

# Ratings and Characteristics of Fuji Inverter Module

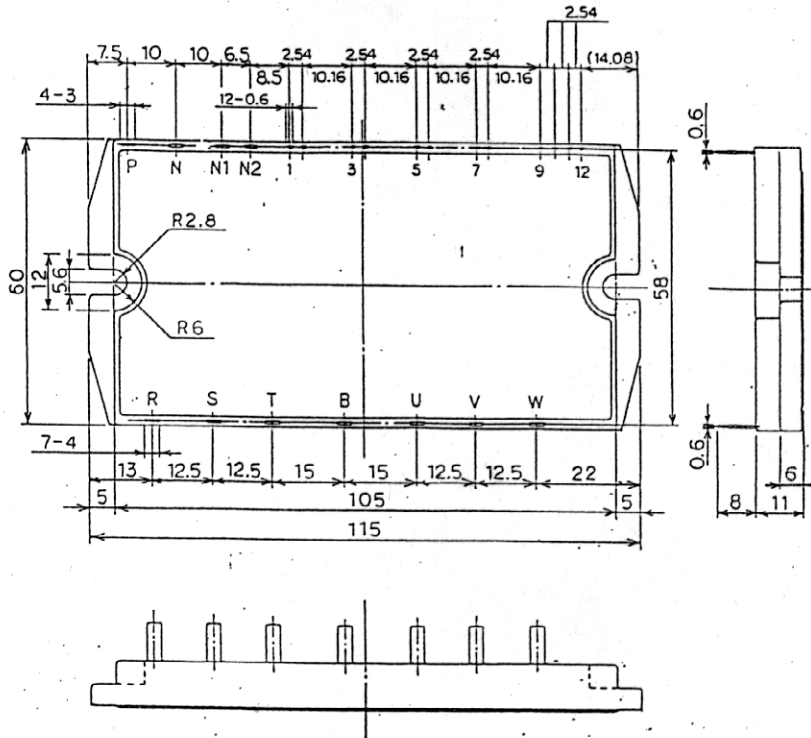
## 7 MBR 8 L B 1 2 0 (TENTATIVE)

\* This specification is subject to change without notice.

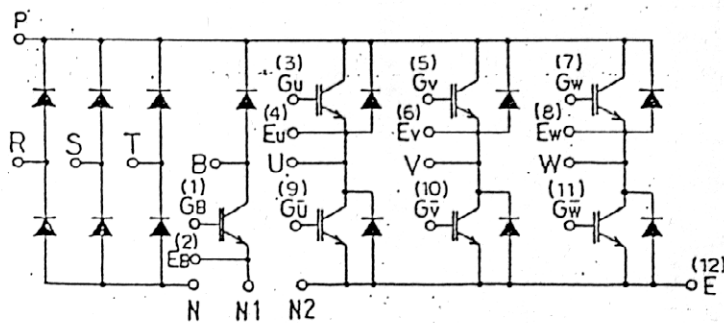
### 1. Outline Drawing

Unit : mm

\* Isolation Voltage (Terminal to Case) : AC 2500V 1 minute



### 2. Equivalent Circuit of Module



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3. Absolute Maximum Ratings (Tc=25°C)

Item		Symbol	Condition	Maximum Ratings	Unit	
Inverter	Collector-Emitter Voltage	V <sub>CEs</sub>		1200	V	
	Gate-Emitter Voltage	V <sub>GEs</sub>		±20	V	
	Collector Current	DC	I <sub>c</sub>		8	A
		1ms	I <sub>cP</sub>		16	A
		DC	-I <sub>c</sub>		8	A
Collector Power Dissipation	One	P <sub>c</sub>		45	W	
Brake	Collector-Emitter Voltage	V <sub>CEs</sub>		1200	V	
	Gate-Emitter Voltage	V <sub>GEs</sub>		±20	V	
	Collector Current	DC	I <sub>c</sub>		8	A
		1ms	I <sub>cP</sub>		16	A
	Collector power Dissipation	One	P <sub>c</sub>		45	W
	Repetitive peak Reverse Voltage				1200	V
	Average Forward Current		I <sub>F (AV)</sub>		1	A
Surge Current		I <sub>FSM</sub>	10ms	50	A	
Converter	Repetitive Peak Reverse Voltage		V <sub>RRM</sub>		1600	V
	Non-Repetitive Peak Reverse Voltage		V <sub>RSM</sub>		1700	V
	Average Output Current		I <sub>o</sub>	50Hz/60Hz sine wave	25	A
	Surge Current (Non-Repetitive)		I <sub>FSM</sub>	Tj=150°C, 10ms	320	A
	I <sup>2</sup> t (Non-Repetitive)			Tj=150°C, 10ms	512	A <sup>2</sup> s
Operating Junction Temperature		T <sub>j</sub>		+ 150	°C	
Storage Temperature		T <sub>stg</sub>		-30 ~ +125	°C	
Isolation Voltage		Viso	AC : 1 minute	AC 2500	V	
Mounting Screw Torque				*1 1.67	N·m	

\*1 Recommendable Value M4 : 1.27 ~ 1.67 N · m

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4. Electrical Characteristics (Tj=25°C)

