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MUN2235T1G, MMUN2235LT1G, MUN5235T1G, DTC123JET1G, DTC123JM3T5G

Digital Transistors (BRT)
R1 = 2.2 kΩ, R2 = 47 kΩ

NPN Transistors with Monolithic Bias Resistor Network

This series of digital transistors is designed to replace a single device and its external resistor bias network. The Bias Resistor Transistor (BRT) 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.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count

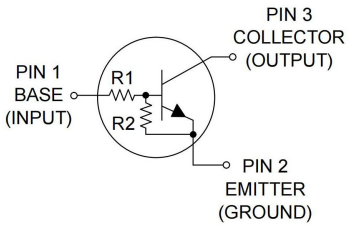
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS (T_A = 25°C)

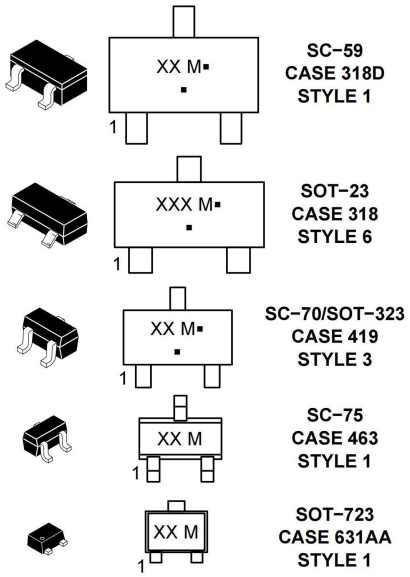
Rating	Symbol	Max	Unit
Collector−Base Voltage	V_{CBO}	50	Vdc
Collector−Emitter Voltage	V_{CEO}	50	Vdc
Collector Current − Continuous	I_C	100	mAdc
Input Forward Voltage	$V_{IN(fwd)}$	12	Vdc
Input Reverse Voltage	$V_{IN(rev)}$	6	Vdc

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

PIN CONNECTIONS



MARKING DIAGRAMS

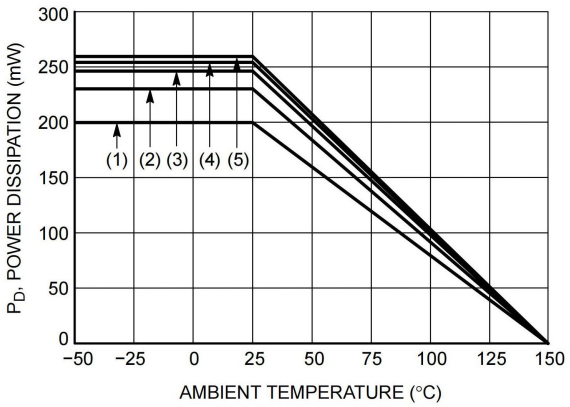


XXX = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

OM SENI

Table 1. ORDERING INFORMATION

Device	Part Marking	Package	Shipping†
MUN2235T1G	6M	SC−59 (Pb−Free)	3000 / Tape & Reel
MMUN2235LT1G	AA2	SOT−23 (Pb−Free)	3000 / Tape & Reel
MUN5235T1G	8M	SC−70/SOT−323 (Pb−Free)	3000 / Tape & Reel
DTC123JET1G	8M	SC−75 (Pb−Free)	3000 / Tape & Reel
DTC123JM3T5G	8M	SOT−723 (Pb−Free)	8000 / Tape & Reel



(1) SC−75 and SC−70/SOT323; Minimum Pad
(2) SC−59; Minimum Pad
(3) SOT−23; Minimum Pad
(4) SOT−1123; 100 mm^2, 1 oz. copper trace
(5) SOT−723; Minimum Pad

Figure 1. Derating Curve

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Table 2. THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
THERMAL CHARACTERISTICS (SC−59) (MUN2235)				
Total Device Dissipation T_A = 25°C Derate above 25°C Thermal Resistance, Junction to Ambient Thermal Resistance, Junction to Lead Junction and Storage Temperature Range	(Note 1) (Note 2) (Note 1) (Note 2) (Note 1) (Note 2) (Note 1) (Note 2)	P_D $R_{\theta JA}$ $R_{\theta JL}$ T_J, T_{stg}	230 338 1.8 2.7 540 370 264 287 −55 to +150	mW mW/°C °C/W °C/W °C
THERMAL CHARACTERISTICS (SOT−23) (MMUN2235L)				
Total Device Dissipation T_A = 25°C Derate above 25°C Thermal Resistance, Junction to Ambient Thermal Resistance, Junction to Lead Junction and Storage Temperature Range	(Note 1) (Note 2) (Note 1) (Note 2) (Note 1) (Note 2) (Note 1) (Note 2)	P_D $R_{\theta JA}$ $R_{\theta JL}$ T_J, T_{stg}	246 400 2.0 3.2 508 311 174 208 −55 to +150	mW mW/°C °C/W °C/W °C
THERMAL CHARACTERISTICS (SC−70/SOT−323) (MUN5235)				
Total Device Dissipation T_A = 25°C Derate above 25°C Thermal Resistance, Junction to Ambient Thermal Resistance, Junction to Lead Junction and Storage Temperature Range	(Note 1) (Note 2) (Note 1) (Note 2) (Note 1) (Note 2) (Note 1) (Note 2)	P_D $R_{\theta JA}$ $R_{\theta JL}$ T_J, T_{stg}	202 310 1.6 2.5 618 403 280 332 −55 to +150	mW mW/°C °C/W °C/W °C
THERMAL CHARACTERISTICS (SC−75) (DTC123JE)				
Total Device Dissipation T_A = 25°C Derate above 25°C Thermal Resistance, Junction to Ambient Junction and Storage Temperature Range	(Note 1) (Note 2) (Note 1) (Note 2) (Note 1) (Note 2)	P_D $R_{\theta JA}$ T_J, T_{stg}	200 300 1.6 2.4 600 400 −55 to +150	mW mW/°C °C/W °C
THERMAL CHARACTERISTICS (SOT−723) (DTC123JM3)				
Total Device Dissipation T_A = 25°C Derate above 25°C Thermal Resistance, Junction to Ambient Junction and Storage Temperature Range	(Note 1) (Note 2) (Note 1) (Note 2) (Note 1) (Note 2)	P_D $R_{\theta JA}$ T_J, T_{stg}	260 600 2.0 4.8 480 205 −55 to +150	mW mW/°C °C/W °C

