

# SPECIFICATION

Device Name : IGBT module  
Type Name : 2MBI400NT-060-02  
Spec. No. : **MS5F3984**

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Matsumoto Factory

	DATE	NAME	APPROVED	Fuji Electric Co., Ltd.	
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CHECKED	Apr. - 2 - '97	<i>S. Ogawa</i>			
			S.K.		1/8

# Revised Records

Date	Classi- fication	Ind.	Content	Applied date	Drawn	Checked	Approved
	enactment	—	—————	Issued date	—	S. Ogawa	S. K.

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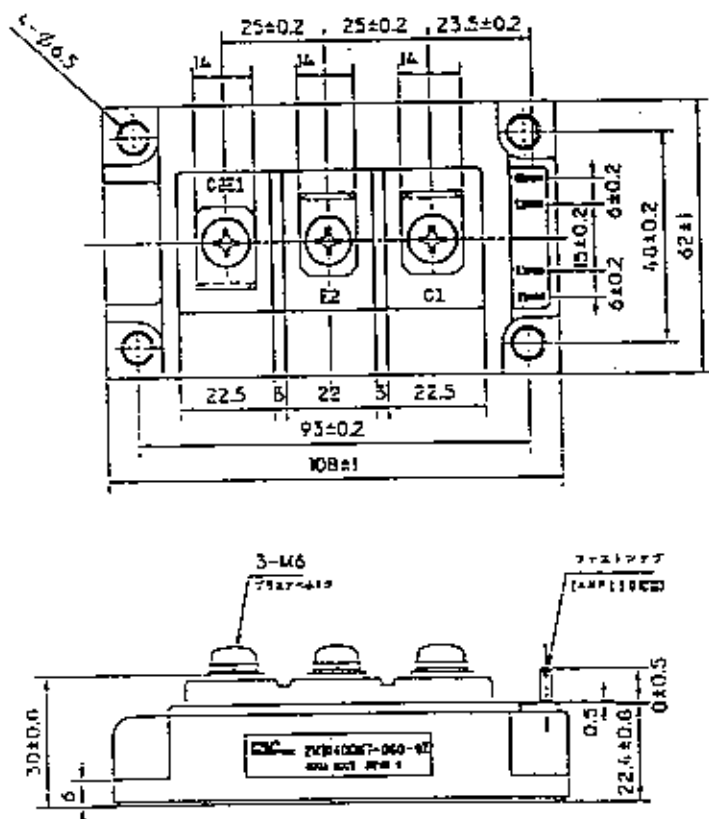
2/8

Ratings and characteristics of Fuji IGBT Module

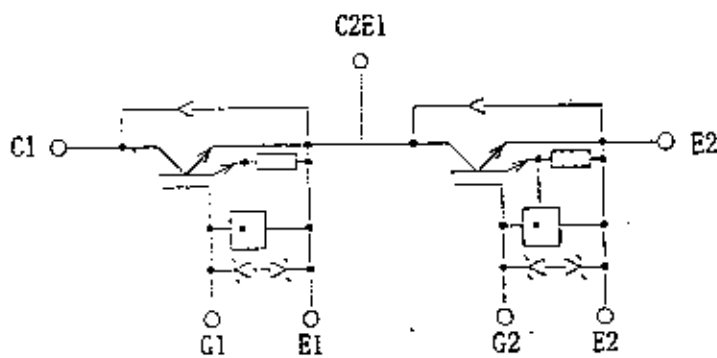
2MBI400NT-060-02

1. Outline Drawing

Unit : mm



2. Equivalent circuit



\* MLU (Over Current Limiting Circuit)

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3/8

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3. Absolute Maximum Ratings ( at  $T_c=25^\circ\text{C}$  unless otherwise specified )

