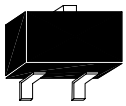
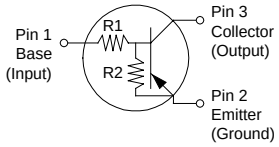
HUN2111 / HUN2112 / HUN2113 / HUN2114 / HUN2115
HUN2116 / HUN2130 / HUN2131 / HUN2132 / HUN2133
HUN2134 / HUN2136 / HUN2137 / HUN2140

PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor Network



SOT-23

Symbol:



Description

This new series of digital transistors is designed to replace a single device and its external resistor bias network. The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space. The device is housed in the SOT-23 package which is designed for low power surface mount applications.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Moisture Sensitivity Level: 1
- ESD Rating: Human Body Model: Class1, Machine Model: Class B
- The SOT-23 package can be soldered using wave or reflow.
  The modified gull-winged leads absorb thermal stress during soldering eliminating the possibility of damage to the die.
- Available in 8mm embossed tape and reel. Use the device number to order the 7 inch / 3,000 unit reel.

Maximum Ratings (T_A=25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-50	Vdc
Collector-Emitter Voltage	V_{CEO}	-50	Vdc
Collector Curretn	I_C	-100	mAdc

Thermal Characteristics

Rating	Symbol	Value		Unit
		Note1	Note2	
Total Power Dissipation @ T_A=25°C Derate above 25°C	P_D	246 1.5	400 2.0	mW mW/°C
Thermal Resistance-Junction-to-Ambient	$R_{\theta JA}$	508	311	°C/W
Thermal Resistance-Junction-to-Lead	$R_{\theta JL}$	174	208	°C/W
Operating and Storage Temperature Range	T_J, T_{stg}	-65 to +150		°C

Note1: FR-4 @ Minimum Pad, Note2: FR-4 @ 1.0X1.0 inch Pad

Device Marking and Resistor Values

Device	Package	Marking	R1(K)	R2(K)	Shipping
HUN2111	SOT-23	A6A	10	10	3000/Tape & Reel
HUN2112	SOT-23	A6B	22	22	3000/Tape & Reel
HUN2113	SOT-23	A6C	47	47	3000/Tape & Reel
HUN2114	SOT-23	A6D	10	47	3000/Tape & Reel
HUN2115	SOT-23	A6E	10	∞	3000/Tape & Reel
HUN2116	SOT-23	A6F	4.7	∞	3000/Tape & Reel
HUN2130	SOT-23	A6G	1	1	3000/Tape & Reel
HUN2131	SOT-23	A6H	2.2	2.2	3000/Tape & Reel
HUN2132	SOT-23	A6J	4.7	4.7	3000/Tape & Reel
HUN2133	SOT-23	A6K	4.7	47	3000/Tape & Reel
HUN2134	SOT-23	A6L	22	47	3000/Tape & Reel
HUN2136	SOT-23	A6N	100	100	3000/Tape & Reel
HUN2137	SOT-23	A6P	47	22	3000/Tape & Reel
HUN2140	SOT-23	A6T	47	∞	3000/Tape & Reel

Electrical Characteristics (T_A=25°C unless otherwise noted)

