

# SuperSOT

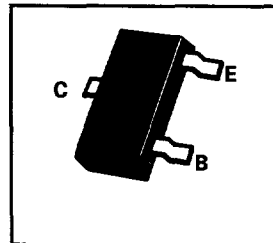
## SOT23 PNP SILICON POWER (SWITCHING) TRANSISTORS

FMMT717 FMMT718  
FMMT720 FMMT722  
FMMT723

ISSUE 3 JUNE 1996

### FEATURES

- \* **625mW POWER DISSIPATION**
- \*  $I_C$  CONT 2.5A
- \*  $I_C$  Up To 10A Peak Pulse Current
- \* Excellent  $h_{fe}$  Characteristics Up To 10A (pulsed)
- \* Extremely Low Saturation Voltage E.g. 10mV Typ.
- \* Exhibits extremely low equivalent on-resistance;  $R_{CE(sat)}$



DEVICE TYPE	COMPLEMENT	PARTMARKING	$R_{CE(sat)}$
FMMT717	FMMT617	717	72m $\Omega$ at 2.5A
FMMT718	FMMT618	718	97m $\Omega$ at 1.5A
FMMT720	FMMT619	720	163m $\Omega$ at 1.5A
FMMT722	-	722	-
FMMT723	FMMT624	723	-

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	FMMT 717	FMMT 718	FMMT 720	FMMT 722	FMMT 723	UNIT
Collector-Base Voltage	$V_{CBO}$	-12	-20	-40	-70	-100	V
Collector-Emitter Voltage	$V_{CEO}$	-12	-20	-40	-70	-100	V
Emitter-Base Voltage	$V_{EBO}$	-5	-5	-5	-5	-5	V
Peak Pulse Current**	$I_{CM}$	-10	-6	-4	-3	-2.5	A
<b>Continuous Collector Current</b>	$I_C$	<b>-2.5</b>	<b>-1.5</b>	<b>-1.5</b>	<b>-1.5</b>	<b>-1</b>	<b>A</b>
Base Current	$I_B$	-500					mA
<b>Power Dissipation at <math>T_{amb}=25^\circ C^*</math></b>	$P_{tot}$	<b>625</b>					<b>mW</b>
Operating and Storage Temperature Range	$T_j; T_{stg}$	-55 to +150					$^\circ C$

\*Maximum power dissipation is calculated assuming that the device is mounted on a ceramic substrate measuring 15x15x0.6mm

\*\*Measured under pulsed conditions. Pulse width=300 $\mu s$ . Duty cycle  $\leq 2\%$   
Spice parameter data is available upon request for these devices