Items		Symbols	Ratings	Units
Collector-Emitter voltage		$V_{CES}$	600	V
Gate-Emitter voltage		$V_{GES}$	$\pm 20$	V
Collector current	Continuous	$I_c$	400	A
	1ms	$I_c$ pulse	800	
		$-I_c$	400	
	1ms	$-I_c$ pulse	800	
Max. power dissipation		PC	1620	W
Operating temperature		$T_j$	+150	$^\circ\text{C}$
Storage temperature		$T_{stg}$	-40~+125	$^\circ\text{C}$
Isolation voltage		$V_{is}$	AC 2500 (1min.)	V
Screw torque		Mounting *1	3.5	N·m
		Terminals *2	4.5	

Note : \*1 Recommendable value : 2.5~3.5 N·m (M5) or (M6)

\*2 Recommendable value : 3.5~4.5 N·m (M6)

4. Electrical characteristics ( at  $T_j=25^\circ\text{C}$  unless otherwise specified )

Items	Symbols	Characteristics			Conditions	Units
		min.	typ.	max.		
Zero gate voltage Collector current	$I_{CES}$			2.0	$V_{GE}=0V, V_{CE}=600V$	mA
Gate-Emitter leakage current	$I_{GES}$			30	$V_{CE}=0V, V_{GE}=\pm 20V$	$\mu\text{A}$
Gate-Emitter threshold voltage	$V_{GE(th)}$	4.5		7.5	$V_{CE}=20V, I_c=400\text{mA}$	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$			2.8	$V_{GE}=15V, I_c=400A$	V
Input capacitance	$C_{ies}$		26400		$V_{GE}=0V$	pF
Output capacitance	$C_{oes}$		5870		$V_{CE}=10V$	
Reverse transfer capacitance	$C_{res}$		2670		$f=1\text{MHz}$	
Turn-on time	$t_{on}$		0.6	1.2	$V_{cc}=300V$	$\mu\text{s}$
	$t_r$		0.2	0.6	$I_c=400A$	
Turn-off time	$t_{off}$		0.6	1.0	$V_{GE}=\pm 15V$	$\mu\text{s}$
	$t_f$		0.2	0.35	$R_G=4.7\Omega$	
Diode forward on voltage	$V_f$			3.0	$I_f=400A, V_{GE}=0V$	V
Reverse recovery time	$t_{rr}$			300	$I_f=400A$	ns

5. Thermal resistance characteristics

Items	Symbols	Characteristics			Conditions	Units
		min.	typ.	max.		
Thermal resistance	$R_{th(j-c)}$			0.077	IGBT	$^\circ\text{C/W}$
	$R_{th(j-c)}$			0.20	Diode	
	*		0.025		the base to cooling fin	
	$R_{th(c-f)}$					

\* This is the value which is defined mounting on the additional cooling fin with thermal compound.

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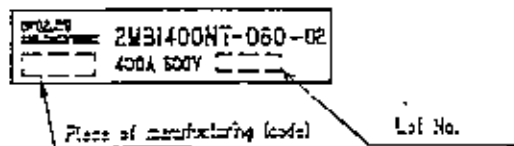
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**MS5F3984**

4/8

H04-004-03

6. Indication on module (モジュール表示)



7. Applicable category (適用範囲)

This specification is applied to IGBT module named 2MBI400NT-060-02.  
本納入仕様書は、IGBTモジュール 2MBI400NT-060-02 適用する。

8. Storage and transportation notes (保管、運搬上の注意事項)

- The IGBT module should be stored at a standard temperature of 5 to 35°C and humidity of 45 to 75%.  
常温保存が望ましい。(5~35°C、45~75%)
- Store modules in a place with few temperature changes in order to avoid condensation on the module surface.  
急激な温度変化の無きこと。(モジュール表面が結露しないこと)
- Avoid exposure to corrosive gases and dust.  
腐蝕性ガスの発生場所、塵埃の多い場所は避けること。
- Avoid excessive external force on the module.  
製品に荷重がかからないように十分注意すること。
- Store modules with unprocessed terminals.  
モジュールの端子は未加工の状態で保管すること。
- Do not drop or otherwise shock the modules when transporting.  
製品の運搬時に衝撃を与えたり、落下させたりしないこと。

9. Heat sink mounting notes (ヒートシンク取り付け上の注意事項)

- The mounting surface of the heat sink should be finished to a roughness of 10 $\mu$ m or less and a warp between screw holes of 100 $\mu$ m or less.  
本モジュールを取り付ける冷却体の取付面の仕上げは、粗さ10 $\mu$ m以下、取付ネジ間で平坦度100 $\mu$ m以下とする。
- Each mounting screw should be fastened using a specified torque after pre-fastening using a 1/3 specified torque.  
取付けネジは、規定の1/3のトルクで仮締を行った後、規定のトルクで本締を行って下さい。
- If the above notes are not met, it has a possibility to break the insulation between the IGBT module's chips and metal base.  
上記注意事項の範囲外で御適用した場合、IGBTモジュールのチップと金属ベース間の絶縁破壊を生ずる可能性があります。

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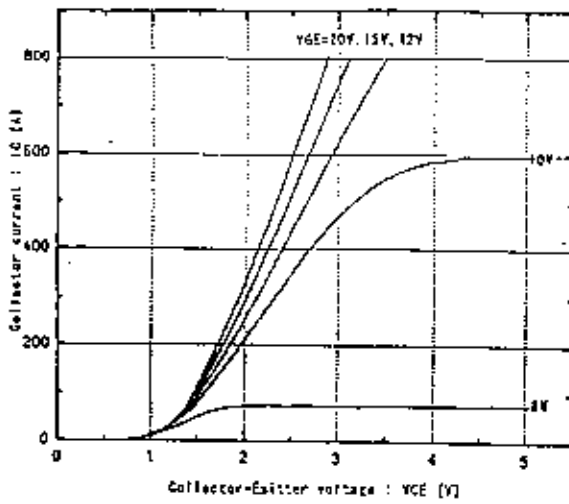
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5/8

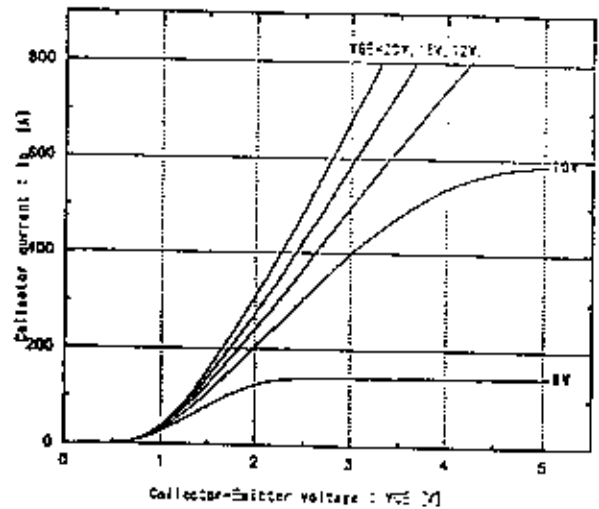
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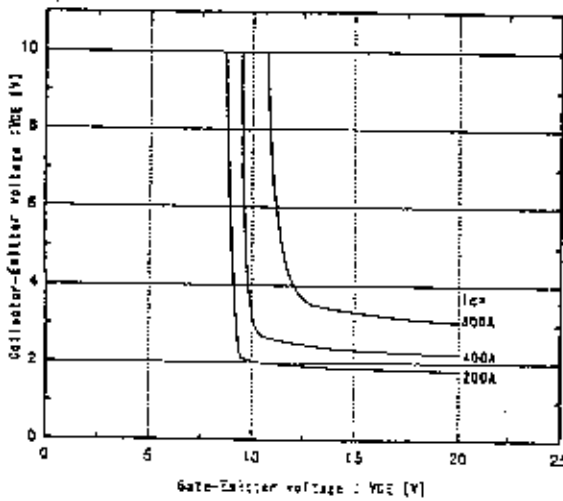
Collector current vs. Collector-Emitter voltage  
Tj=25°C