1. FR−4 @ Minimum Pad.
2. FR−4 @ 1.0 x 1.0 Inch Pad.
3. FR−4 @ 100 mm^2, 1 oz. copper traces, still air.
4. FR−4 @ 500 mm^2, 1 oz. copper traces, still air.

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Table 2. THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
THERMAL CHARACTERISTICS (SOT−1123) (NSBC123JF3)				
Total Device Dissipation T_A = 25°C Derate above 25°C	 (Note 3) (Note 4) (Note 3) (Note 4)	P_D	 254 297 2.0 2.4	 mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 3) (Note 4)	$R_{\theta JA}$	493 421	°C/W
Thermal Resistance, Junction to Lead	(Note 3)	$R_{\theta JL}$	193	°C/W
Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C

1. FR−4 @ Minimum Pad.
2. FR−4 @ 1.0 x 1.0 Inch Pad.
3. FR−4 @ 100 mm^2, 1 oz. copper traces, still air.
4. FR−4 @ 500 mm^2, 1 oz. copper traces, still air.

Table 3. ELECTRICAL CHARACTERISTICS (T_A = 25°C, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector−Base Cutoff Current (V_{CB} = 50 V, I_E = 0)	I_{CBO}	−	−	100	nAdc
Collector−Emitter Cutoff Current (V_{CE} = 50 V, I_B = 0)	I_{CEO}	−	−	500	nAdc
Emitter−Base Cutoff Current (V_{EB} = 6.0 V, I_C = 0)	I_{EBO}	−	−	0.2	mAdc
Collector−Base Breakdown Voltage (I_C = 10 μA, I_E = 0)	$V_{(BR)CBO}$	50	−	−	Vdc
Collector−Emitter Breakdown Voltage (Note 5) (I_C = 2.0 mA, I_B = 0)	$V_{(BR)CEO}$	50	−	−	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 5) (I_C = 5.0 mA, V_{CE} = 10 V)	h_{FE}	80	140	−	
Collector − Emitter Saturation Voltage (Note 5) (I_C = 10 mA, I_B = 1.0 mA)	$V_{CE(sat)}$	−	−	0.25	Vdc
Input Voltage (off) (V_{CE} = 5.0 V, I_C = 100 μA)	$V_{i(off)}$	−	0.6	0.5	Vdc
Input Voltage (on) (V_{CE} = 0.3 V, I_C = 5.0 mA)	$V_{i(on)}$	1.1	0.8	−	Vdc
Output Voltage (on) (V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	V_{OL}	−	−	0.2	Vdc
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)	V_{OH}	4.9	−	−	Vdc
Input Resistor	R1	1.5	2.2	2.9	kΩ
Resistor Ratio	R_1/R_2	0.038	0.047	0.056	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle ≤ 2%.

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TYPICAL CHARACTERISTICS
MUN2235, MMUN2235L, MUN5235, DTC123JE, DTC123JM3