Characteristics		Symbol	Conditions	min.	max.	Unit	
Inverter	Zero gate voltage collector current	I <sub>CES</sub>	Tj=25°C V <sub>CE</sub> =1200V V <sub>GE</sub> = 0V		1.0	mA	
	Gate-emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V V <sub>GE</sub> =±20V		100	nA	
	Gate-emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> =20V I <sub>C</sub> = 8mA	3.0	6.0	V	
	Collector-emitter saturation Voltage	V <sub>CE(sat)</sub>	V <sub>GE</sub> =15V I <sub>C</sub> = 8A	chip		3.5	V
				Terminal		3.6	
	Collector-Emitter Voltage	-V <sub>CE</sub>	-I <sub>C</sub> =8A	chip		2.5	V
				Terminal		2.6	
	Input capacitance	C <sub>ies</sub>	V <sub>GE</sub> =0V V <sub>CE</sub> =10V f=1MHz		1450 (typ.)	PF	
	Switching Time	ton	V <sub>CC</sub> = 600V I <sub>C</sub> = 8 A V <sub>GE</sub> =±15V R <sub>G</sub> =150 Ω			0.8	μs
toff					1.5		
tf					0.5		
Reverse Recovery Time of FRD	t <sub>rr</sub>	I <sub>F</sub> = 8A V <sub>GE</sub> =-10V -di/dt= 50A/μs			350	ns	
Brake	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>CE(s)</sub> =1200V V <sub>GE</sub> = 0V		1.0	mA	
	Gate-emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V V <sub>GE</sub> =±20V		100	nA	
	Collector-emitter Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = 8 A V <sub>GE</sub> =15V	chip		3.5	V
				Terminal		3.6	
	Switching Time	ton	V <sub>CC</sub> = 600V I <sub>C</sub> = 8 A V <sub>GE</sub> =±15V R <sub>G</sub> =150 Ω			0.8	μs
		toff				1.5	
tf					0.5		

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Characteristics		Symbol	Conditions		min.	max.	Unit
Converter	Reverse Current	$I_{RRM}$	$V_R = V_{RRM}$			1	mA
	Reverse Recovery Time	$t_{rr}$				600	ns
	Forward Voltage	$V_{FM}$	$I_F = 25A$	chip		1.30	V
				Terminal		1.55	
	Reverse Current	$I_{RRM}$	$V_R = V_{RRM}$			1	mA

5. Thermal Characteristics

Characteristics	Symbol	Conditions	min.	max.	Unit
Thermal Resistance (1 chip)	$R_{th(j-c)}$	Inverter IGBT		2.78	°C/W
		Inverter FRD		3.30	
		Brake IGBT		2.78	
		Converter Diode		3.40	
Contact Thermal Resistance	$R_{th(c-f)}$	With Thermal Compound		(typ) 0.05	

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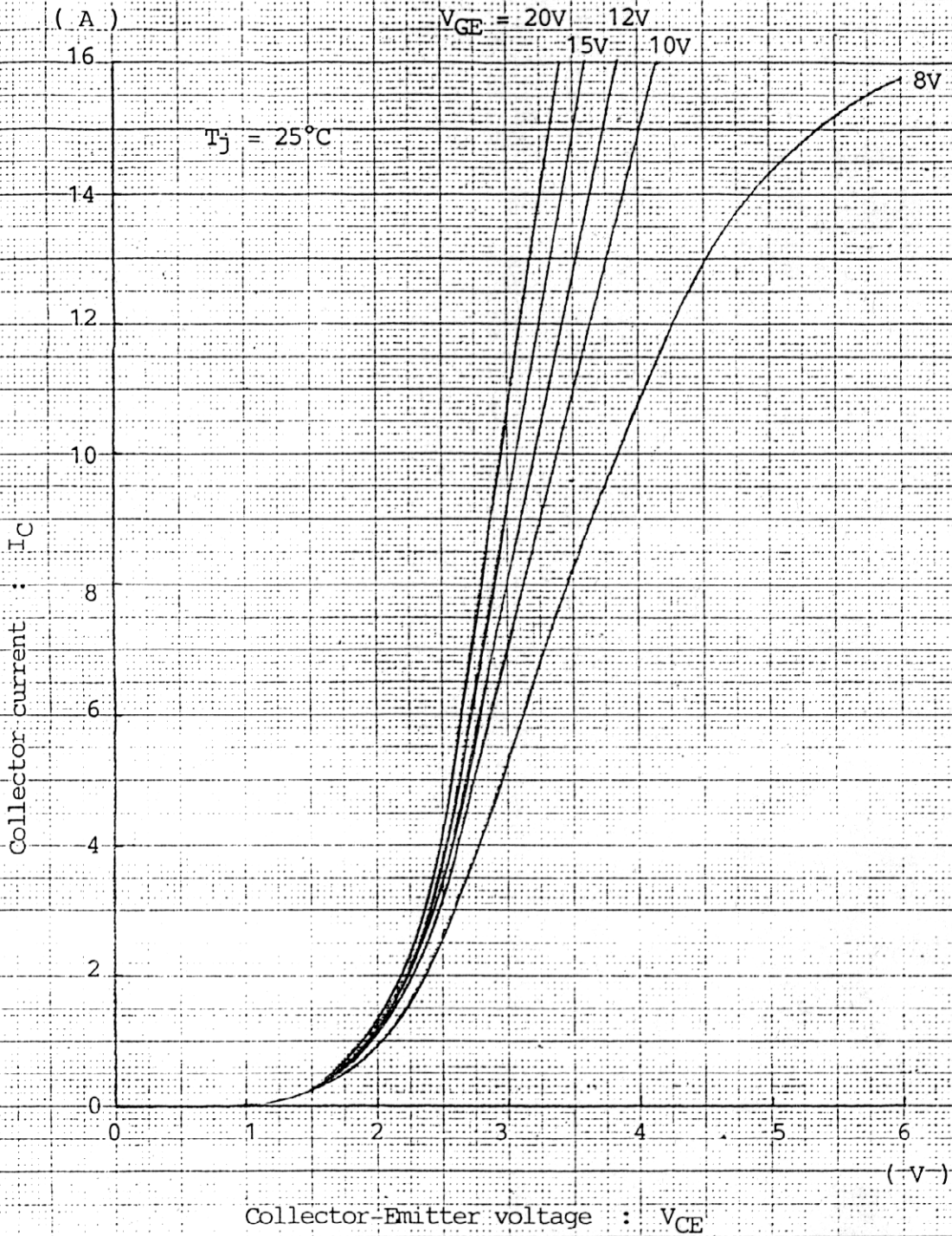
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Collector current vs.  
Collector-Emmitter voltage