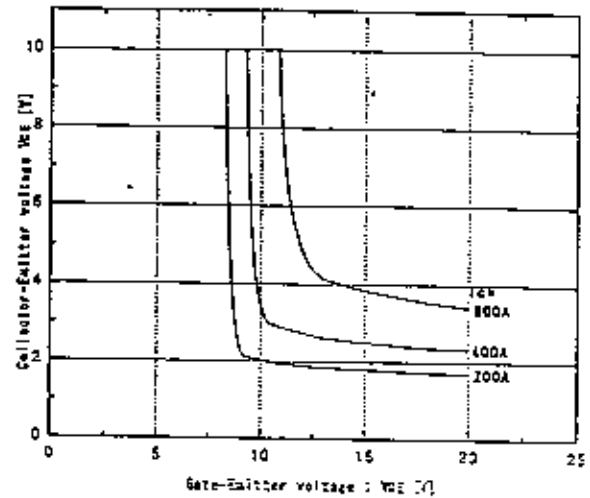
Collector current vs. Collector-Emitter voltage  
Tj=125°C



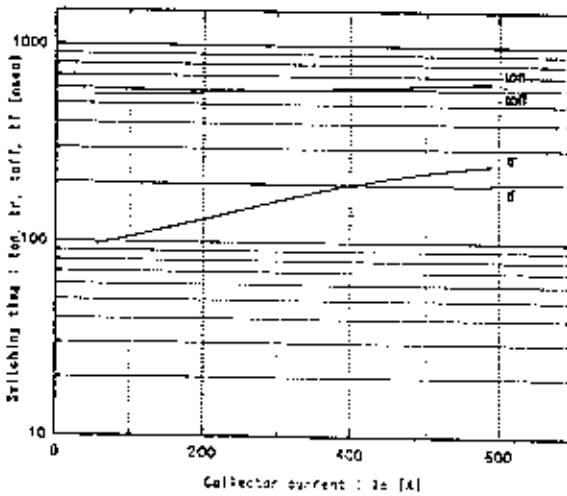
Collector-Emitter vs. Gate-Emitter voltage  
Tj=25°C



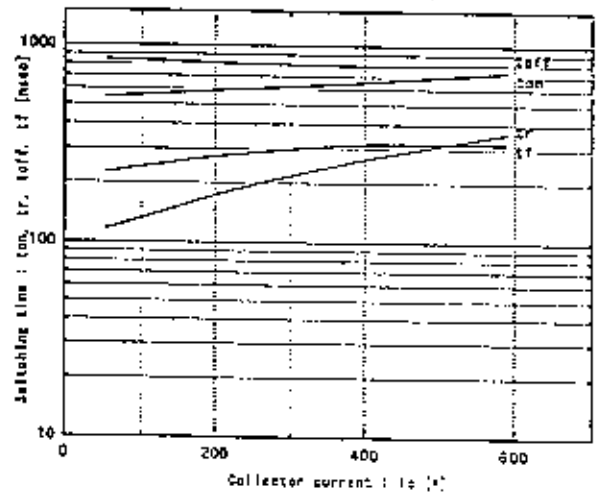
Collector-Emitter vs. Gate-Emitter voltage  
Tj=125°C



Switching time vs. Collector current  
Vce=300V, Rθ=4.1°C/W, VGE=15V, Tj=25°C



Switching time vs. Collector current  
Vce=300V, Rθ=4.1°C/W, VGE=15V, Tj=125°C



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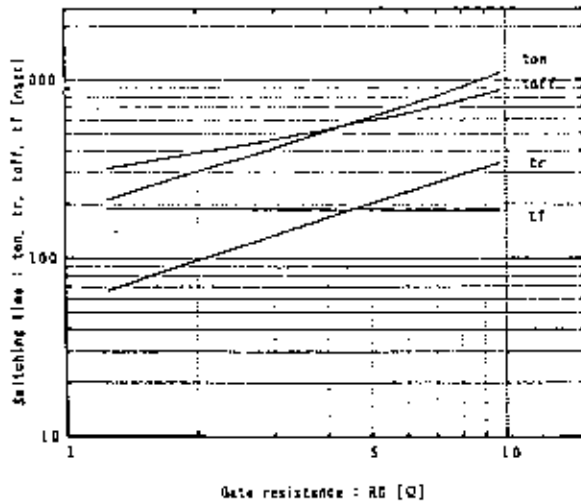
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6/8

