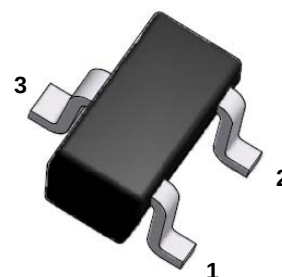


150mW SOT-523 SURFACE MOUNT Plastic Package NPN Silicon General Purpose Transistor

Green Product



SOT-523

Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

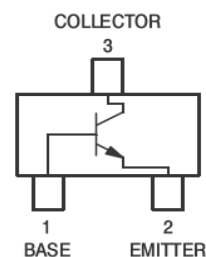
Symbol	Parameter	Value	Units
P_C	Collector Power Dissipation	150	mW
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_J	Operating Junction Temperature	+150	$^\circ\text{C}$
V_{CBO}	Collector-Base Voltage	50	V
V_{CEO}	Collector-Emitter Voltage	50	V
V_{EBO}	Emitter-Base Voltage	5	V
I_C	Collector Current - Continuous	100	mA

These ratings are limiting values above which the serviceability of the diode may be impaired.

Specification Features:

- Low $C_{ob} = 2.0\text{pF}$ (Typical)
- Low $V_{ce(sat)} < 0.4\text{V}$
- RoHS Compliant
- Green EMC
- Matte Tin(Sn) Lead Finish
- Weight: approx. 0.002g

Electrical Symbol:

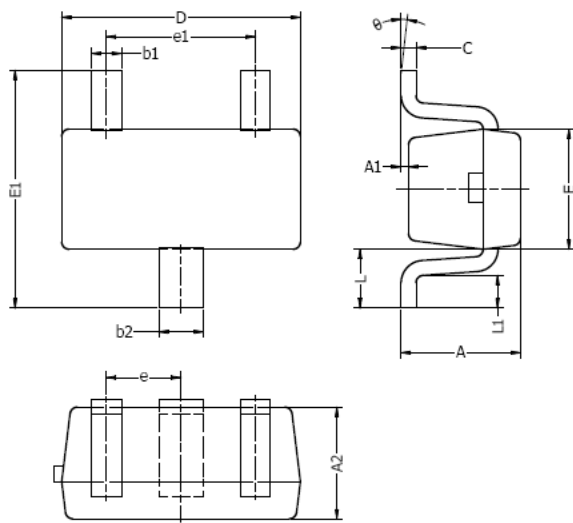
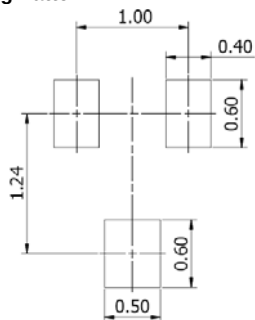


Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Condition	Limits			Unit
			Min	Typ	Max	
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C=50\mu\text{A}$, $I_E=0\text{A}$	50			Volts
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C=1\text{mA}$, $I_B=0\text{A}$	50			Volts
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E=50\mu\text{A}$, $I_C=0\text{A}$	5			Volts
I_{CBO}	Collector Cut-off Current	$V_{CB}=50\text{V}$, $I_E=0\text{A}$			0.1	μA
I_{EBO}	Emitter Cut-off Current	$V_{EB}=5\text{V}$, $I_C=0\text{A}$			0.1	μA
h_{FE}	DC Current Gain	$V_{CE}=6\text{V}$, $I_C=1\text{mA}$	120		560	---
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=50\text{mA}$, $I_B=5\text{mA}$			0.4	Volts
f_T	Transition Frequency	$V_{CE}=5\text{V}$, $I_C=10\text{mA}$ $f=30\text{MHz}$		280		MHz
C_{OB}	Collector Output Capacitance	$V_{CB}=12\text{V}$, $I_E=0\text{A}$, $f=1\text{MHz}$		2.0		pF