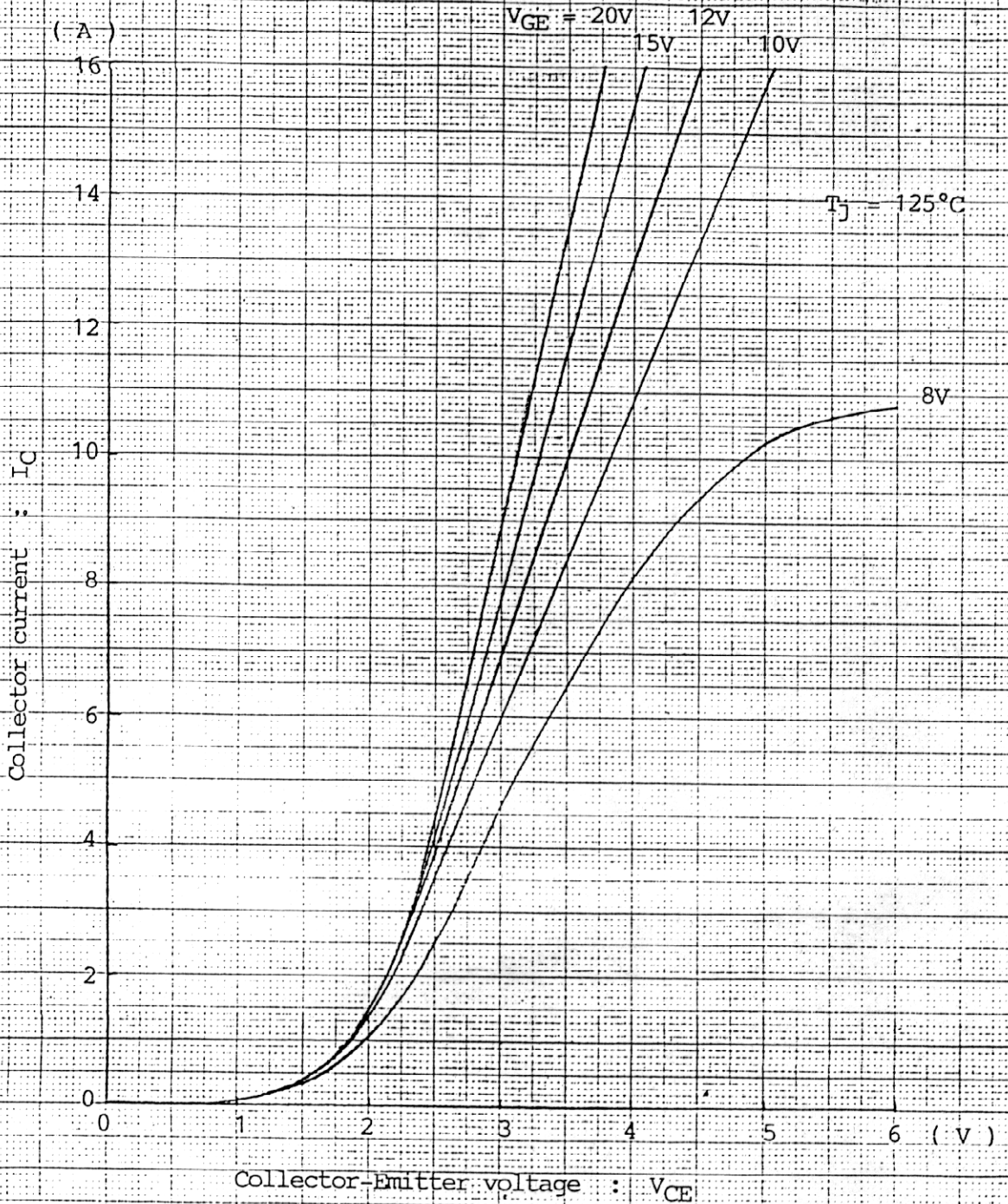


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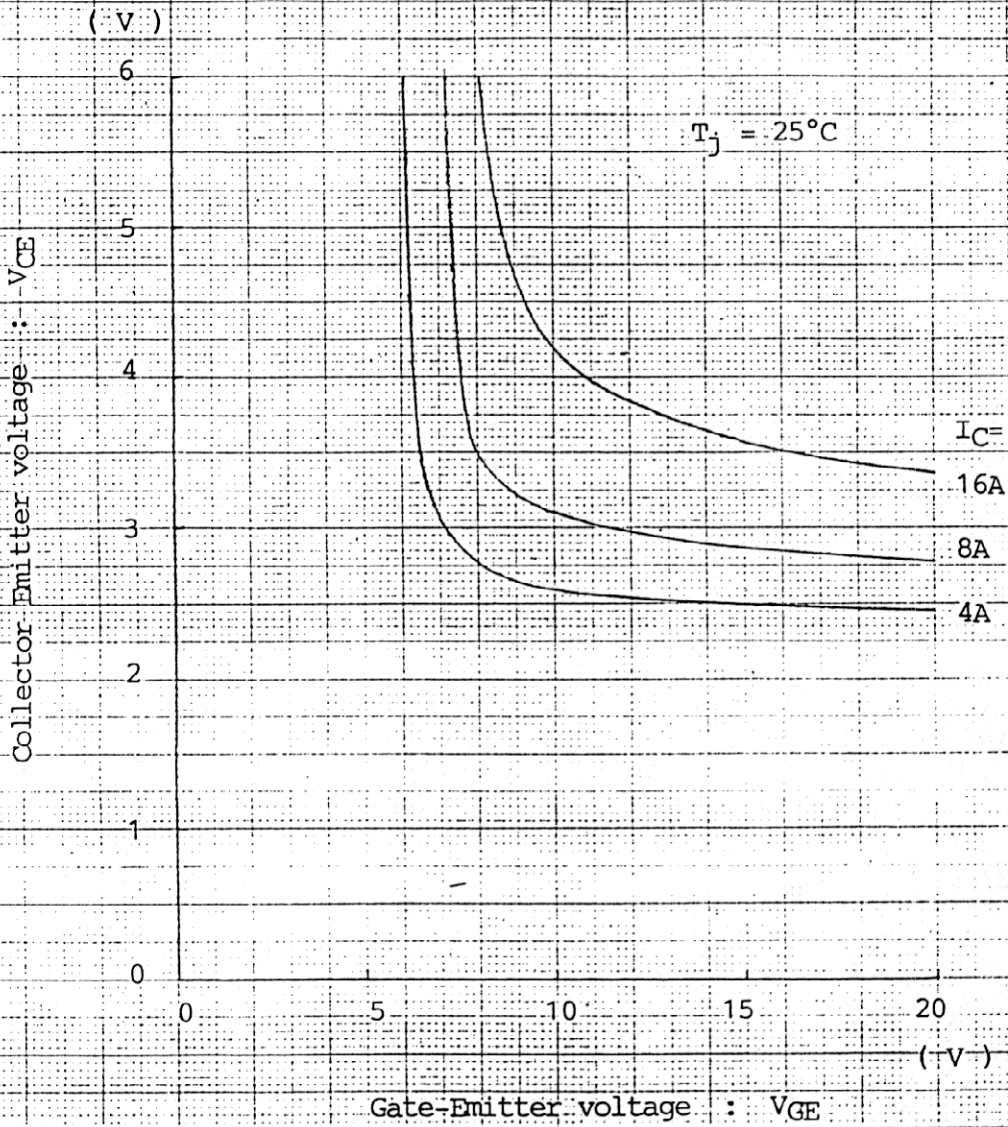
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Collector current vs.  
Collector-Emmitter voltage