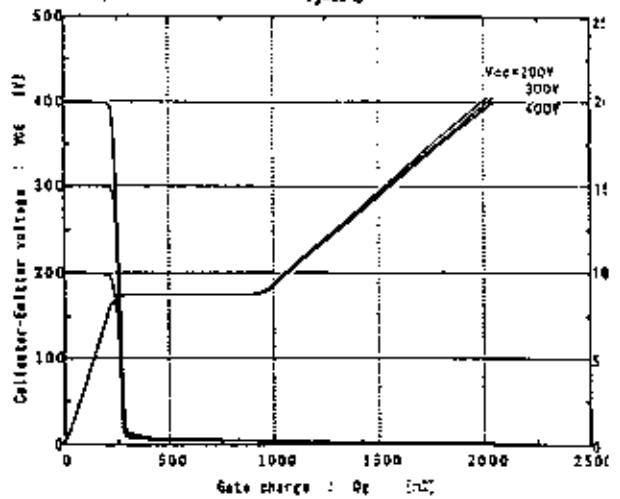
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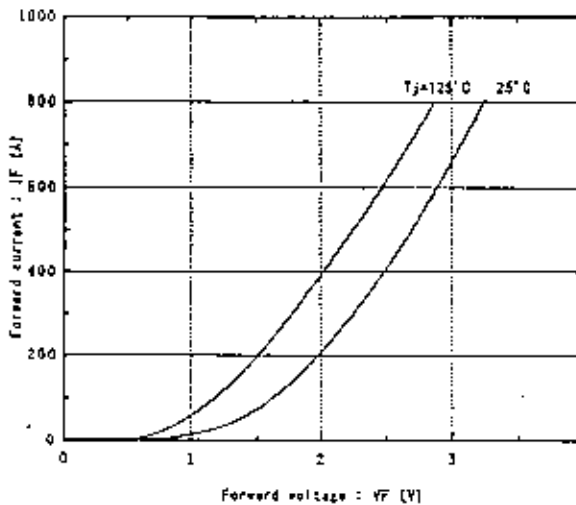
Switching time vs.  $R_G$   
 $V_{CE}=300V$ ,  $I_C=400A$ ,  $V_{GE}=\pm 15V$ ,  $T_J=25^\circ C$



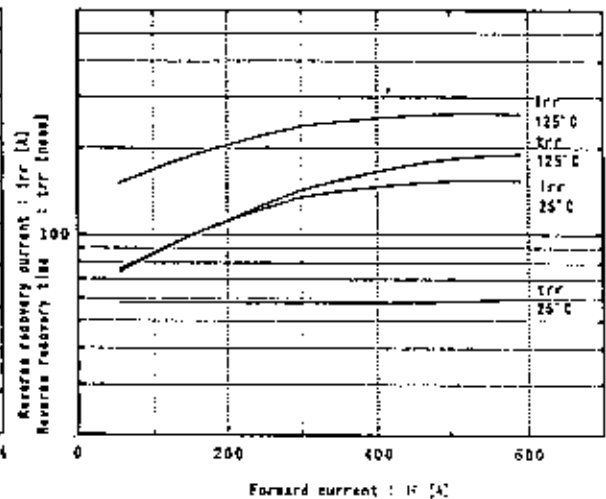
Dynamic input characteristics  
 $T_J=25^\circ C$



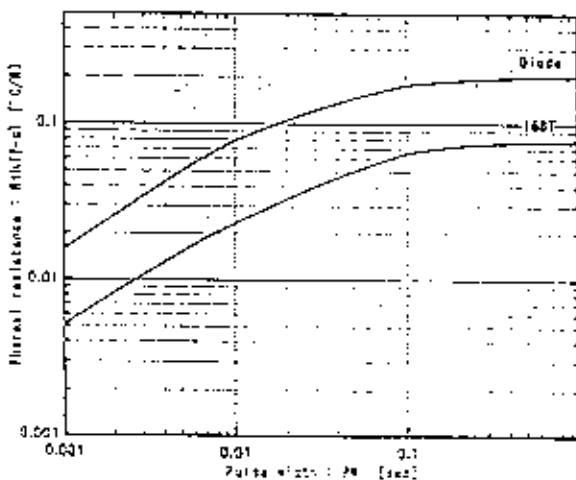
Forward current vs. Forward voltage  
 $V_{GE}=0V$



