



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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## Features & Benefits

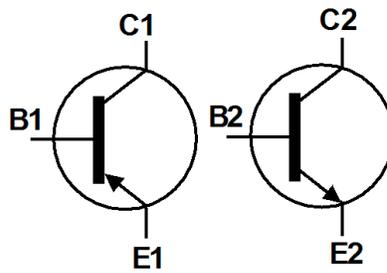
- Complementary Pairs:
  - One 2222A Type (NPN)
  - One 2907A Type (PNP)
- Ideal for Low-Power Amplification and Switching

## Mechanical Data

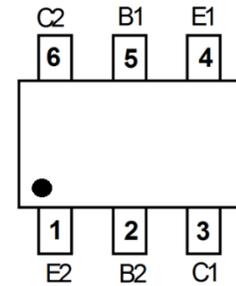
- Package: SOT363
- Package Material: Molded Plastic, "Green" Molding Compound  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 ③
- Weight: 0.006 grams (approximate)



Top View



Device Symbol



Top View  
Pin-Out

**Maximum Ratings, 2222A Type (NPN)** (@  $T_{amb} = +25^{\circ}\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	75	V
Collector-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6	V
Continuous Collector Current	$I_C$	600	mA

**Maximum Ratings, 2907A Type (PNP)** (@  $T_{amb} = +25^{\circ}\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	-60	V
Collector-Emitter Voltage	$V_{CEO}$	-60	V
Emitter-Base Voltage	$V_{EBO}$	-6	V
Continuous Collector Current	$I_C$	-600	mA

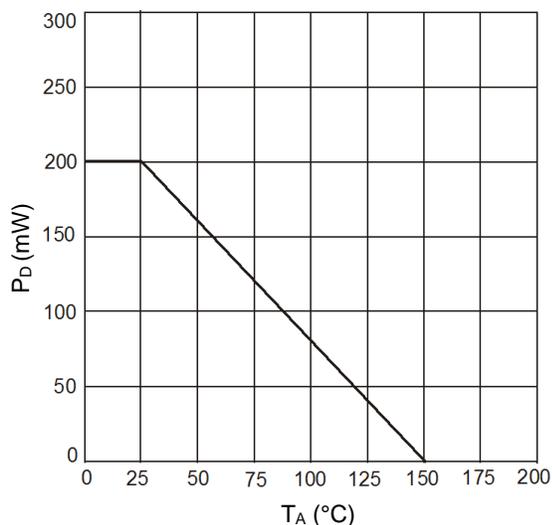
**Thermal Characteristics** (@  $T_{amb} = +25^{\circ}\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	$P_D$	200	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	625	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Case (Note 6)	$R_{\theta JC}$	150	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^{\circ}\text{C}$

**ESD Ratings** (Note 7)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

Notes: 5. For the device mounted on minimum recommended pad layout FR-4, device is measured under still air conditions whilst operating in a steady-state.  
 6. Thermal resistance from junction to the top of package.  
 7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

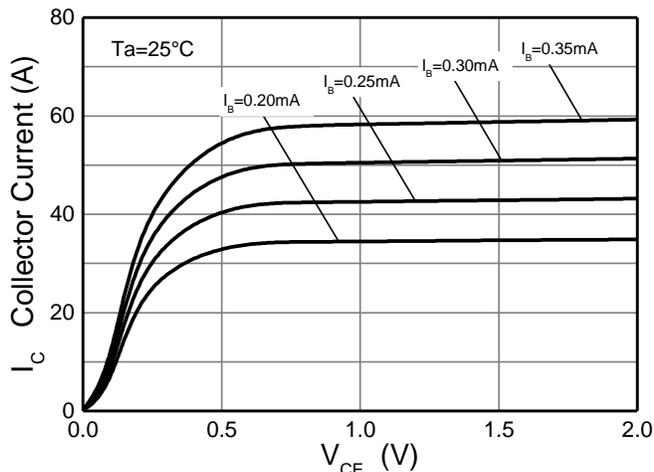
**Thermal Characteristic and Derating Information**