Characteristic		Symbol	Min.	Typ.	Max.	Unit
Off Characteristics						
Collector-Base Cutoff Current (V_{CB}=-50V, I_E=0)		I_{CBO}	-	-	-100	nAdc
Collector-Emitter Cutoff Current (V_{CE}=-50V, I_B=0)		I_{CEO}	-	-	-500	nAdc
Emitter-Base Cutoff Current (V_{EB}=-6V, I_C=0)	HUN2111	I_{EBO}	-	-	-0.5	mAdc
	HUN2112		-	-	-0.2	
	HUN2113		-	-	-0.1	
	HUN2114		-	-	-0.2	
	HUN2115		-	-	-0.9	
	HUN2116		-	-	-1.9	
	HUN2130		-	-	-4.3	
	HUN2131		-	-	-2.3	
	HUN2132		-	-	-1.5	
	HUN2133		-	-	-0.18	
	HUN2134		-	-	-0.13	
	HUN2136		-	-	-0.05	
	HUN2137		-	-	-0.13	
	HUN2140		-	-	-0.20	
Collector-Base Breakdown Voltage (I_C=-10uA, I_E=0)		$V_{(BR)CBO}$	-50	-	-	Vdc
Collector-Emitter Breakdown Voltage (I_C=-2mA, I_B=0)		*$V_{(BR)CEO}$	-50	-	-	Vdc
**On Characteristics*						
DC Current Gain (V_{CE}=-10V, I_C=-5mA)	HUN2111	hFE	35	60	-	
	HUN2112		60	100	-	
	HUN2113		80	140	-	
	HUN2114		80	140	-	
	HUN2115		160	250	-	
	HUN2116		160	250	-	
	HUN2130		3	5	-	
	HUN2131		8	15	-	
	HUN2132		15	27	-	
	HUN2133		80	140	-	
	HUN2134		80	130	-	
	HUN2136		80	150	-	
	HUN2137		80	140	-	
	HUN2140		120	250	-	
Collector-Emitter Saturation Voltage (I_C=-10mA, I_B=-0.3mA) HUN2111/HUN2112/HUN2113/HUN2114 HUN2115/HUN2130/HUN2136/HUN2137 (I_C=-10mA, I_B=-5mA) HUN2131 (I_C=-10mA, I_B=-1mA) HUN2116/HUN2132/HUN2134/HUN2140		$V_{CE(sat)}$	-	-	-0.25	Vdc
Output Voltage (on) (V_{CC}=-5V, V_B=-2.5V, R_L=1kΩ)	HUN2111	V_{OL}	-	-	-0.2	Vdc
	HUN2112		-	-	-0.2	
	HUN2114		-	-	-0.2	
	HUN2115		-	-	-0.2	
	HUN2116		-	-	-0.2	
	HUN2130		-	-	-0.2	
	HUN2131		-	-	-0.2	
	HUN2132		-	-	-0.2	
	HUN2133		-	-	-0.2	
	HUN2134		-	-	-0.2	
(V_{CC}=-5V, V_B=-3.5V, R_L=1kΩ)	HUN2113		-	-	-0.2	
	HUN2140		-	-	-0.2	
(V_{CC}=-5V, V_B=-5.5V, R_L=1kΩ)	HUN2136		-	-	-0.2	
(V_{CC}=-5V, V_B=-4.0V, R_L=1kΩ)	HUN2137		-	-	-0.2	

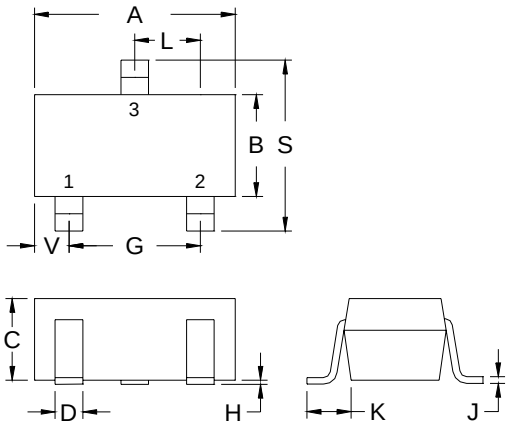
*Pulse Test: Pulse Width ≤300us, Duty Cycle≤2%

Electrical Characteristics (T_A=25°C unless otherwise noted)

Characteristic		Symbol	Min.	Typ.	Max.	Unit
*On Characteristics						
Output Voltage (off) (V_{CC}=-5V, V_B=-0.5V, R_L=1kΩ)		V_{OH}	-4.9	-	-	Vdc
(V_{CC}=-5V, V_B=-0.25V, R_L=1kΩ)	HUN2115					
	HUN2116					
	HUN2131					
	HUN2132					
	HUN2140					
(V_{CC}=-5V, V_B=-0.05V, R_l=1kΩ)	HUN2130					
Input Resistor	HUN2111	R_1	7	10	13	kΩ
	HUN2112		15.4	22	28.6	
	HUN2113		32.9	47	61.1	
	HUN2114		7	10	13	
	HUN2115		7	10	13	
	HUN2116		3.3	4.7	6.1	
	HUN2130		0.7	1	1.3	
	HUN2131		1.5	2.2	2.9	
	HUN2132		3.3	4.7	6.1	
	HUN2133		3.3	4.7	6.1	
	HUN2134		15.4	22	28.6	
	HUN2136		70	100	130	
	HUN2137		32.9	47	61.1	
	HUN2140		32.9	47	61.1	
Resistor Ratio HUN2111/HUN2112/HUN2113/HUN2136		R_1/R_2	0.8	1	1.2	
HUN2114			0.17	0.21	0.25	
HUN2115/HUN2116/HUN2140			-	-	-	
HUN2130/HUN2131/HUN2132			0.8	1	1.2	
HUN2133			0.055	0.1	0.185	
HUN2134			0.38	0.47	0.56	
HUN2137			1.7	2.1	2.6	