Classification of h_{FE}

Rank	Q	R	S
Range	120 - 270	180 - 390	270 - 560
Marking	BQ	BR	BS

SOT-523 Package Outline

Typical Soldering Pattern:


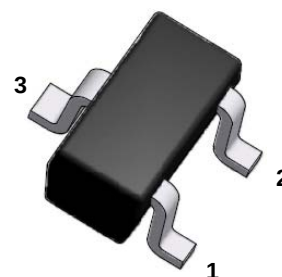
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.70	0.90	0.028	0.035
A1	0.00	0.10	0.000	0.004
A2	0.70	0.80	0.028	0.031
b1	0.15	0.25	0.006	0.010
b2	0.25	0.35	0.010	0.014
c	0.10	0.20	0.004	0.008
D	1.50	1.70	0.059	0.067
E	0.70	0.90	0.028	0.035
E1	1.45	1.75	0.057	0.069
e	0.50 TYP.		0.020 TYP.	
e1	0.90	1.10	0.035	0.043
L	0.40 REF.		0.016 REF.	
L1	0.10	0.30	0.004	0.012
theta	0°	8°	0°	8°

NOTES:

1. Above package outline conforms to JEITA EAIJ ED-7500A SC-75A.
2. Dimensions are exclusive of Burrs, Mold Flash & Tie Bar extrusions.

150mW SOT-523 SURFACE MOUNT **Plastic Package** **PNP Silicon General Purpose Transistor**

Green Product



SOT-523

Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

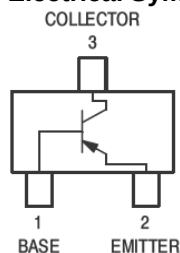
Symbol	Parameter	Value	Units
P_C	Collector Power Dissipation	150	mW
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_J	Operating Junction Temperature	+150	$^\circ\text{C}$
V_{CBO}	Collector-Base Voltage	-50	V
V_{CEO}	Collector-Emitter Voltage	-50	V
V_{EBO}	Emitter-Base Voltage	-5	V
I_C	Collector Current - Continuous	-100	mA

These ratings are limiting values above which the serviceability of the diode may be impaired.

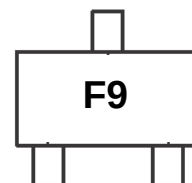
Specification Features:

- Low C_{ob} = 3.5pF (Typical)
- Low $V_{ce(sat)}$ < 0.5V
- RoHS Compliant
- Green EMC
- Matte Tin(Sn) Lead Finish
- Weight: approx. 0.002g

Electrical Symbol:

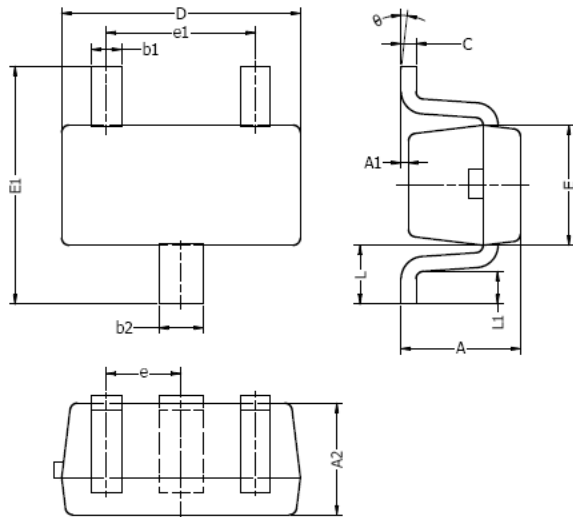
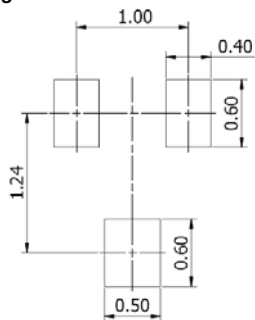


Device Marking Code:



Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Condition	Limits			Unit
			Min	Typ	Max	
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = -50\mu\text{A}$, $I_E = 0\text{A}$	-50			Volts
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = -1\text{mA}$, $I_B = 0\text{A}$	-50			Volts
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = -50\mu\text{A}$, $I_C = 0\text{A}$	-5			Volts
I_{CBO}	Collector Cut-off Current	$V_{CB} = -50\text{V}$, $I_E = 0\text{A}$			-0.1	μA
I_{EBO}	Emitter Cut-off Current	$V_{EB} = -5\text{V}$, $I_C = 0\text{A}$			-0.1	μA
h_{FE}	DC Current Gain	$V_{CE} = -6\text{V}$, $I_C = -1\text{mA}$	120		560	---
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = -50\text{mA}$, $I_B = -5\text{mA}$			-0.5	Volts
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = -50\text{mA}$, $I_B = -5\text{mA}$			-1.2	Volts
f_T	Transition Frequency	$V_{CE} = -5\text{V}$, $I_C = -10\text{mA}$ $f = 30\text{MHz}$		230		MHz
C_{OB}	Collector Output Capacitance	$V_{CB} = -12\text{V}$, $I_E = 0\text{A}$, $f = 1\text{MHz}$		3.5		pF

SOT-523 Package Outline

Typical Soldering Pattern:


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.70	0.90	0.028	0.035
A1	0.00	0.10	0.000	0.004
A2	0.70	0.80	0.028	0.031
b1	0.15	0.25	0.006	0.010
b2	0.25	0.35	0.010	0.014
c	0.10	0.20	0.004	0.008
D	1.50	1.70	0.059	0.067
E	0.70	0.90	0.028	0.035
E1	1.45	1.75	0.057	0.069
e	0.50 TYP.		0.020 TYP.	
e1	0.90	1.10	0.035	0.043
L	0.40 REF.		0.016 REF.	
L1	0.10	0.30	0.004	0.012
θ	0°	8°	0°	8°

NOTES:

1. Above package outline conforms to JEITA EAIJ ED-7500A SC-75A.
2. Dimensions are exclusive of Burrs, Mold Flash & Tie Bar extrusions.

SOT-523 General Purpose Transistor

NPN Silicon

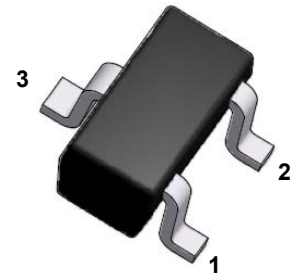
Surface Mount Plastic Package

Green Product

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage	60	V
V_{CEO}	Collector-Emitter Voltage	40	V
V_{EBO}	Emitter-Base Voltage	6	V
I_C	Collector Current	200	mA
P_D	Power Dissipation (FR-4 Board – minimum pad)	200	mW
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	600	$^\circ\text{C}/\text{W}$
T_J T_{STG}	Junction & Storage Temperature Range	-55 to +150	$^\circ\text{C}$

These ratings are limiting values above which the serviceability of the device may be impaired.

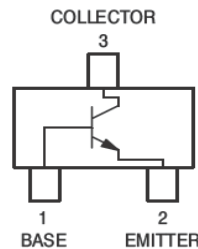


SOT-523 (SC-75A)

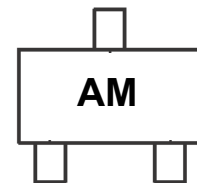
Specification Features:

- Simplifies Circuit Design
- RoHS Compliant
- Green EMC
- Matte Tin(Sn) Lead Finish
- Weight: approx. 0.002g

Electrical Symbol:



Device Marking Code:



Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Off Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 1)	$I_C = 1\text{mA}$, $I_B = 0\text{A}$	40	-	Volts
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10\mu\text{A}$, $I_E = 0\text{A}$	60	-	Volts
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10\mu\text{A}$, $I_B = 0\text{A}$	6	-	Volts
I_{BL}	Base Cutoff Current	$V_{CE} = 30\text{V}$, $V_{EB} = 3\text{V}$	-	50	nA
I_{CEX}	Collector Cutoff Current	$V_{CE} = 30\text{V}$, $V_{EB} = 3\text{V}$	-	50	nA