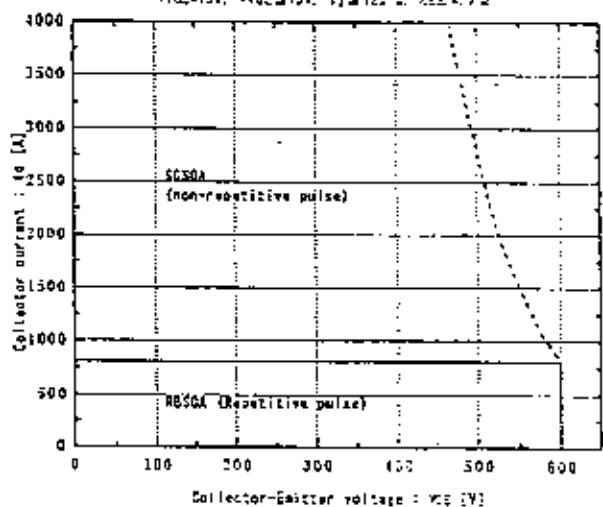
Reverse recovery characteristics  
 $t_{rr}$ ,  $I_{rr}$  vs.  $I_F$



Transient thermal resistance



Reversed biased safe operating area  
 $+V_{CE} \pm 15V$ ,  $-V_{GE} \pm 15V$ ,  $T_J=125^\circ C$ ,  $R_{th(j-c)}=4.7^\circ C/W$



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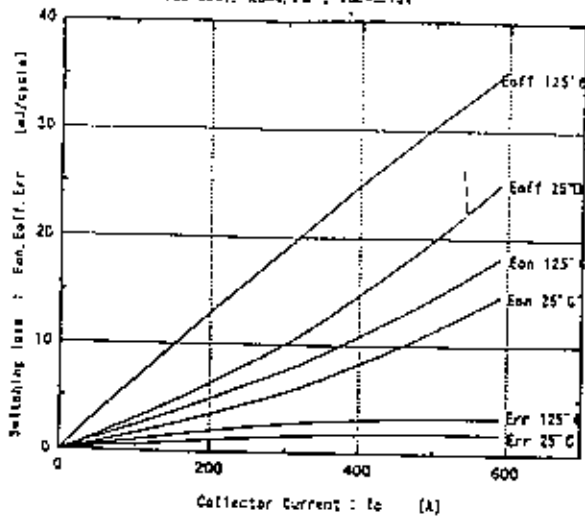
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7/8

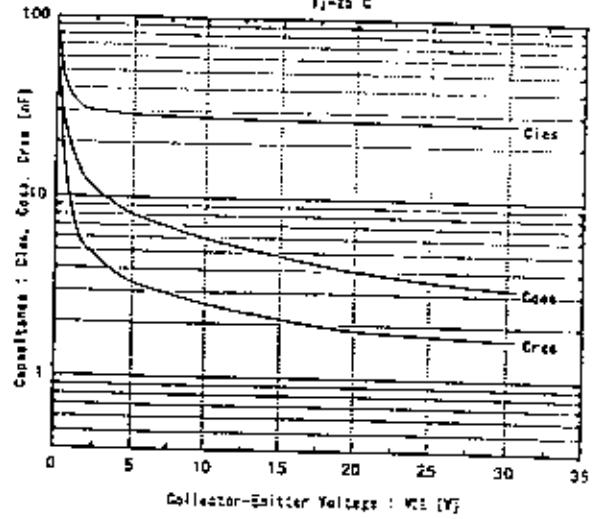
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Switching loss vs. Collector current  
 $V_{ce}=100V$ ,  $R_{\theta c}=7.0$ ,  $V_{BE}=1.5V$



Capacitance vs. Collector-Emitter voltage  
 $T_j=25^\circ C$



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8/8

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