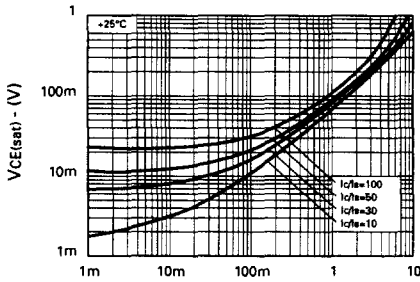
# FMMT717

## ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated).

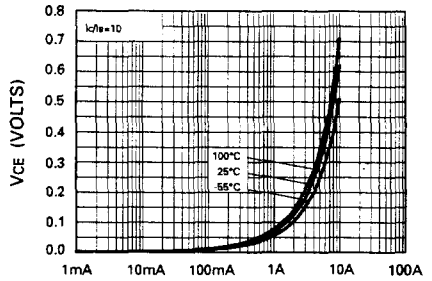
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-12	-35		V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-12	-25		V	$I_C = -10\text{mA}^*$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5	-8.5		V	$I_E = -100\mu\text{A}$
Collector Cut-Off Current	$I_{CBO}$			-100	nA	$V_{CB} = -10\text{V}$
Emitter Cut-Off Current	$I_{EBO}$			-100	nA	$V_{EB} = -4\text{V}$
Collector Emitter Cut-Off Current	$I_{CES}$			-100	nA	$V_{CES} = -10\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-10	-17	mV	$I_C = -0.1\text{A}, I_B = -10\text{mA}^*$
			-100	-140	mV	$I_C = -1\text{A}, I_B = -10\text{mA}^*$
			-110	-170	mV	$I_C = -1.5\text{A}, I_B = -50\text{mA}^*$
			-180	-220	mV	$I_C = -2.5\text{A}, I_B = -50\text{mA}^*$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.9	-1.0	V	$I_C = -2.5\text{A}, I_B = -50\text{mA}^*$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.8	-1.0	V	$I_C = -2.5\text{A}, V_{CE} = -2\text{V}^*$
Static Forward Current Transfer Ratio	$h_{FE}$	300	475			$I_C = -10\text{mA}, V_{CE} = -2\text{V}^*$
		300	450			$I_C = -100\text{mA}, V_{CE} = -2\text{V}^*$
		180	275			$I_C = -2.5\text{A}, V_{CE} = -2\text{V}^*$
		60	100			$I_C = -8\text{A}, V_{CE} = -2\text{V}^*$
		45	70			$I_C = -10\text{A}, V_{CE} = -2\text{V}^*$
Transition Frequency	$f_T$	80	110		MHz	$I_C = -50\text{mA}, V_{CE} = -10\text{V}$ $f = 100\text{MHz}$
Output Capacitance	$C_{obo}$		21	30	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Turn-On Time	$t_{(on)}$		70		ns	$V_{CC} = -6\text{V}, I_C = -2\text{A}$
Turn-Off Time	$t_{(off)}$		130		ns	$I_{B1} = I_{B2} = 50\text{mA}$

\*Measured under pulsed conditions. Pulse width=300 $\mu\text{s}$ . Duty cycle  $\leq 2\%$

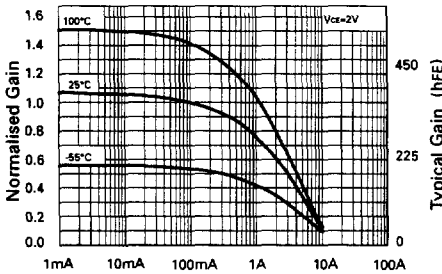
## TYPICAL CHARACTERISTICS



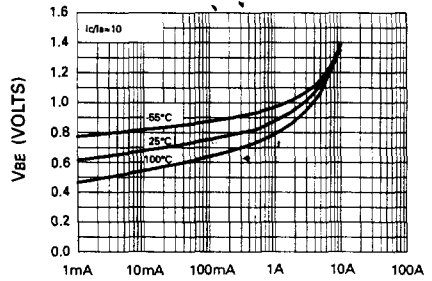
Collector Current (A)  
 **$V_{CE(sat)}$  vs  $I_C$**



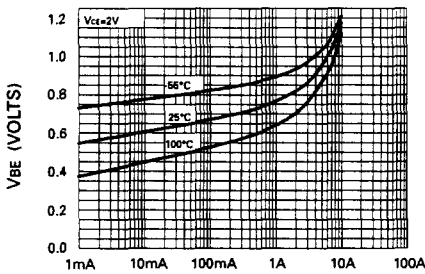
Collector Current  
 **$V_{CE(sat)}$  vs  $I_C$**



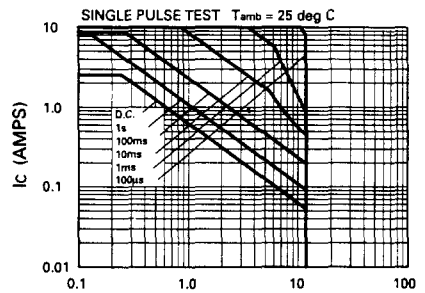
Collector Current  
**hFE vs  $I_C$**



Collector Current  
 **$V_{BE(sat)}$  vs  $I_C$**



Collector Current  
 **$V_{BE(ON)}$  vs  $I_C$**



**Safe Operating Area**

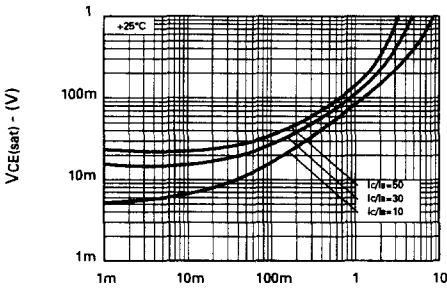
# FMMT718 FMMT720

## ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated).

PARAMETER	SYMBOL	FMMT718			FMMT720			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-20	-65		-40	-95		V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-20	-55		-40	-85		V	$I_C = -10\text{mA}^*$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5	-8.8		-5	-8.8		V	$I_E = -100\mu\text{A}$
Collector Cut-Off Current	$I_{CBO}$			-100				nA nA	$V_{CB} = -15\text{V}$ $V_{CB} = -35\text{V}$
Emitter Cut-Off Current	$I_{EBO}$			-100				nA	$V_{EB} = -4\text{V}$
Collector Emitter Cut-Off Current	$I_{CES}$			-100				nA nA	$V_{CES} = -15\text{V}$ $V_{CES} = -35\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-16 -130 -145	-40 -200 -220		-25 -150 -245	-40 -220 -330	mV mV mV mV	$I_C = -0.1\text{A}, I_B = -10\text{mA}^*$ $I_C = -1\text{A}, I_B = -20\text{mA}^*$ $I_C = -1\text{A}, I_B = -50\text{mA}^*$ $I_C = -1.5\text{A}, I_B = -50\text{mA}^*$ $I_C = -1.5\text{A}, I_B = -100\text{mA}^*$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.87	-1.0		-0.89	-1.0	V V	$I_C = -1.5\text{A}, I_B = -50\text{mA}^*$ $I_C = -1.5\text{A}, I_B = -75\text{mA}^*$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.81	-1.0		-0.80	-1.0	V V	$I_C = -2\text{A}, V_{CE} = -2\text{V}^*$ $I_C = -1.5\text{A}, V_{CE} = -2\text{V}^*$
Static Forward Current Transfer Ratio	$h_{FE}$	300 300	475 450		300 300 180 60	480 450 290 130			$I_C = -10\text{mA}, V_{CE} = -2\text{V}^*$ $I_C = -0.1\text{A}, V_{CE} = -2\text{V}^*$ $I_C = -1\text{A}, V_{CE} = -2\text{V}^*$ $I_C = -1.5\text{A}, V_{CE} = -2\text{V}^*$ $I_C = -2\text{A}, V_{CE} = -2\text{V}^*$ $I_C = -3\text{A}, V_{CE} = -2\text{V}^*$ $I_C = -4\text{A}, V_{CE} = -2\text{V}^*$ $I_C = -6\text{A}, V_{CE} = -2\text{V}^*$
Transition Frequency	$f_T$	150	180		150	190		MHz	$I_C = -50\text{mA}, V_{CE} = -10\text{V}$ $f = 100\text{MHz}$
Output Capacitance	$C_{obo}$		21	30		19	25	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Turn-On Time	$t_{(on)}$		40					ns	$V_{CC} = -10\text{V}, I_C = -1\text{A}$ $I_{B1} = I_{B2} = -20\text{mA}$
Turn-Off Time	$t_{(off)}$		670					ns	
Turn-On Time	$t_{(on)}$					40		ns	$V_{CC} = -15\text{V}, I_C = -0.75\text{A}$ $I_{B1} = I_{B2} = -15\text{mA}$
Turn-Off Time	$t_{(off)}$					435		ns	

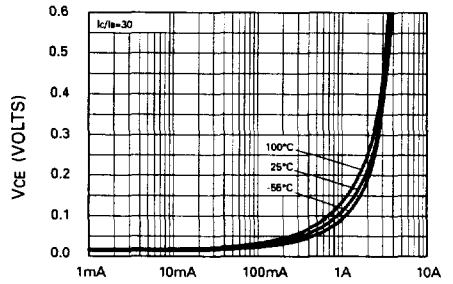
\*Measured under pulsed conditions. Pulse width=300 $\mu\text{s}$ . Duty cycle  $\leq 2\%$