Note 1: Pulse Test. Pulse width $< 300\mu\text{s}$, Duty cycle $< 2.0\%$

On Characteristics (Note 1)

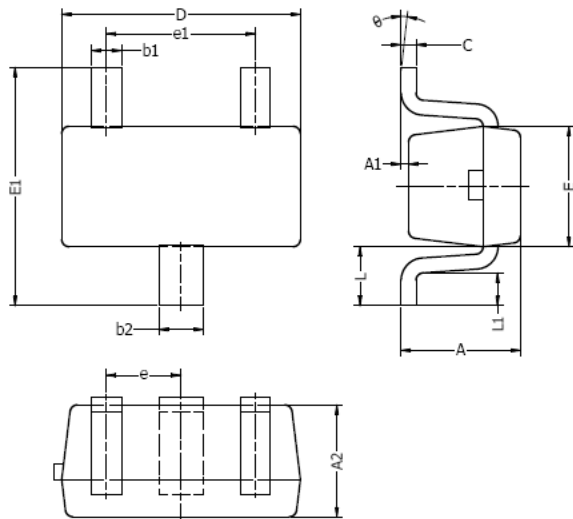
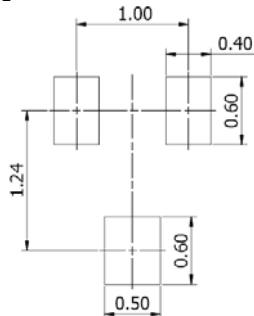
Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
H_{FE}	DC Current Gain	I _C = 0.1mA, V _{CE} = 1V	40	-	-
		I _C = 1.0mA, V _{CE} = 1V	70	-	
		I _C = 10mA, V _{CE} = 1V	100	300	
		I _C = 50mA, V _{CE} = 1V	60	-	
		I _C = 100mA, V _{CE} = 1V	30	-	
V_{CE(sat)}	Collector-Emitter Saturation Voltage	I _C = 10mA, I _B = 1mA	-	0.2	Volts
		I _C = 50mA, I _B = 5mA	-	0.3	
V_{BE(sat)}	Base-Emitter Saturation Voltage	I _C = 10mA, I _B = 1mA	0.65	0.85	Volts
		I _C = 50mA, I _B = 5mA	-	0.95	

Small-signal Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
f_T	Current-Gain-Bandwidth Product	I _C = 10mA, V _{CE} = 20V, f = 100MHz	200	-	MHz
C_{obo}	Output Capacitance	V _{CB} = 5V, I _E = 0A, f = 1.0MHz	-	4	pF
C_{ibo}	Input Capacitance	V _{BE} = 0.5V, I _C = 0A, f = 1.0MHz	-	8	pF
h_{ie}	Input Impedance	V _{CE} = 10V, I _C = 1mA, f = 1.0kHz	1	10	pF
h_{re}	Voltage Feedback Ratio	V _{CE} = 10V, I _C = 1mA, f = 1.0kHz	0.5	8	X10 ⁻⁴
h_{fe}	Small-signal Current Gain	V _{CE} = 10V, I _C = 1mA, f = 1.0kHz	100	400	-
h_{oe}	Output Admittance	V _{CE} = 10V, I _C = 1mA, f = 1.0kHz	1	40	μ mhos
NF	Noise Figure	V _{CE} = 5V, I _C = 100μA R _s = 1.0kΩ, f = 1.0kHz		5	dB

Switching Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
t_d	Delay Time	V _{CC} = 3V, V _{BE} = 0.5V,	-	35	nS
t_r	Rise Time	I _C = 10mA, I _{B1} = 1mA	-	35	
t_s	Storage Time	V _{CC} = 3V, I _C = 10mA,	-	200	nS
t_f	Fall Time	I _{B1} = I _{B2} = 1mA	-	50	