**Figure 1.  $P_D$  v  $T_A$**

**Electrical Characteristics, 2222A Type (NPN)** (@  $T_{amb} = +25^{\circ}\text{C}$ , unless otherwise specified.)

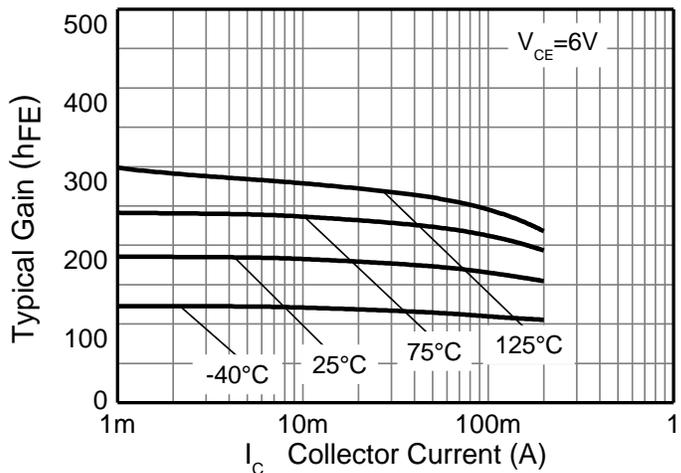
Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>					
Collector-Base Breakdown Voltage	$BV_{CBO}$	75	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage	$BV_{CEO}$	40	—	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	6.0	—	V	$I_E = 100\mu\text{A}$
Collector Cutoff Current	$I_{CBO}$	—	10	nA $\mu\text{A}$	$V_{CB} = 60\text{V}$ $V_{CB} = 60\text{V}, T_{amb} = +150^{\circ}\text{C}$
Collector Cutoff Current	$I_{CEX}$	—	10	nA	$V_{CE} = 60\text{V}, V_{EB(off)} = 3.0\text{V}$
Emitter Cutoff Current	$I_{EBO}$	—	10	nA	$V_{EB} = 5.0\text{V}$
Base Cutoff Current	$I_{BL}$	—	20	nA	$V_{CE} = 60\text{V}, V_{EB(off)} = 3.0\text{V}$
<b>ON CHARACTERISTICS (Note 8)</b>					
DC Current Gain	$h_{FE}$	35	—	—	$I_C = 100\mu\text{A}, V_{CE} = 10\text{V}$ $I_C = 1\text{mA}, V_{CE} = 10\text{V}$ $I_C = 10\text{mA}, V_{CE} = 10\text{V}$ $I_C = 150\text{mA}, V_{CE} = 10\text{V}$ $I_C = 500\text{mA}, V_{CE} = 10\text{V}$ $I_C = 10\text{mA}, V_{CE} = 10\text{V}, T_{amb} = -55^{\circ}\text{C}$ $I_C = 150\text{mA}, V_{CE} = 1\text{V}$
		50	—		
		75	—		
		100	300		
		40	—		
		50	—		
35	—				
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	0.3 1.0	V	$I_C = 150\text{mA}, I_B = 15\text{mA}$ $I_C = 500\text{mA}, I_B = 50\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.6 —	1.2 2.0	V	$I_C = 150\text{mA}, I_B = 15\text{mA}$ $I_C = 500\text{mA}, I_B = 50\text{mA}$
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	$C_{obo}$	—	8	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$
Input Capacitance	$C_{ibo}$	—	25	pF	$V_{EB} = 0.5\text{V}, f = 1\text{MHz}$
Current Gain-Bandwidth Product	$f_T$	300	—	MHz	$V_{CE} = 20\text{V}, I_C = 20\text{mA}, f = 100\text{MHz}$
Noise Figure	NF	—	4.0	dB	$V_{CE} = 10\text{V}, I_C = 100\mu\text{A}, R_S = 1\text{k}\Omega, f = 1\text{kHz}$
<b>SWITCHING CHARACTERISTICS</b>					
Delay Time	$t_d$	—	10	ns	$V_{CC} = 30\text{V}, I_C = 150\text{mA}, V_{BE(off)} = -0.5\text{V}, I_{B1} = 15\text{mA}$
Rise Time	$t_r$	—	25	ns	
Storage Time	$t_s$	—	225	ns	$V_{CC} = 30\text{V}, I_C = 150\text{mA}, I_{B1} = -I_{B2} = 15\text{mA}$
Fall Time	$t_f$	—	60	ns	