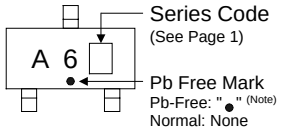
*Pulse Test: Pulse Width ≤300us, Duty Cycle≤2%

SOT-23 Dimension



3-Lead SOT-23 Plastic
Surface Mounted Package
HSMC Package Code: N

Marking:



Note: Pb-free product can distinguish by the green label or the extra description on the right side of the label.

Pin Style: 1.Base 2.Emitter 3.Collector

Material:
- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	2.80	3.04
B	1.20	1.60
C	0.89	1.30
D	0.30	0.50
G	1.70	2.30
H	0.013	0.10
J	0.085	0.177
K	0.32	0.67
L	0.85	1.15
S	2.10	2.75
V	0.25	0.65

*: Typical, Unit: mm

Head Office And Factory:

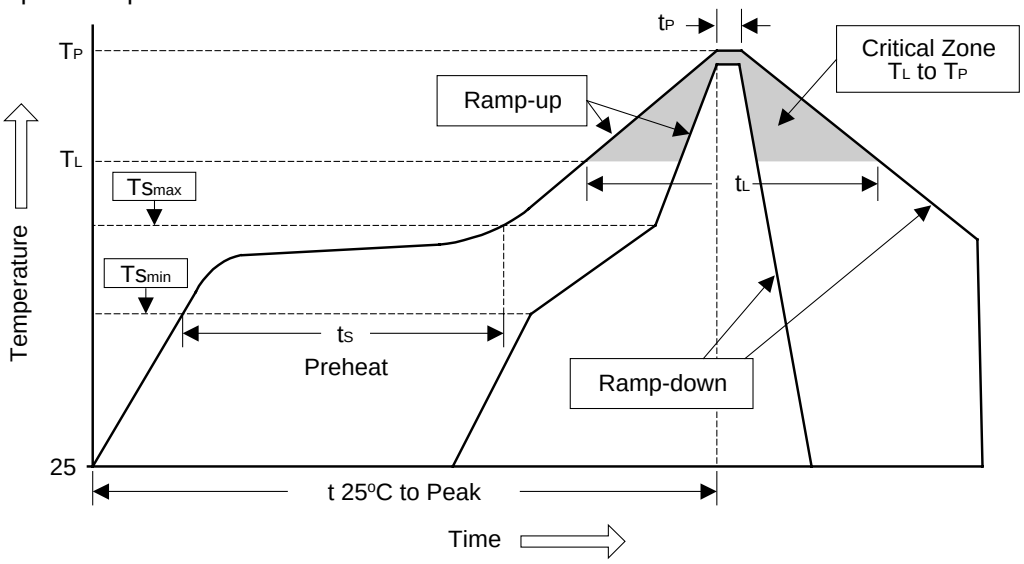
- **Head Office** (Hi-Sincerity Microelectronics Corp.): 10F.,No. 61, Sec. 2, Chung-Shan N. Rd. Taipei Taiwan R.O.C.
  Tel: 886-2-25212056 Fax: 886-2-25632712, 25368454
- **Factory 1:** No. 38, Kuang Fu S. Rd., Fu-Kou Hsin-Chu Industrial Park Hsin-Chu Taiwan. R.O.C
  Tel: 886-3-5983621~5 Fax: 886-3-5982931

Soldering Methods for HSMC's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%

2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60~120 sec	 150°C 200°C 60~180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60~150 sec	 217°C 60~150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec