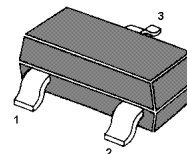


NPN Silicon General Purpose Transistor

General Features

- Epitaxial planar die construction
- MSL 3
- $I_C=600\text{mA}$
- ROHS
- Marking:2X



1. Base 2. Emitter 3. Collector
SOT-23 Plastic Package

Application

- General purpose in desktop & handheld systems
- Ideal for medium-power signal amplification and switching
- Medium power amplifier and switch requiring collector currents up to 600 mA

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Value	Unit
Collector Base Voltage	V_{CBO}	60	V
Collector Emitter Voltage	V_{CEO}	40	V
Emitter Base Voltage	V_{EBO}	6	V
Collector Current Continuous	I_C	600	mA
Total Device Dissipation FR-5 Board ¹⁾	P_{tot}	300	mW
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 55 to + 150	$^\circ\text{C}$

¹⁾ FR-5 = 1 X 0.75 X 0.062 in.

Characteristics at $T_a = 25\text{ }^{\circ}\text{C}$

Parameter	Symbol	Min.	Max.	Unit
DC Current Gain				
at $V_{CE} = 1\text{ V}$, $I_C = 0.1\text{ mA}$	h_{FE}	20	-	-
at $V_{CE} = 1\text{ V}$, $I_C = 1\text{ mA}$	h_{FE}	40	-	-
at $V_{CE} = 1\text{ V}$, $I_C = 10\text{ mA}$	h_{FE}	80	-	-
at $V_{CE} = 1\text{ V}$, $I_C = 150\text{ mA}$	h_{FE}	100	300	-
at $V_{CE} = 2\text{ V}$, $I_C = 500\text{ mA}$	h_{FE}	40	-	-
Collector Base Cutoff Current at $V_{CB} = 35\text{ V}$	I_{CBO}	-	0.1	μA
Emitter Base Cutoff Current at $V_{EB} = 5\text{ V}$	I_{EBO}	-	0.1	μA
Collector Base Breakdown Voltage at $I_C = 0.1\text{ mA}$	$V_{(BR)CBO}$	60	-	V
Collector Emitter Breakdown Voltage at $I_C = 1\text{ mA}$	$V_{(BR)CEO}$	40	-	V
Emitter Base Breakdown Voltage at $I_E = 0.1\text{ mA}$	$V_{(BR)EBO}$	6	-	V
Collector Emitter Saturation Voltage at $I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$	$V_{CE(sat)}$	-	0.4	V
at $I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$	$V_{CE(sat)}$	-	0.75	V
Base Emitter Saturation Voltage at $I_C = 150\text{ mA}$, $I_B = 15\text{ mA}$	$V_{BE(sat)}$	0.75	0.95	V
at $I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$	$V_{BE(sat)}$	-	1.2	V
Current Gain Bandwidth Product at $V_{CE} = 10\text{ V}$, $I_C = 20\text{ mA}$, $f = 100\text{ MHz}$	f_T	250	-	MHz
Collector Base Capacitance at $V_{CB} = 5\text{ V}$, $f = 1\text{ MHz}$	C_{ob}	-	6.5	pF
Delay Time $V_{CC} = 30\text{ V}$, $V_{EB} = 2\text{ V}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$	t_d	-	15	ns
Rise Time $V_{CC} = 30\text{ V}$, $V_{EB} = 2\text{ V}$, $I_C = 150\text{ mA}$, $I_{B1} = 15\text{ mA}$	t_r	-	20	ns
Storage Time $V_{CC} = 30\text{ V}$, $I_C = 150\text{ mA}$, $I_{B1} = I_{B2} = 15\text{ mA}$	t_s	-	225	ns
Fall Time $V_{CC} = 30\text{ V}$, $I_C = 150\text{ mA}$, $I_{B1} = I_{B2} = 15\text{ mA}$	t_f	-	60	ns

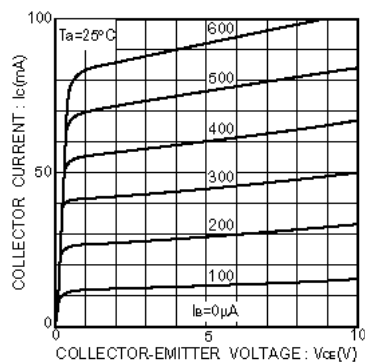
TYPICAL CHARACTERISTICS @ $T_a=25^\circ\text{C}$ unless otherwise specified


Fig.1 Grounded emitter output characteristics

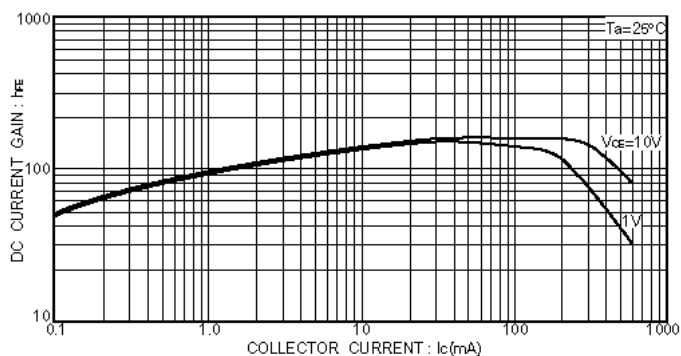


Fig.3 DC current gain vs. collector current(I)

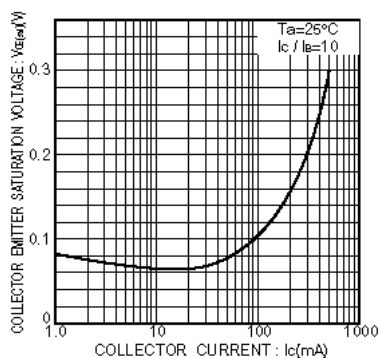


Fig.2 Collector-emitter saturation voltage vs. collector current

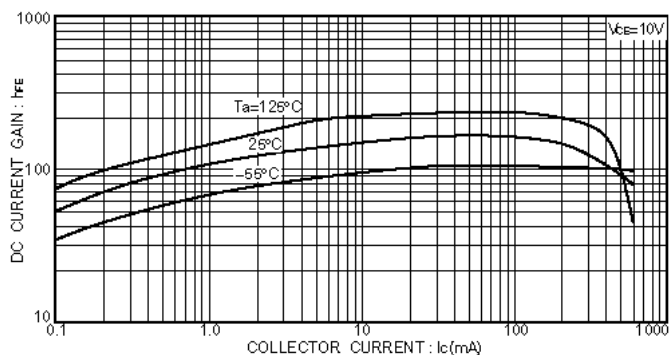


Fig.4 DC current gain vs. collector current(II)