 Note: 8. Pulse test: Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

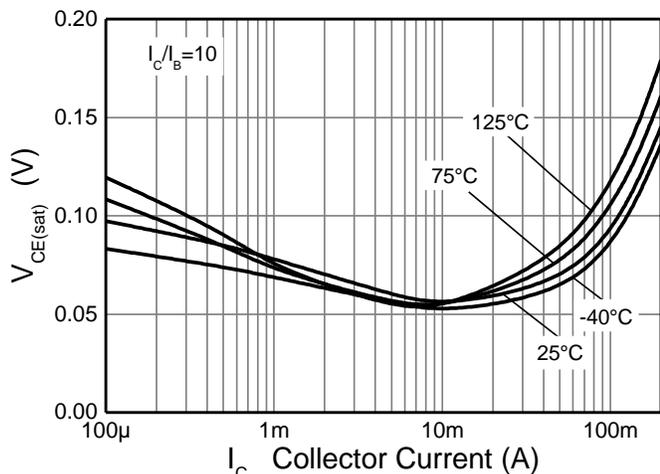
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



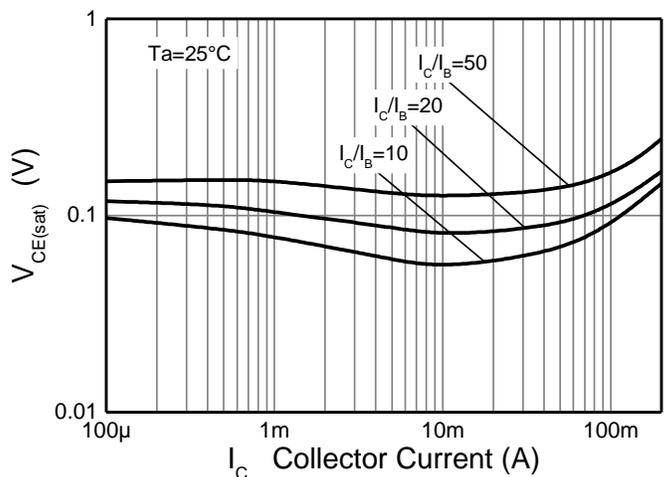
**Figure 2.  $I_C$  v  $V_{CE}$**



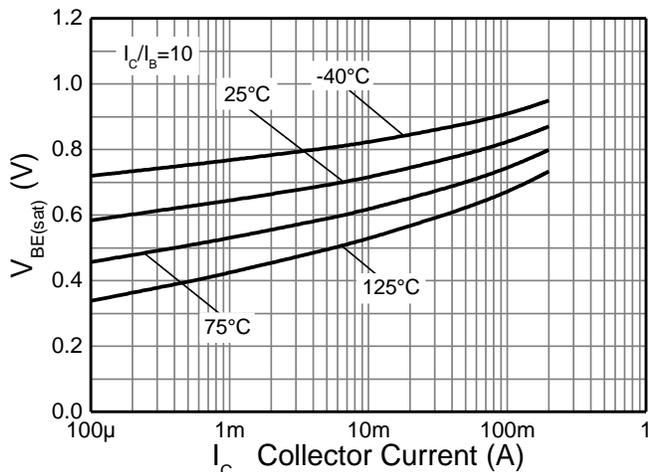
**Figure 3.  $h_{FE}$  v  $I_C$**



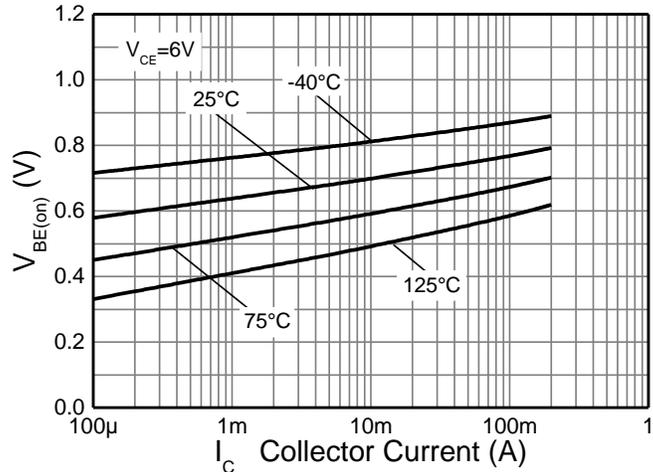
