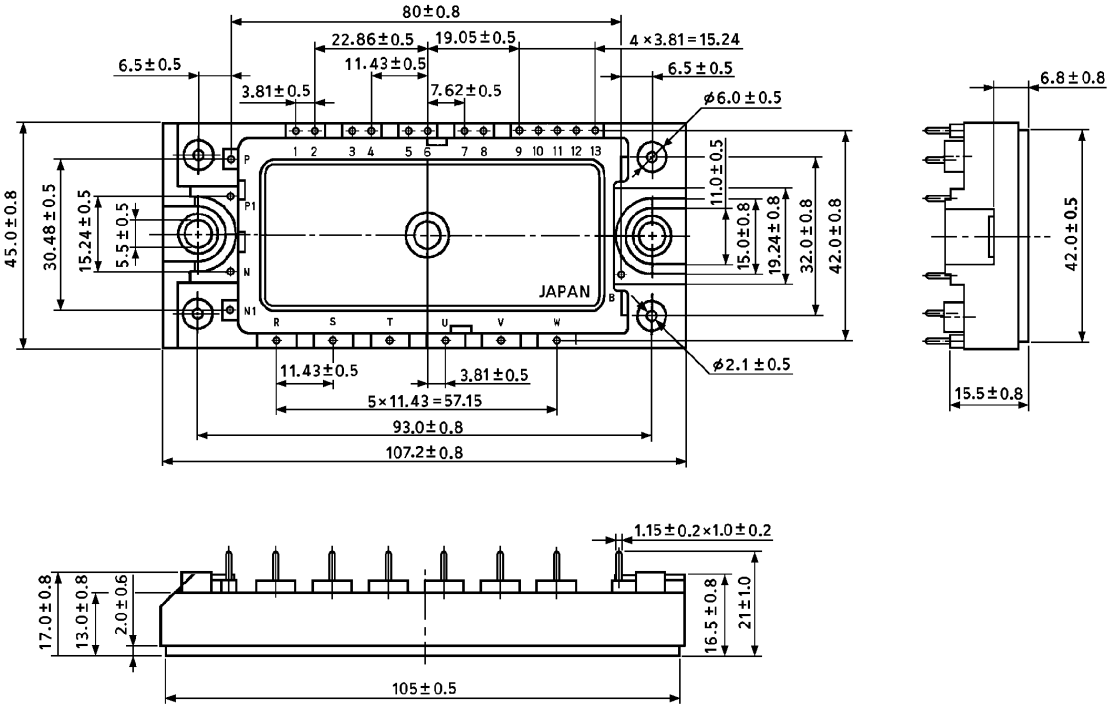


961001EAA1

PACKAGE DIMENSION

Unit : mm

MIG50J906H



2-108E5A

MAXIMUM RATINGS (Ta = 25°C)

STAGE		CHARACTERISTIC		SYMBOL	RATING	UNIT	
Inverter		Collector-Emitter Voltage		V_{CES}	600	V	
		Gate-Emitter Voltage		V_{GES}	±20	V	
		Collector Current	DC	I_C	75 / 50	A	(25°C / 40°C)
			1 ms	I_{CP}	150 / 100	A	(25°C / 40°C)
		Forward Current	DC	I_F	50	A	
			1 ms	I_{FM}	100	A	
		Collector Power Dissipation (Tc = 25°C)		P_C	200	W	
Converter		Repetitive Peak Reverse Voltage		V_{RRM}	800	V	
		Average Output Rectified Current		I_O	30	A	
		Peak One Cycle Surge Forward Current (50Hz, Non-Repetitive)		I_{FSM}	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	(25°C / 40°C)
			1 ms	I_{CP}	150 / 100	A	(25°C / 40°C)
		Collector Power Dissipation (Tc = 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 (Ta = 25°C)

a. Inverter stage

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

b. Converter stage

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Repetitive Peak Reverse Current	I_{RRM}	V_{RRM} = 800 V	—	—	50	μA
Peak Forward Voltage	V_{FM}	I_{FM} = 30 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	°C / W

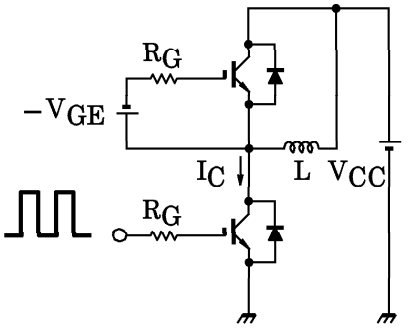
c. Brake stage

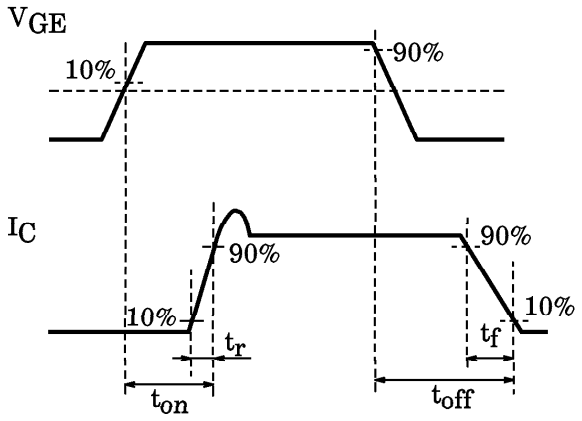
CHARACTERISTIC		SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GES}	V_{GE} = ±20 V, V_{CE} = 0		—	—	±500	nA
Collector Cut-Off Current		I_{CES}	V_{CE} = 600 V, V_{GE} = 0		—	—	1.0	mA
Reverse Current		I_R	V_R = 600 V		—	—	1.0	mA
Gate-Emitter Cut-Off Voltage		$V_{GE\ (off)}$	I_C = 5 mA, V_{CE} = 5 V		5.0	—	8.0	V
Collector-Emitter Saturation Voltage		$V_{CE\ (sat)}$	I_C = 50 A, V_{GE} = 15 V	T_j = 25°C	—	2.1	2.7	V
				T_j = 125°C	—	2.2	2.8	
Input Capacitance		C_{ies}	V_{CE} = 10 V, V_{GE} = 0, f = 1 MHz		—	4800	—	pF
Switching Time	Rise Time	t_r	V_{CC} = 600 V, I_C = 50 A, V_{GE} = ±15 V, R_G = 24 Ω (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 A, V_{GE} = 0		—	2.3	3.0	V
Thermal Resistance		$R_{th\ (j-c)}$	Transistor		—	—	0.6	°C / W
			Diode		—	—	1.5	

d. Thermistor

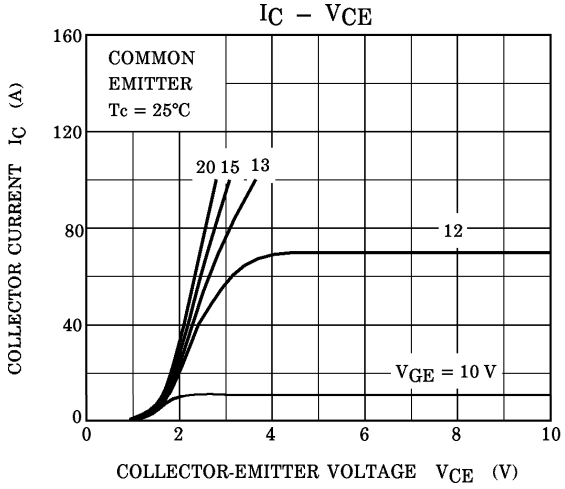
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Zero-power Resistance	R_{25}	I_{TM} = 0.2 mA, Tc = 25°C	17.31	20	23.14	kΩ
B Value	$B_{25\ /\ 85}$	Tc = 25°C / Tc = 85°C	—	3760	—	K

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

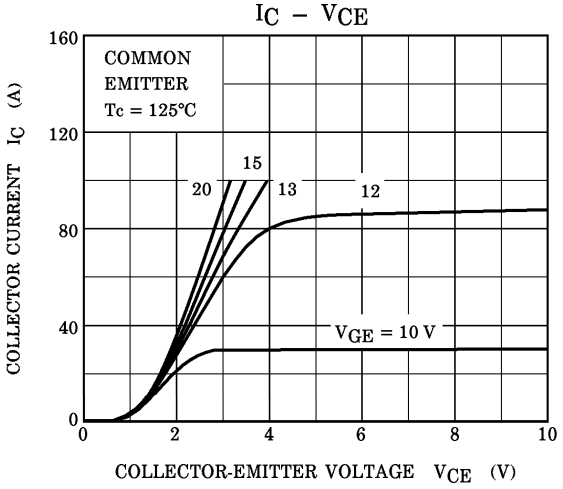




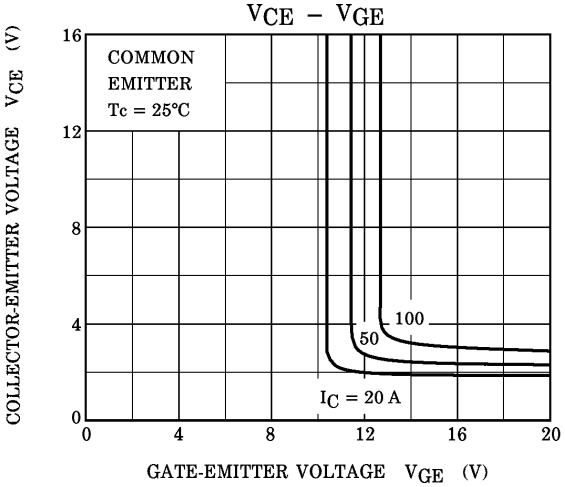
$I_C - V_{CE}$



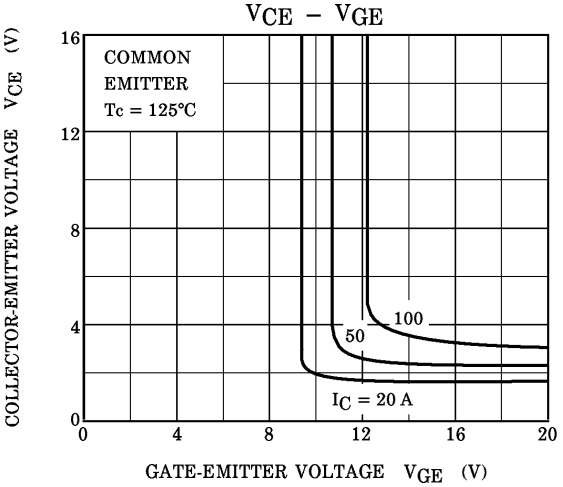
$I_C - V_{CE}$



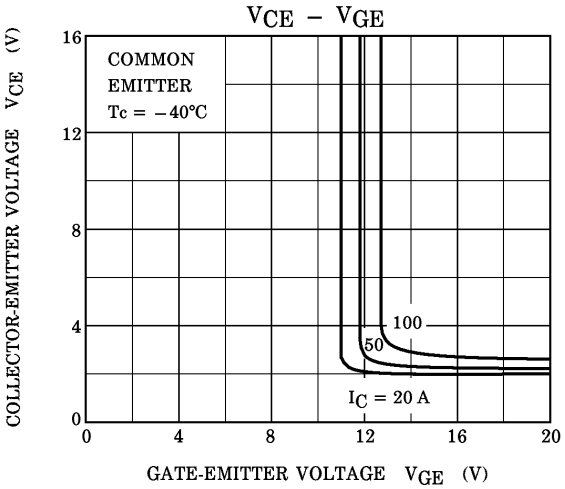
$V_{CE} - V_{GE}$



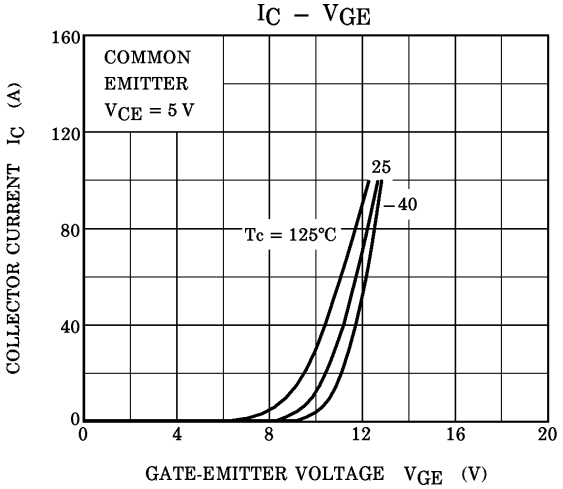
$V_{CE} - V_{GE}$



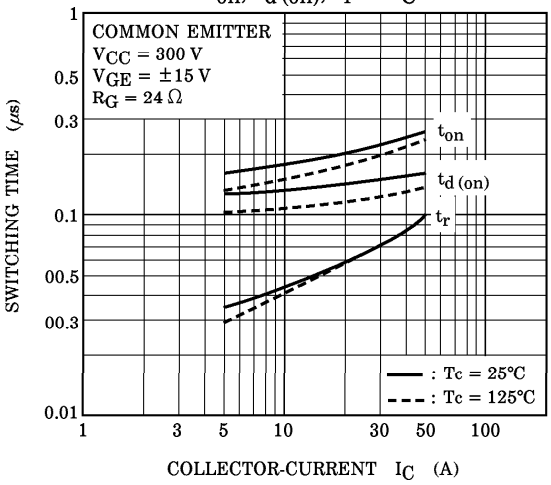
$V_{CE} - V_{GE}$



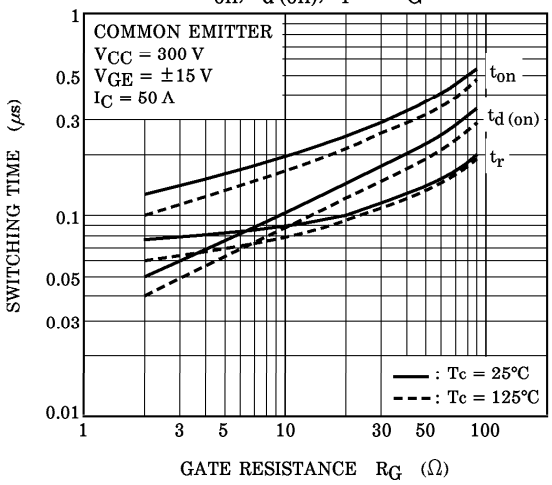
$I_C - V_{GE}$



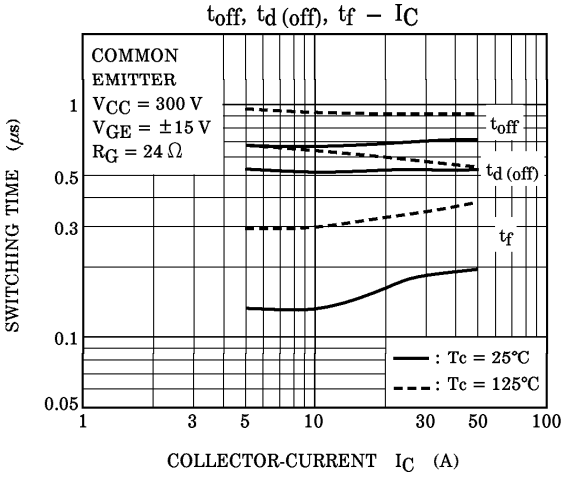
t_{on}, $t_{d\,(on)}$, t_f – I_C



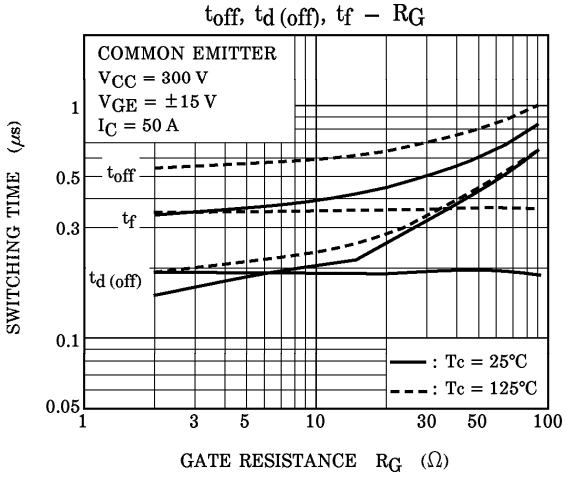
t_{on}, $t_{d\,(on)}$, t_f – R_G



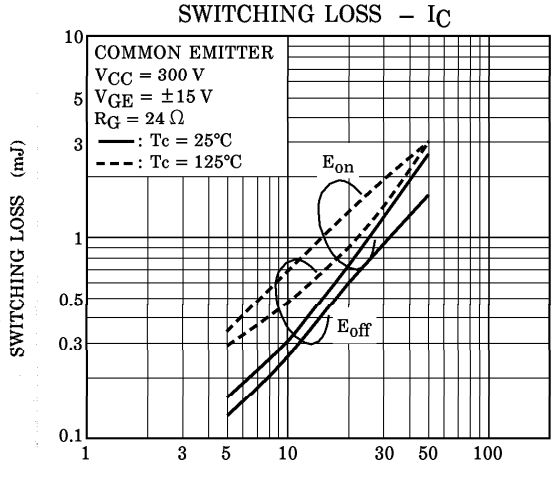
t_{off}, $t_{d\,(off)}$, t_f – I_C



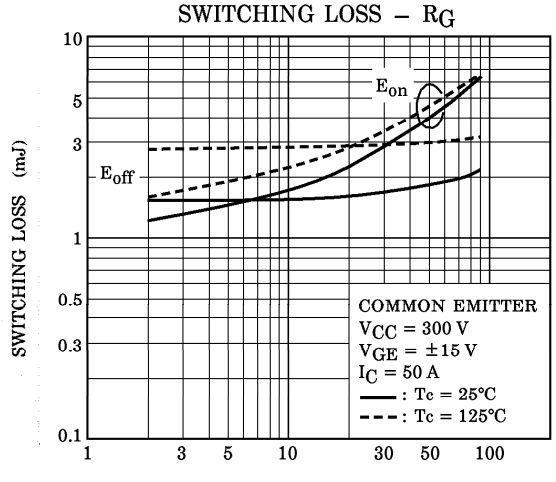
t_{off}, $t_{d\,(off)}$, t_f – R_G



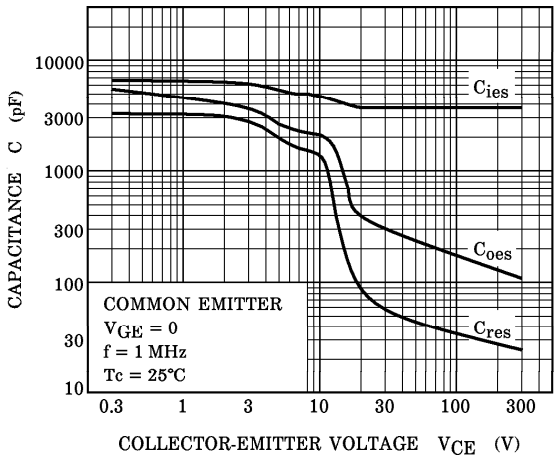
SWITCHING LOSS – I_C



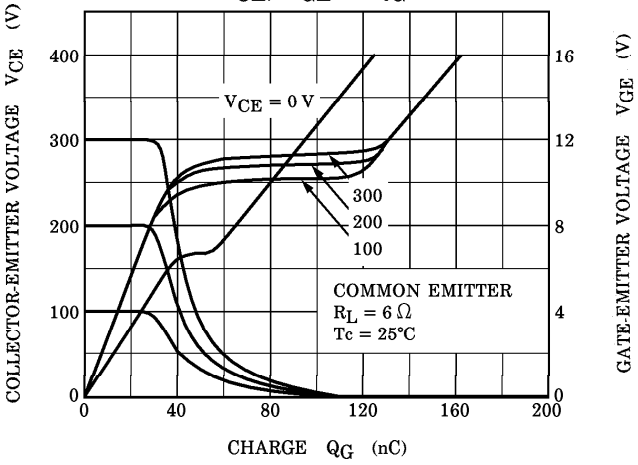
SWITCHING LOSS – R_G



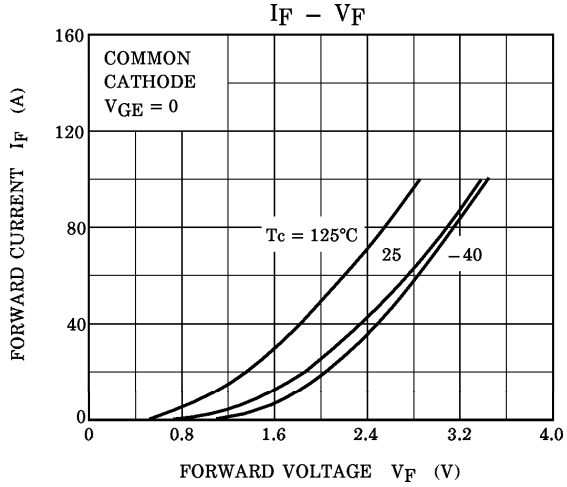
C – V_{CE}



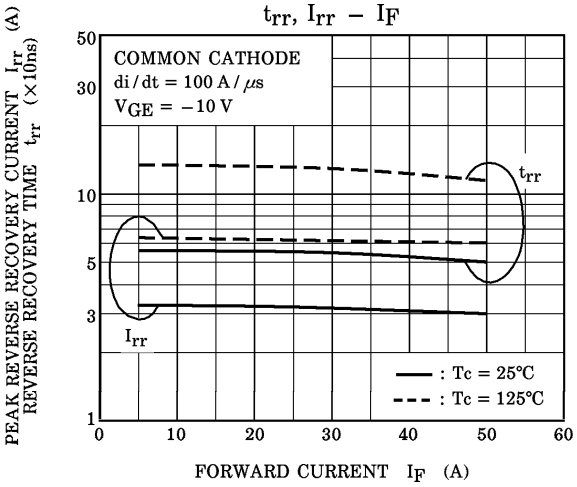
V_{CE}, V_{GE} – Q_G



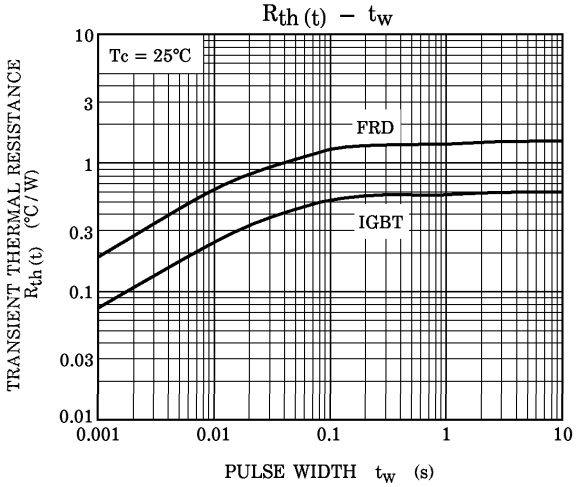
I_F – V_F



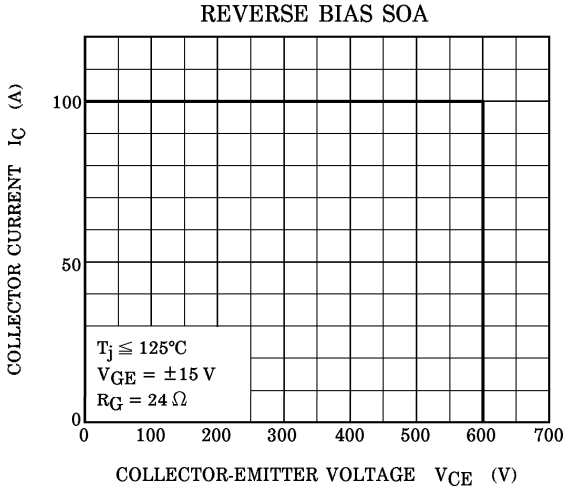
t_{rr}, I_{rr} – I_F



$R_{th\,(t)}$ – t_w



REVERSE BIAS SOA



b. Converter stage