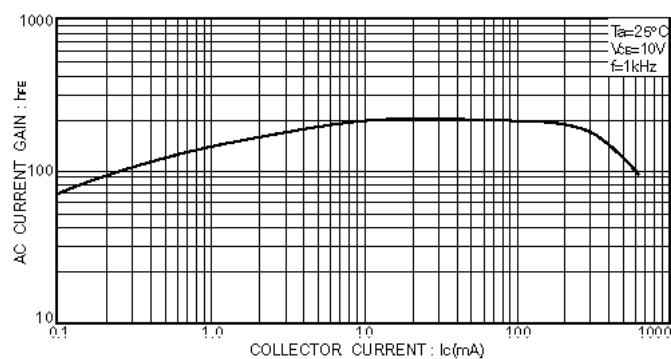


Fig.5 AC current gain vs. collector current

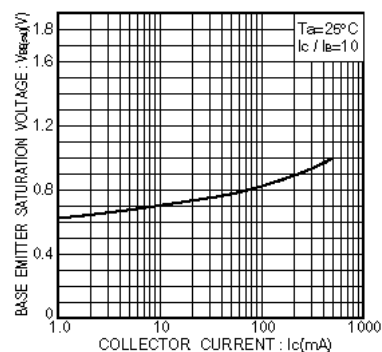
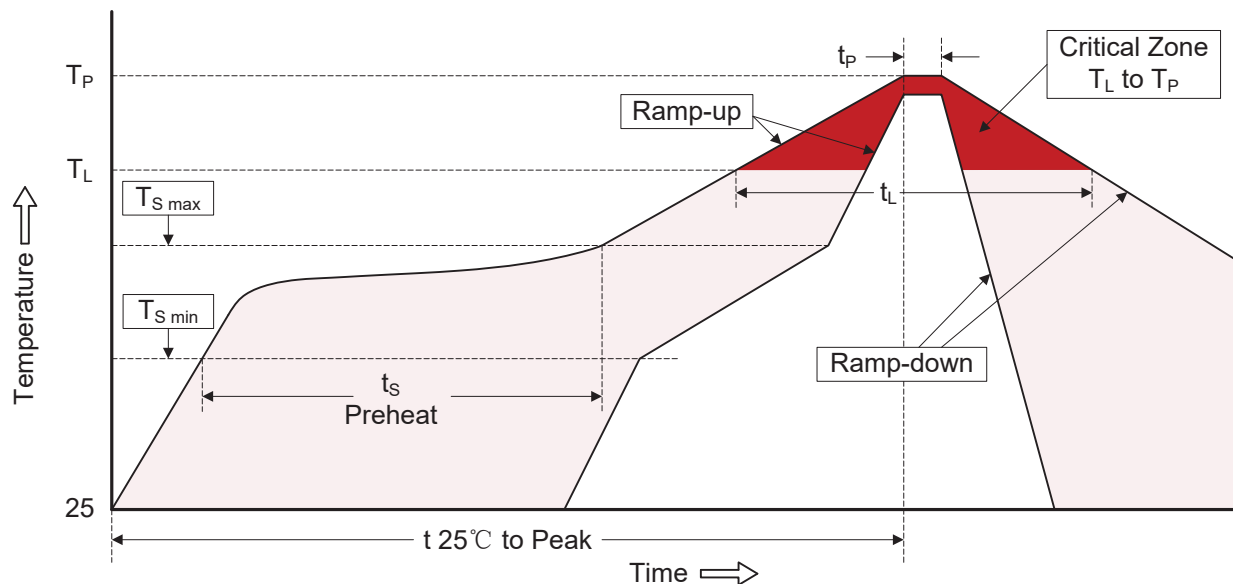


Fig.6 Base-emitter saturation voltage vs. collector current

Recommended Soldering Conditions

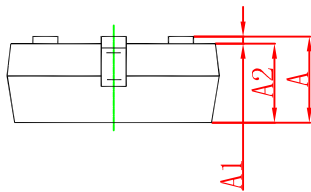
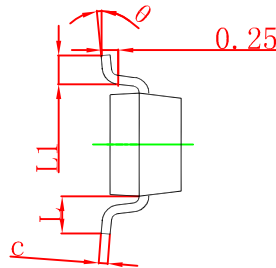
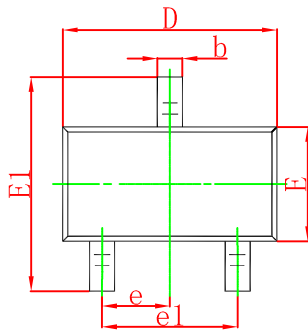
Reflow Soldering



Recommended Conditions

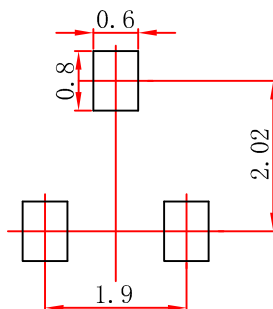
Profile Feature	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	3°C/second max.
Preheat -Temperature Min ($T_{S\ min}$) -Temperature Max ($T_{S\ max}$) -Time (min to max) (t_s)	150°C 200°C 60-180 seconds
$T_{S\ max}$ to T_L -Ramp-up Rate	3°C/second max.
Time maintained above: -Temperature (T_L) -Time (t_L)	217°C 60-150 seconds
Peak Temperature (T_P)	260°C
Time within 5°C of actual Peak Temperature (t_P)	20-40 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