**Figure 4.  $V_{CE(sat)}$  v  $I_C$**



**Figure 5.  $V_{CE(sat)}$  v  $I_C$**

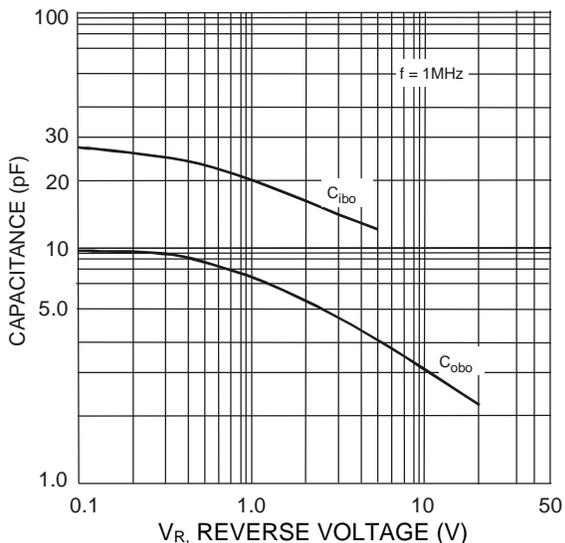


**Figure 6.  $V_{BE(sat)}$  v  $I_C$**

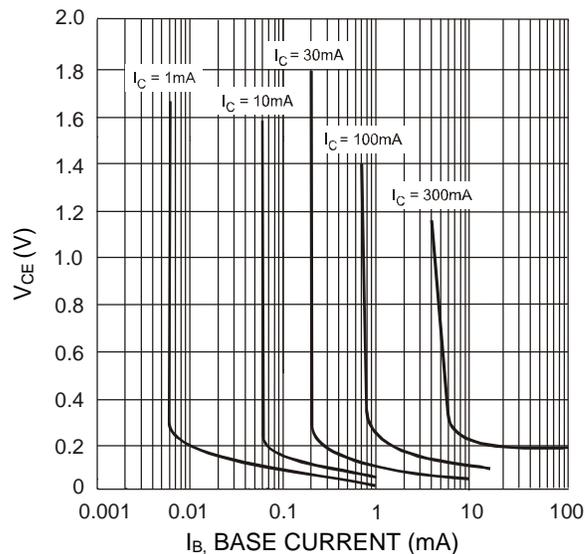


**Figure 7.  $V_{BE(on)}$  v  $I_C$**

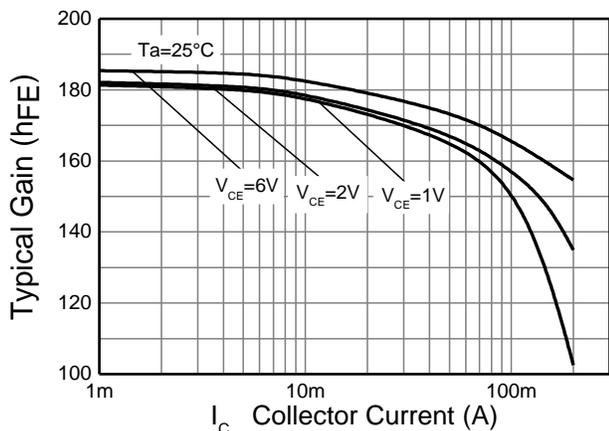
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Figure 8. Capacitance v  $V_R$**