## TYPICAL CHARACTERISTICS



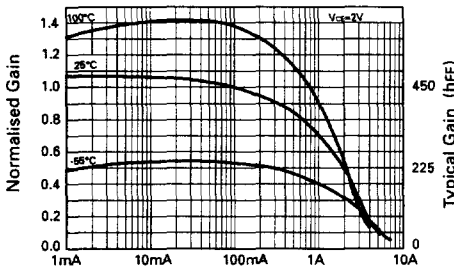
$I_C$  - Collector Current (A)

**$V_{CE(SAT)}$  v  $I_C$**



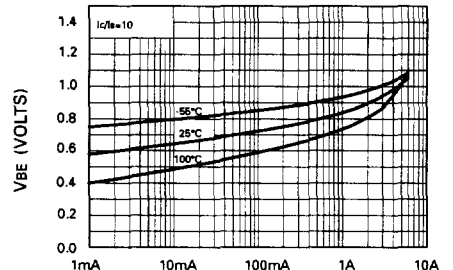
Collector Current

**$V_{CE(SAT)}$  vs  $I_C$**



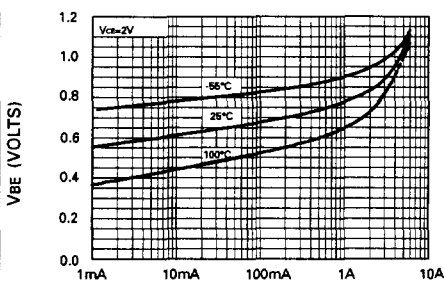
Collector Current

**hFE vs  $I_C$**



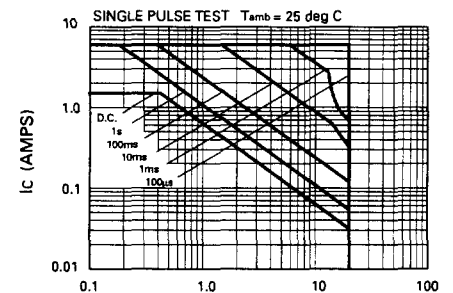
Collector Current

**$V_{BE(SAT)}$  vs  $I_C$**



Collector Current

**$V_{BE(ON)}$  vs  $I_C$**

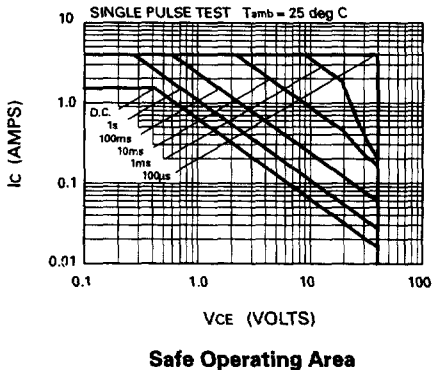
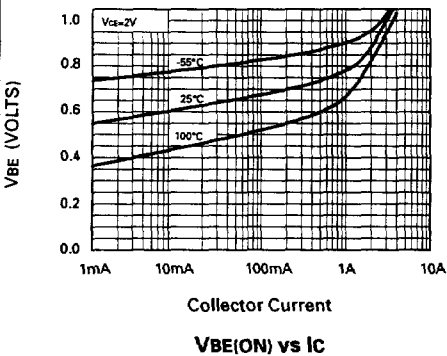
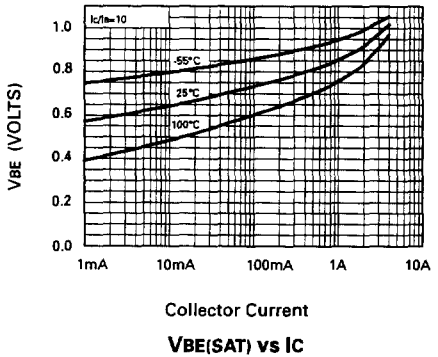
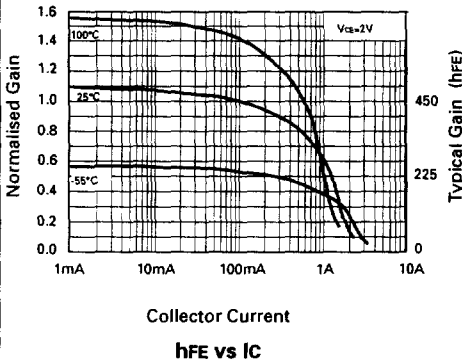
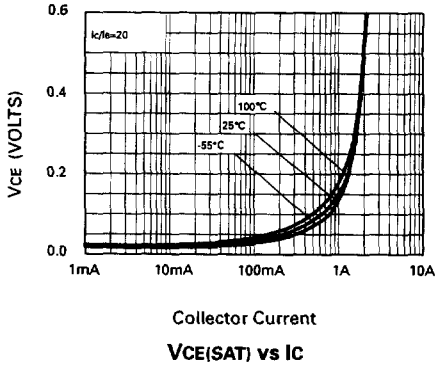
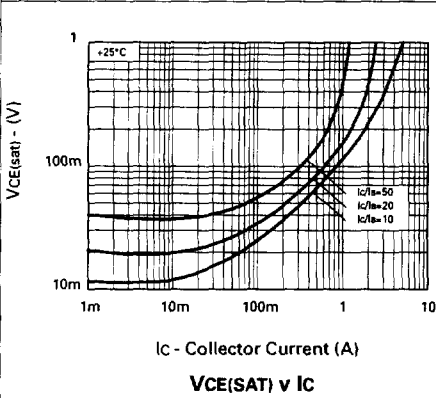


$V_{CE}$  (VOLTS)

**Safe Operating Area**

# FMMT720

## TYPICAL CHARACTERISTICS



# FMMT722 FMMT723

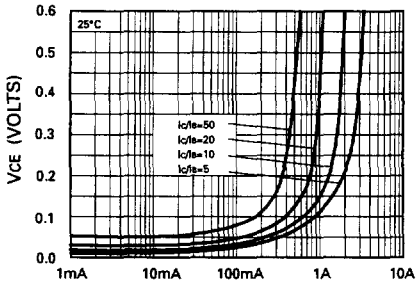
## ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated).

PARAMETER	SYMBOL	FMMT722			FMMT723			UNIT	CONDITIONS.
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-70	-150		-100	-200		V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-70	-125		-100	-160		V	$I_C = -10\text{mA}^*$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5	-8.8		-5	-8.8		V	$I_E = -100\mu\text{A}$
Collector Cut-Off Current	$I_{CBO}$			-100			-100	nA nA	$V_{CB} = -60\text{V}$ $V_{CB} = -80\text{V}$
Emitter Cut-Off Current	$I_{EBO}$			-100			-100	nA	$V_{EB} = -4\text{V}$
Collector Emitter Cut-Off Current	$I_{CES}$			-100			-100	nA nA	$V_{CES} = -60\text{V}$ $V_{CES} = -80\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-35 -135 -140 -175	-50 -200 -220 -260		-50 -80 -125 -200 -210 -330		mV mV mV mV mV	$I_C = -0.1\text{A}, I_B = -10\text{mA}^*$ $I_C = -0.5\text{A}, I_B = -20\text{mA}^*$ $I_C = -0.5\text{A}, I_B = -50\text{mA}^*$ $I_C = -1\text{A}, I_B = -100\text{mA}^*$ $I_C = -1\text{A}, I_B = -150\text{mA}^*$ $I_C = -1.5\text{A}, I_B = -200\text{mA}^*$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.94	-1.05		-0.89	-1.0	V	$I_C = -1\text{A}, I_B = -150\text{mA}^*$ $I_C = -1.5\text{A}, I_B = -200\text{mA}^*$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.78	-1.0		-0.71	-1.0	V	$I_C = -1\text{A}, V_{CE} = -10\text{V}^*$ $I_C = -1.5\text{A}, V_{CE} = -5\text{V}^*$
Static Forward Current Transfer Ratio	$h_{FE}$	300 300 175 40	470 450 275 60 10		300 300 250	475 450 375 250 30			$I_C = -10\text{mA}, V_{CE} = -5\text{V}^*$ $I_C = -10\text{mA}, V_{CE} = -10\text{V}^*$ $I_C = -0.1\text{A}, V_{CE} = -5\text{V}^*$ $I_C = -0.1\text{A}, V_{CE} = -10\text{V}^*$ $I_C = -0.5\text{A}, V_{CE} = -10\text{V}^*$ $I_C = -1\text{A}, V_{CE} = -5\text{V}^*$ $I_C = -1\text{A}, V_{CE} = -10\text{V}^*$ $I_C = -1.5\text{A}, V_{CE} = -5\text{V}^*$ $I_C = -1.5\text{A}, V_{CE} = -10\text{V}^*$ $I_C = -3\text{A}, V_{CE} = -5\text{V}^*$
Transition Frequency	$f_T$	150	200		150	200		MHz	$I_C = -50\text{mA}, V_{CE} = -10\text{V}$ $f = 100\text{MHz}$
Output Capacitance	$C_{obo}$		14	20		13	20	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Turn-On Time	$t_{(on)}$		40			50		ns	$V_{CC} = -50\text{V}, I_C = -0.5\text{A}$ $I_{B1} = I_{B2} = -50\text{mA}$
Turn-Off Time	$t_{(off)}$		700			760		ns	