SOT-523 Package Outline

Typical Soldering Pattern:


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.70	0.90	0.028	0.035
A1	0.00	0.10	0.000	0.004
A2	0.70	0.80	0.028	0.031
b1	0.15	0.25	0.006	0.010
b2	0.25	0.35	0.010	0.014
c	0.10	0.20	0.004	0.008
D	1.50	1.70	0.059	0.067
E	0.70	0.90	0.028	0.035
E1	1.45	1.75	0.057	0.069
e	0.50 TYP.		0.020 TYP.	
e1	0.90	1.10	0.035	0.043
L	0.40 REF.		0.016 REF.	
L1	0.10	0.30	0.004	0.012
θ	0°	8°	0°	8°

NOTES:

1. Above package outline conforms to JEITA EAIJ ED-7500A SC-75A.
2. Dimensions are exclusive of Burrs, Mold Flash & Tie Bar extrusions.

SOT-523 General Purpose Transistor

PNP Silicon

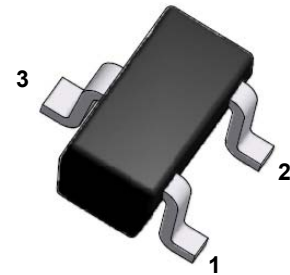
Surface Mount Plastic Package

Green Product

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage	-40	V
V_{CEO}	Collector-Emitter Voltage	-40	V
V_{EBO}	Emitter-Base Voltage	-5	V
I_C	Collector Current	-200	mA
P_D	Power Dissipation (FR-4 Board – minimum pad)	200	mW
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	600	$^\circ\text{C}/\text{W}$
T_J T_{STG}	Junction & Storage Temperature Range	-55 to +150	$^\circ\text{C}$

These ratings are limiting values above which the serviceability of the device may be impaired.

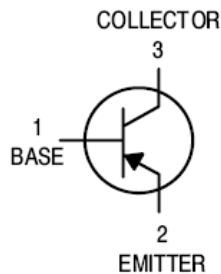


SOT-523 (SC-75A)

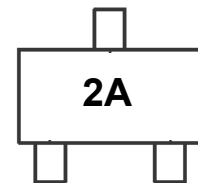
Specification Features:

- Simplifies Circuit Design
- RoHS Compliant
- Green EMC
- Matte Tin(Sn) Lead Finish
- Weight: approx. 0.002g

Electrical Symbol:



Device Marking Code:



Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Off Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 1)	$I_C = -1\text{mA}$, $I_B = 0\text{A}$	-40	-	Volts
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = -10\mu\text{A}$, $I_E = 0\text{A}$	-40	-	Volts
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = -10\mu\text{A}$, $I_B = 0\text{A}$	-5	-	Volts
I_{BL}	Base Cutoff Current	$V_{CE} = -30\text{V}$, $V_{EB} = -3\text{V}$	-	-50	nA
I_{CEX}	Collector Cutoff Current	$V_{CE} = -30\text{V}$, $V_{EB} = -3\text{V}$	-	-50	nA

Note 1: Pulse Test. Pulse width <300us, Duty cycle < 2.0%.

On Characteristics (Note 1)

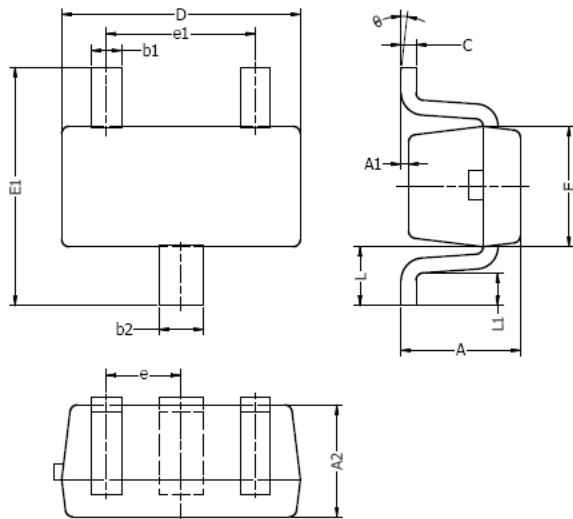
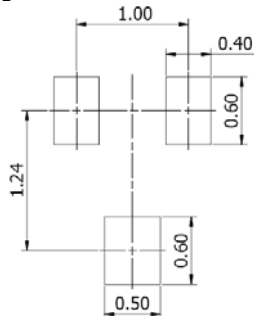
Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
H_{FE}	DC Current Gain	I _C = -0.1mA, V _{CE} = -1V	60	-	-
		I _C = -1.0mA, V _{CE} = -1V	80	-	
		I _C = -10mA, V _{CE} = -1V	100	300	
		I _C = -50mA, V _{CE} = -1V	60	-	
		I _C = -100mA, V _{CE} = -1V	30	-	
V_{CE(sat)}	Collector-Emitter Saturation Voltage	I _C = -10mA, I _B = -1mA	-	0.25	Volts
		I _C = -50mA, I _B = -5mA	-	0.4	
V_{BE(sat)}	Base-Emitter Saturation Voltage	I _C = -10mA, I _B = -1mA	0.65	0.85	Volts
		I _C = -50mA, I _B = -5mA	-	0.95	

Small-signal Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
f_T	Current-Gain-Bandwidth Product	I _C = -10mA, V _{CE} = -20V, f = 100MHz	250	-	MHz
C_{obo}	Output Capacitance	V _{CB} = -5V, I _E = 0A, f = 1.0MHz	-	4.5	pF
C_{ibo}	Input Capacitance	V _{BE} = -0.5V, I _C = 0A, f = 1.0MHz	-	10	pF
h_{ie}	Input Impedance	V _{CE} = -10V, I _C = -1mA, f = 1.0kHz	2	12	pF
h_{re}	Voltage Feedback Ratio	V _{CE} = -10V, I _C = -1mA, f = 1.0kHz	0.1	10	X10 ⁻⁴
h_{fe}	Small-signal Current Gain	V _{CE} = -10V, I _C = -1mA, f = 1.0kHz	100	400	-
h_{oe}	Output Admittance	V _{CE} = -10V, I _C = -1mA, f = 1.0kHz	3	60	μ mhos
NF	Noise Figure	V _{CE} = -5V, I _C = -100μA R _S = 1.0kΩ f = 1.0kHz		4	dB

Switching Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
t_d	Delay Time	V _{CC} = -3V, V _{BE} = -0.5V,	-	35	nS
t_r	Rise Time	I _C = -10mA, I _{B1} = -1mA	-	35	
t_s	Storage Time	V _{CC} = -3V, I _C = -10mA,	-	225	nS
t_f	Fall Time	I _{B1} = I _{B2} = -1mA	-	75	

SOT-523 Package Outline

Typical Soldering Pattern:


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.70	0.90	0.028	0.035
A1	0.00	0.10	0.000	0.004
A2	0.70	0.80	0.028	0.031
b1	0.15	0.25	0.006	0.010
b2	0.25	0.35	0.010	0.014
c	0.10	0.20	0.004	0.008
D	1.50	1.70	0.059	0.067
E	0.70	0.90	0.028	0.035
E1	1.45	1.75	0.057	0.069
e	0.50 TYP.		0.020 TYP.	
e1	0.90	1.10	0.035	0.043
L	0.40 REF.		0.016 REF.	
L1	0.10	0.30	0.004	0.012
θ	0°	8°	0°	8°

NOTES:

1. Above package outline conforms to JEITA EAIJ ED-7500A SC-75A.
2. Dimensions are exclusive of Burrs, Mold Flash & Tie Bar extrusions.