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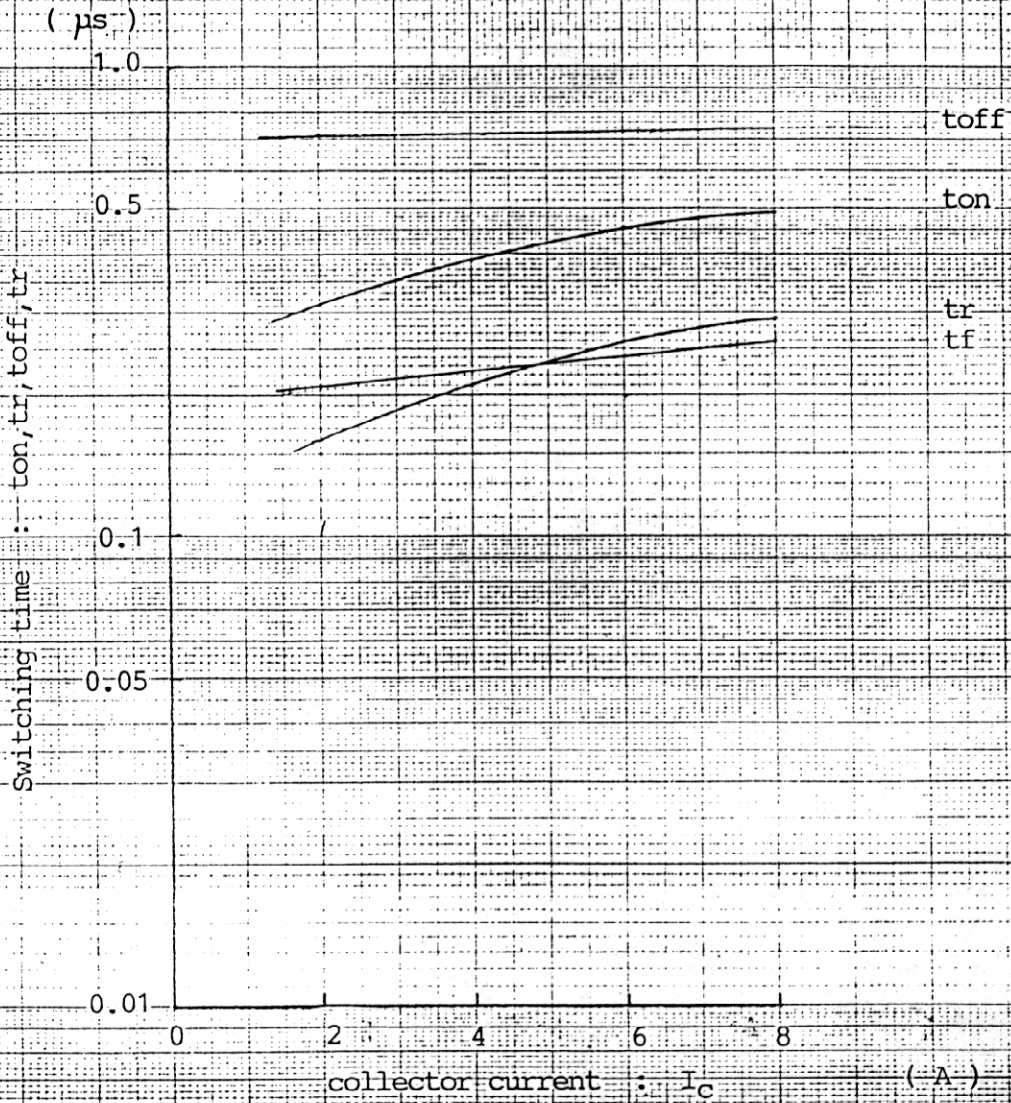
Collector-Emmitter voltage vs.  
Gate-Emmitter voltage



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Switching time - Collector current

$V_{CE} = 600V$   
 $V_{GE} = \pm 15V$   
 $R_G = 150\Omega$   
 $T_j = 25^\circ C$

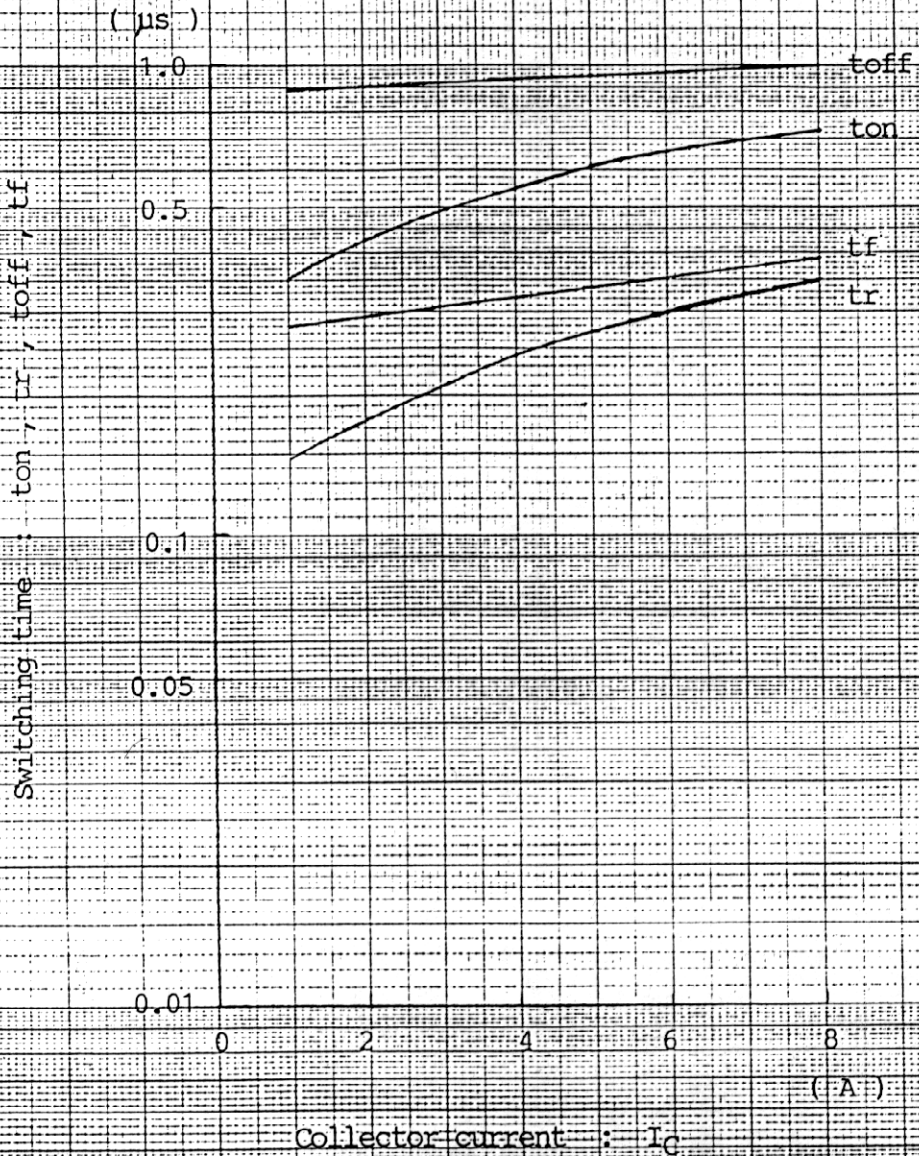




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Switching time - Collector current

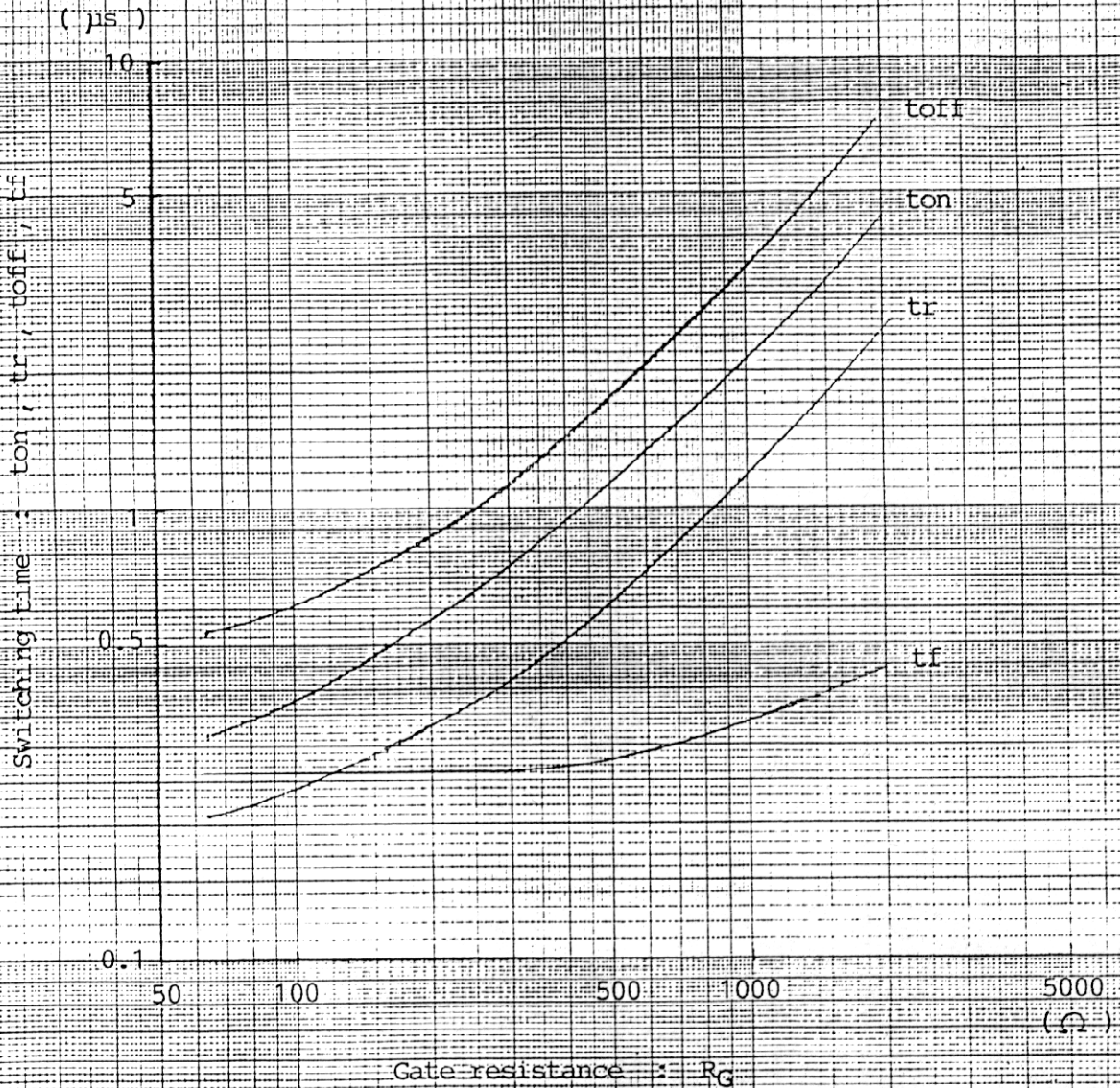
$V_{CE} = 600V$   
 $V_{GE} = \pm 15V$   
 $R_G = 150\Omega$   
 $T_j = 125^\circ C$



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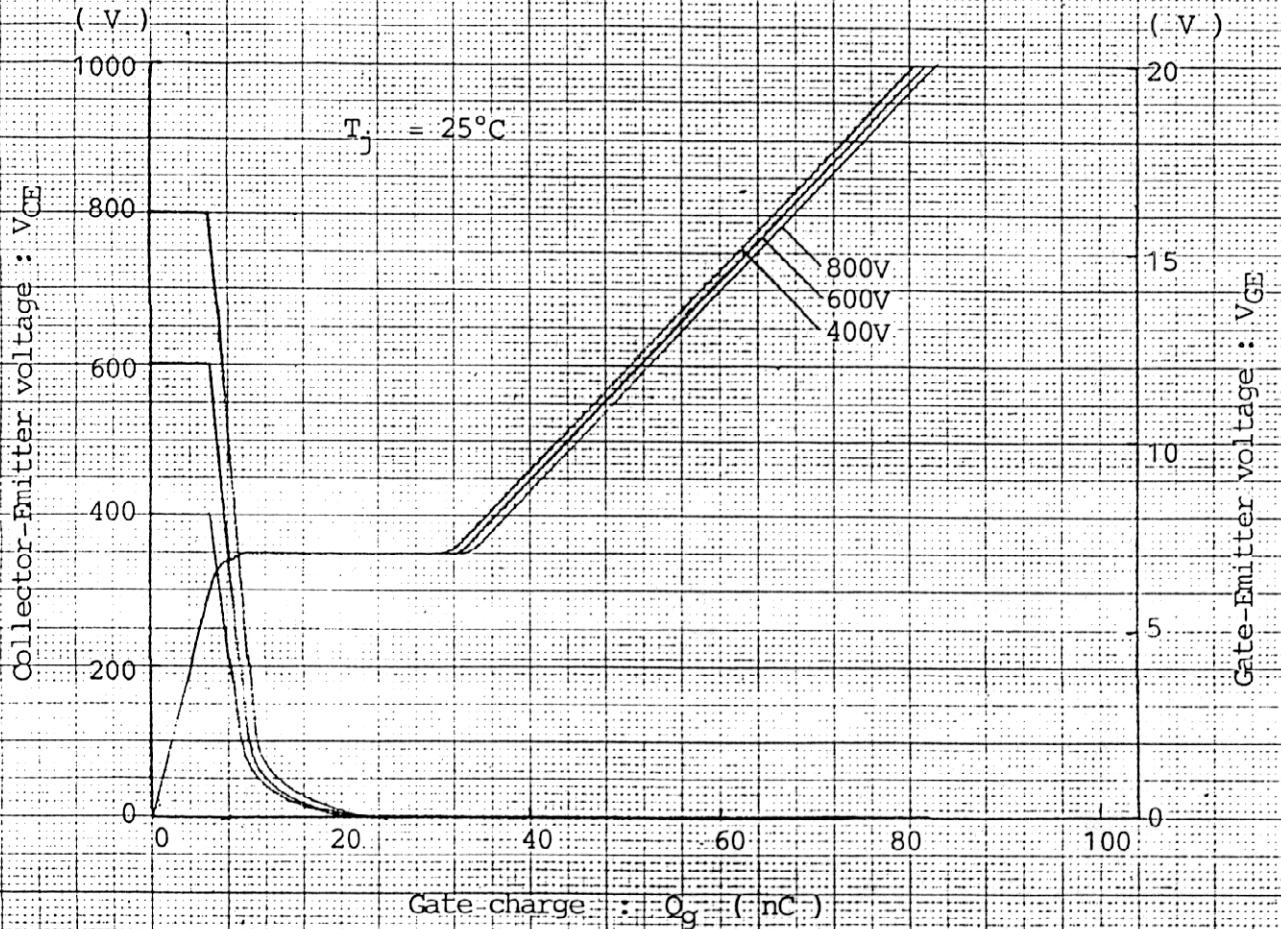
Switching time ~  $R_G$

$V_{CE} = 600V$   
 $I_C = 8A$   
 $V_{GE} = \pm 15V$   
 $T_j = 25^\circ C$



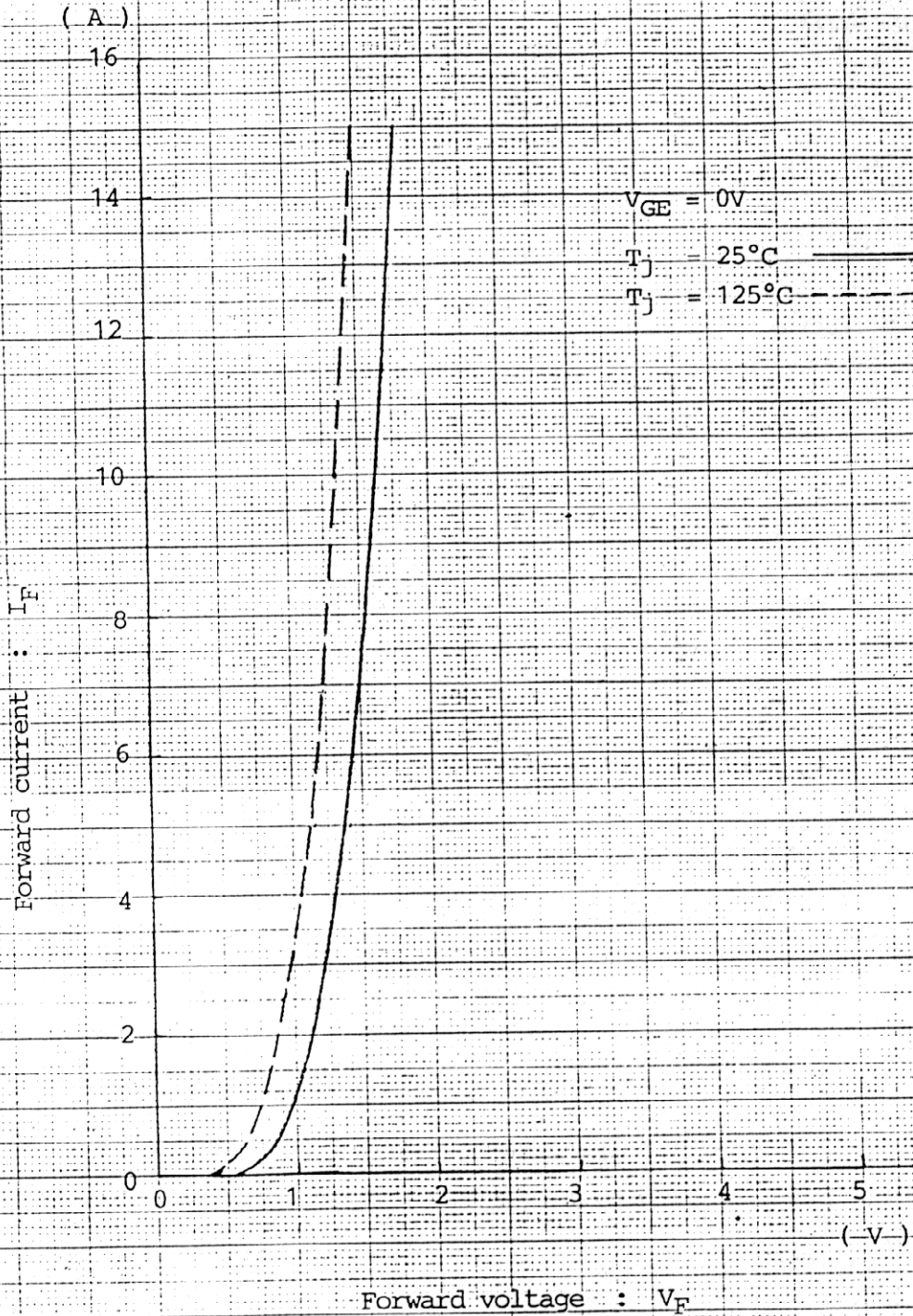
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Dynamic input characteristics



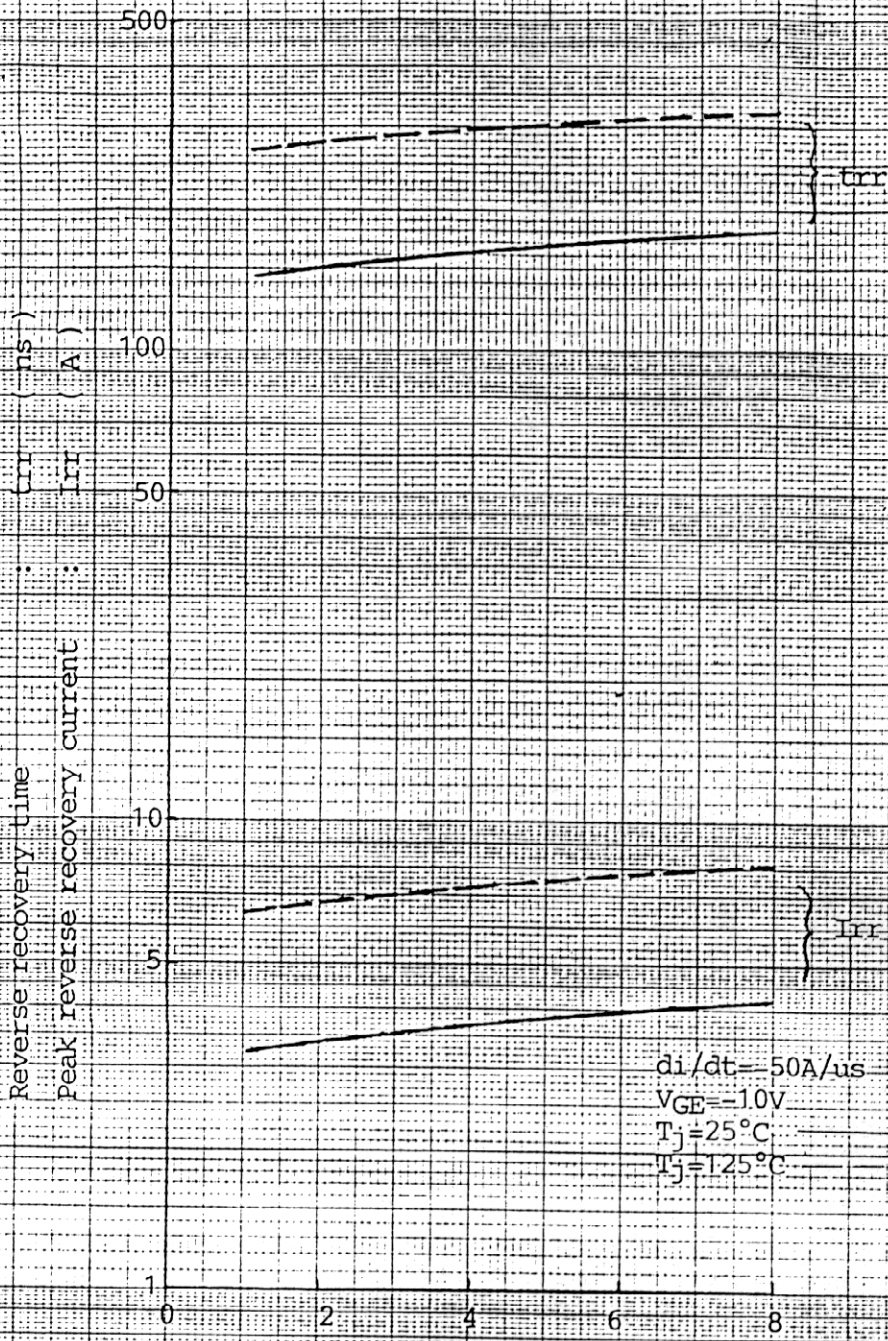
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Forward current vs. Forward voltage



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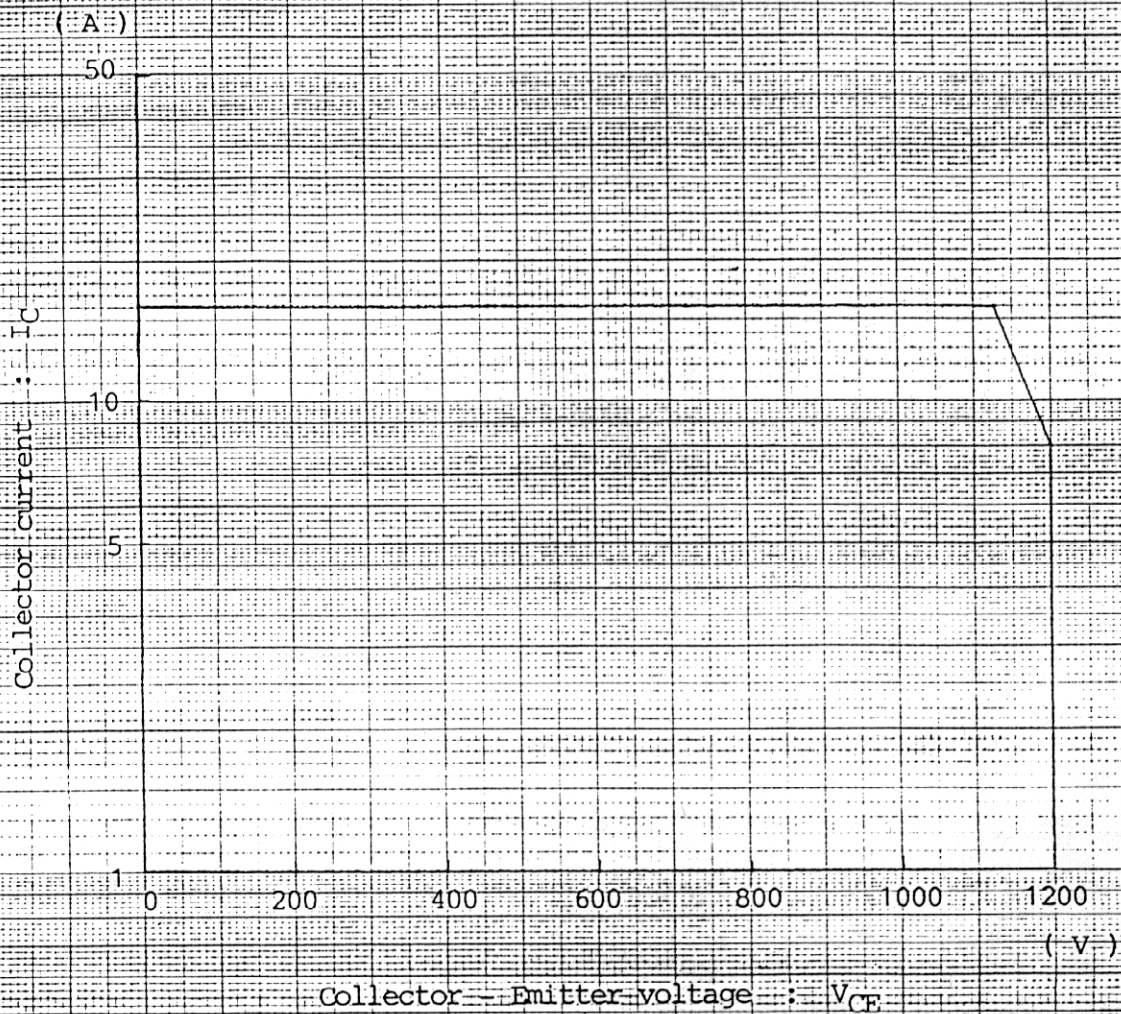
$I_F$   $t_{rr}$ ,  $I_{rr}$



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Reverse biased safe operating area

$T_j = -25^\circ\text{C}$   
 $+V_{GE} = -15\text{V}$   
 $-V_{CE} \leq 15\text{V}$   
 $R_G = 150\Omega$



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