SOT23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

SOT23 Suggested Pad Layout

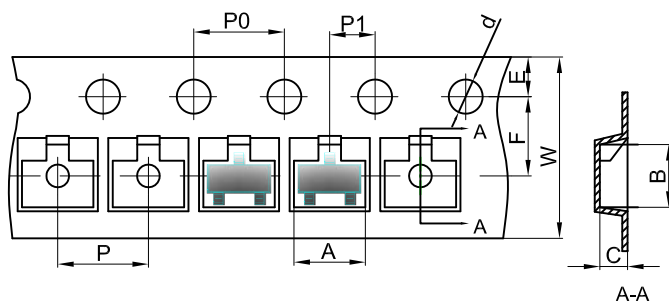


Note:

1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

SOT23 Tape and Reel

SOT23 Embossed Carrier Tape

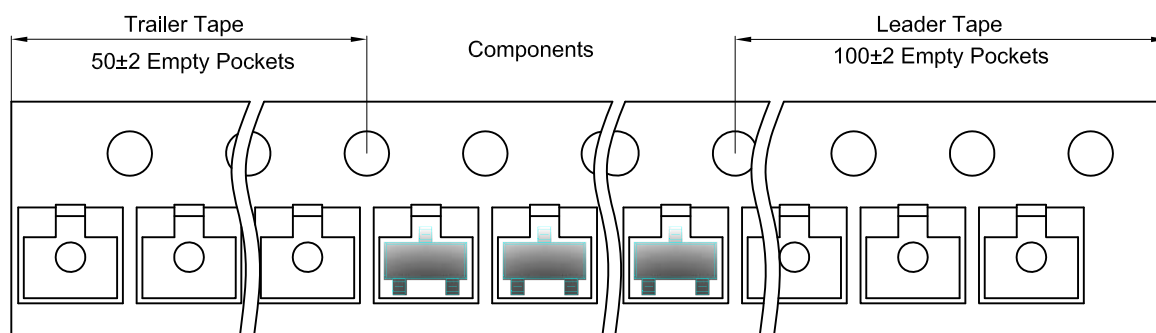


Packaging Description:

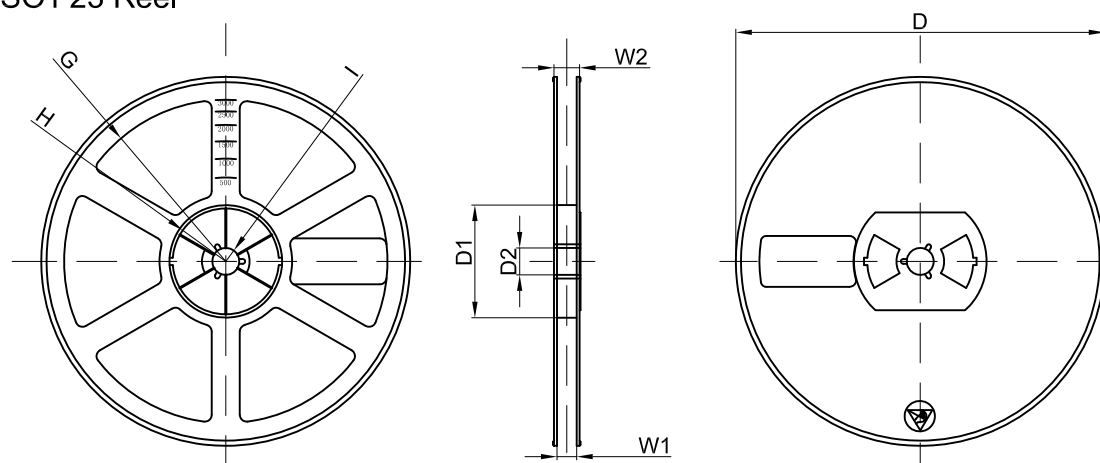
SOT23 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT23	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT23 Tape Leader and Trailer



SOT23 Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30