**Figure 9.  $V_{CE}$  v  $I_B$**



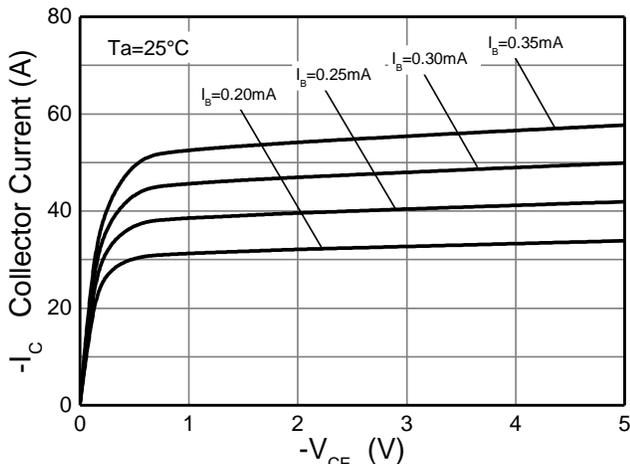
**Figure 10.  $h_{FE}$  v  $I_C$**

**Electrical Characteristics, 2907A Type (PNP)** (@ $T_{amb} = +25^{\circ}C$ , unless otherwise specified.)

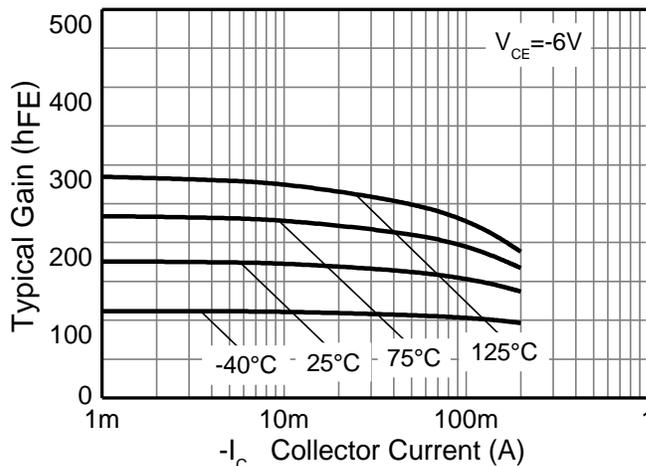
Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 9)</b>					
Collector-Base Breakdown Voltage	$BV_{CBO}$	-60	—	V	$I_C = -100\mu A$
Collector-Emitter Breakdown Voltage	$BV_{CEO}$	-60	—	V	$I_C = -10mA$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-6.0	—	V	$I_E = -100\mu A$
Collector Cutoff Current	$I_{CBO}$	—	-10	nA $\mu A$	$V_{CB} = -50V$ $V_{CB} = -50V, T_{amb} = +125^{\circ}C$
Collector Cutoff Current	$I_{CEX}$	—	-50	nA	$V_{CE} = -30V, V_{EB(off)} = -0.5V$
Base Cutoff Current	$I_{BL}$	—	-50	nA	$V_{CE} = -30V, V_{EB(off)} = -0.5V$
<b>ON CHARACTERISTICS (Note 9)</b>					
DC Current Gain	$h_{FE}$	75 100 100 100 50	— — — 300 —	—	$I_C = -100\mu A, V_{CE} = -10V$ $I_C = -1.0mA, V_{CE} = -10V$ $I_C = -10mA, V_{CE} = -10V$ $I_C = -150mA, V_{CE} = -10V$ $I_C = -500mA, V_{CE} = -10V$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	-0.4 -1.6	V	$I_C = -150mA, I_B = -15mA$ $I_C = -500mA, I_B = -50mA$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	-1.3 -2.6	V	$I_C = 150mA, I_B = 15mA$ $I_C = 500mA, I_B = 50mA$
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	$C_{obo}$	—	8.0	pF	$V_{CB} = -10V, f = 1MHz$
Input Capacitance	$C_{ibo}$	—	30	pF	$V_{EB} = -2V, f = 1MHz$
Current Gain-Bandwidth Product	$f_T$	200	—	MHz	$V_{CE} = -20V, I_C = -50mA,$ $f = 100MHz$
<b>SWITCHING CHARACTERISTICS</b>					
Turn-On Time	$t_{on}$	—	45	ns	—
Delay Time	$t_d$	—	10	ns	$V_{CC} = -30V, I_C = -150mA,$ $I_{B1} = -15mA$
Rise Time	$t_r$	—	40	ns	
Turn-Off Time	$t_{off}$	—	100	ns	—
Storage Time	$t_s$	—	80	ns	$V_{CC} = -6V, I_C = -150mA,$ $I_{B1} = I_{B2} = -15mA$
Fall Time	$t_f$	—	30	ns	

Note: 9. Short duration pulse test used to minimize self-heating effect.

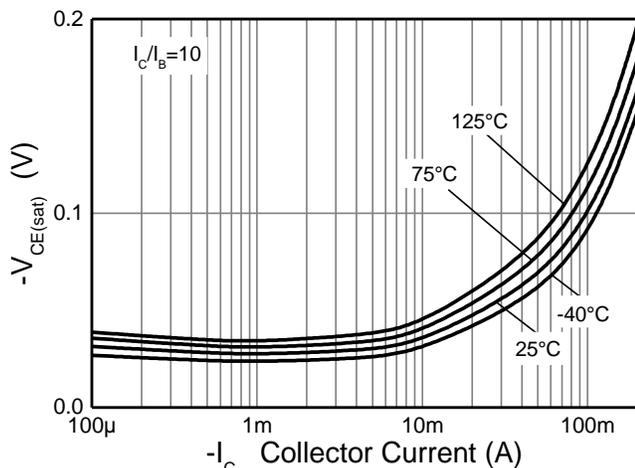
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



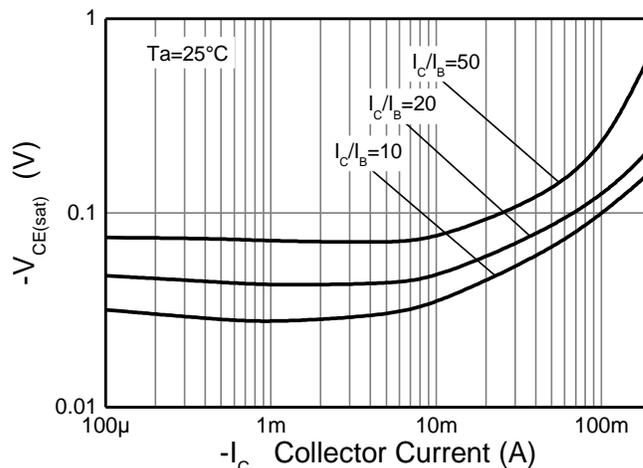
**Figure 11.**  $I_C$  v  $V_{CE}$



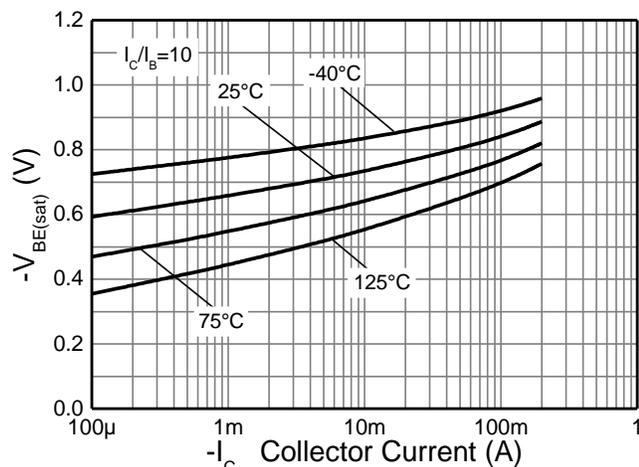
**Figure 12.**  $h_{FE}$  v  $I_C$



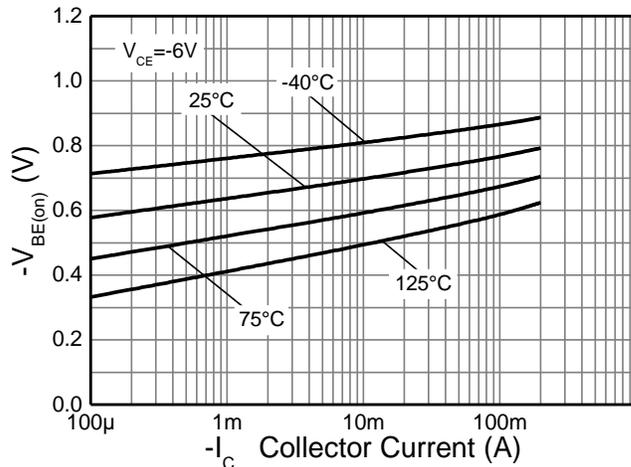
**Figure 13.**  $V_{CE(sat)}$  v  $I_C$



**Figure 14.**  $V_{CE(sat)}$  v  $I_C$

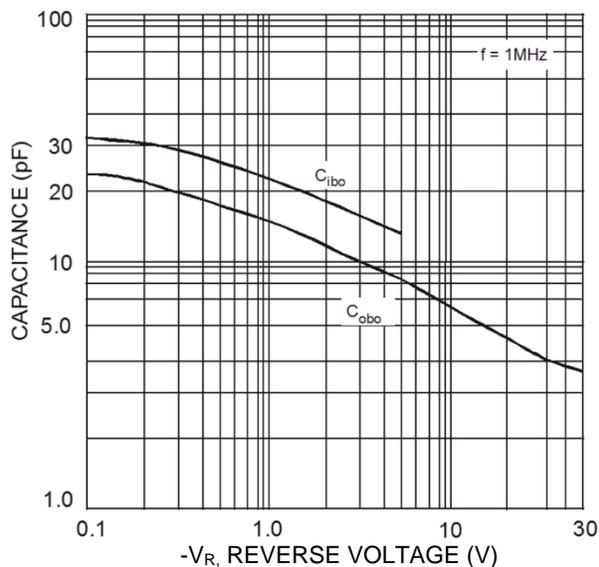


**Figure 15.**  $V_{BE(sat)}$  v  $I_C$

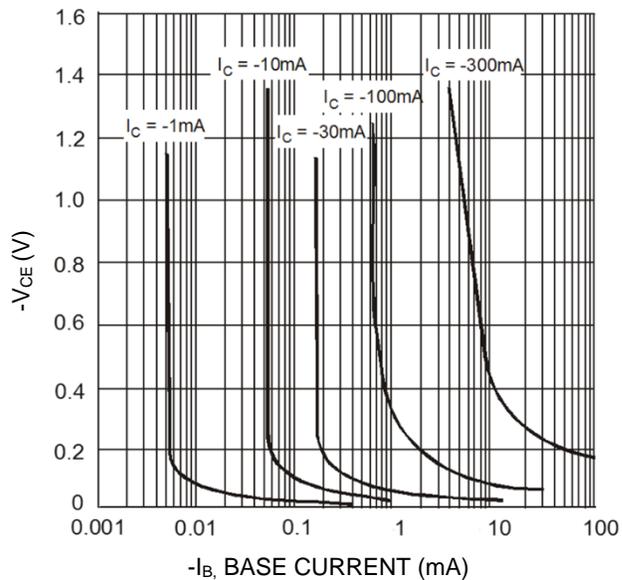


**Figure 15.**  $V_{BE(on)}$  v  $I_C$

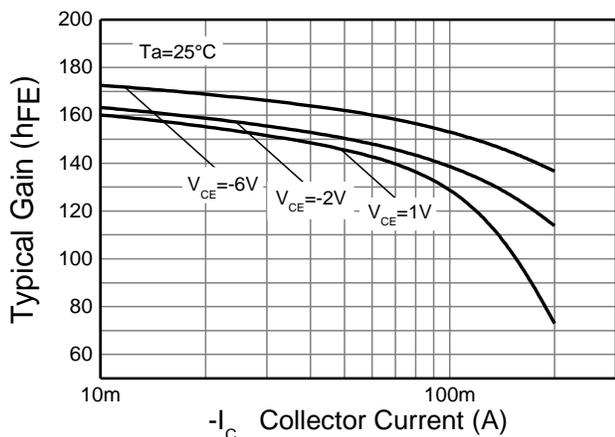
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Figure 17. Capacitance v  $V_R$**



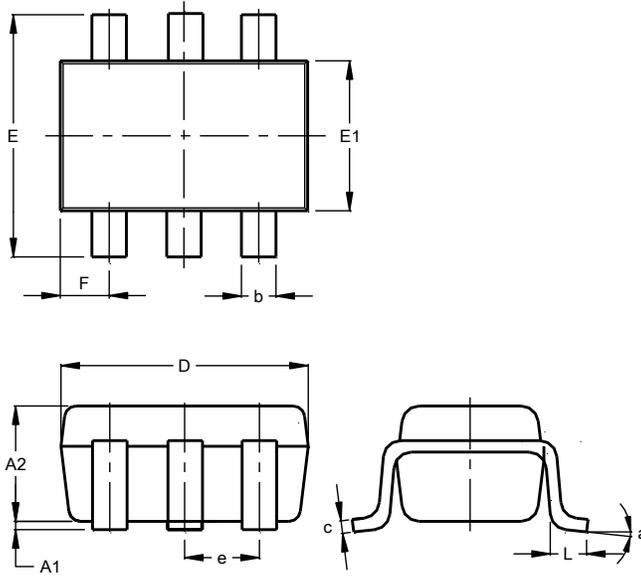
**Figure 18.  $V_{CE}$  v  $I_B$**



**Figure 19.  $h_{FE}$  v  $I_C$**

**Package Outline Dimensions**

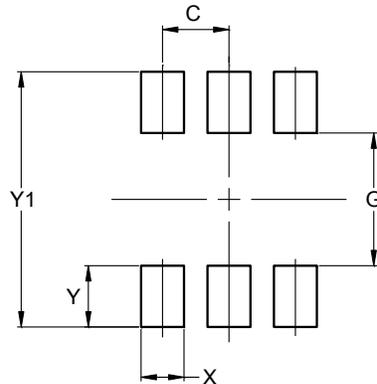
**SOT363**



SOT363			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

**SOT363**



Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.420
Y	0.600
Y1	2.500