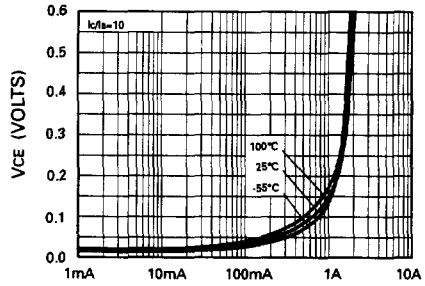
\*Measured under pulsed conditions. Pulse width=300 $\mu\text{s}$ . Duty cycle  $\leq$  2%

# FM722

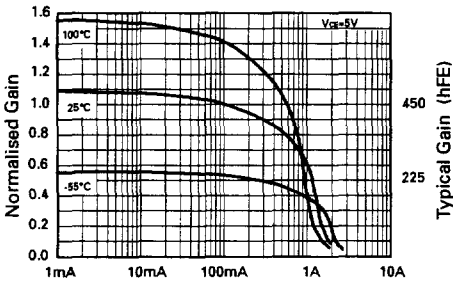
## TYPICAL CHARACTERISTICS



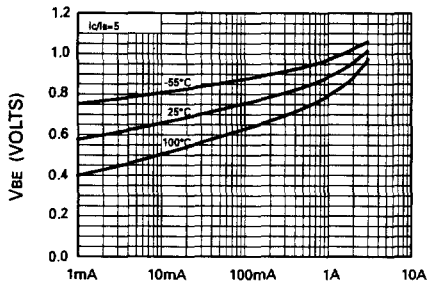
Collector Current  
**VBE(SAT) vs IC**



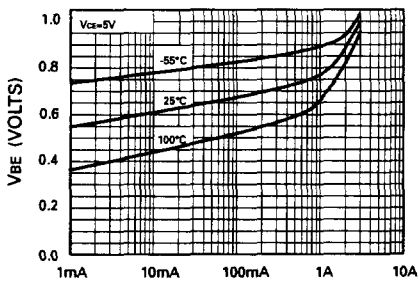
Collector Current  
**VCE(SAT) vs IC**



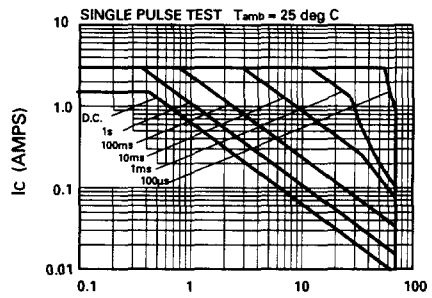
Collector Current  
**hFE vs IC**



Collector Current  
**VBE(SAT) vs IC**



Collector Current  
**VBE(ON) vs IC**



**Safe Operating Area**



# FMMT723

## TYPICAL CHARACTERISTICS