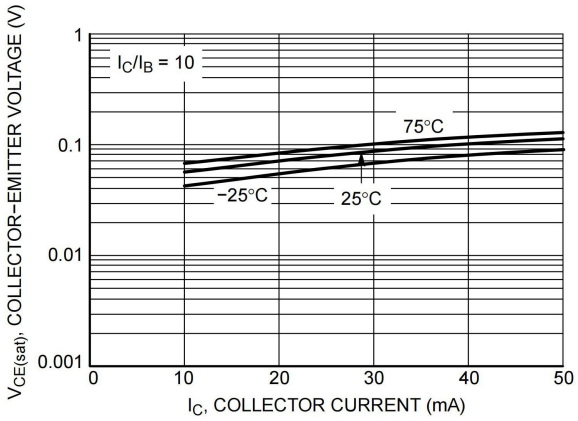

Figure 2. $V_{CE(sat)}$ vs. I_C

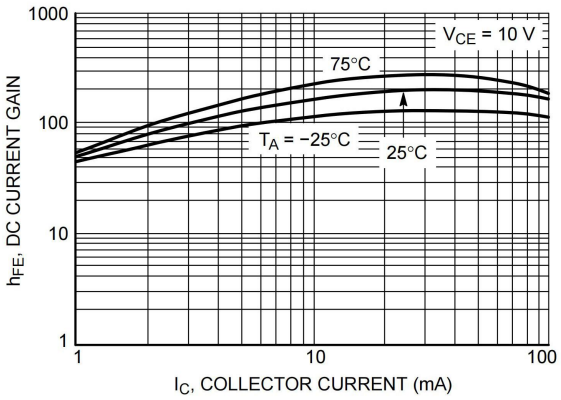

Figure 3. DC Current Gain

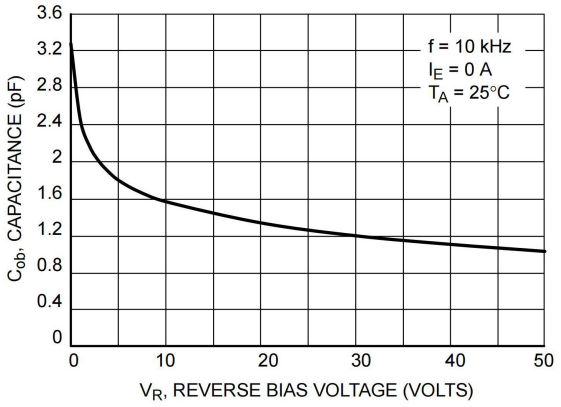

Figure 4. Output Capacitance

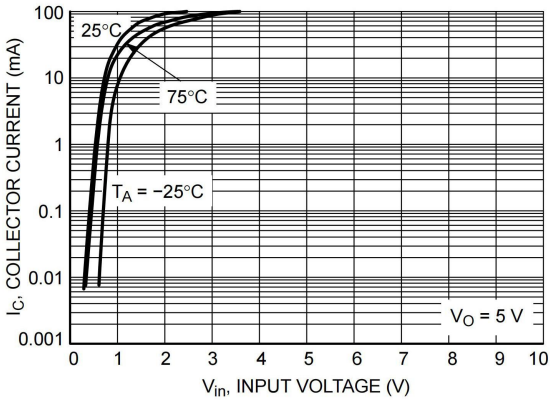

Figure 5. Output Current vs. Input Voltage

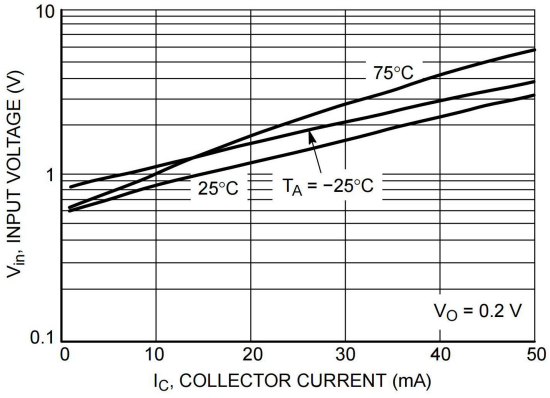

Figure 6. Input Voltage vs. Output Current

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TYPICAL CHARACTERISTICS
NSBC123JF3

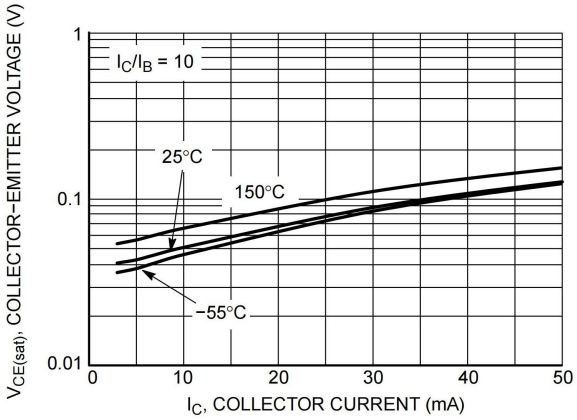


Figure 7. $V_{CE(sat)}$ vs. I_C

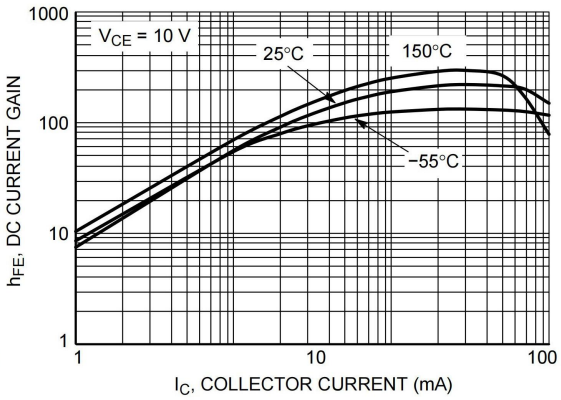


Figure 8. DC Current Gain

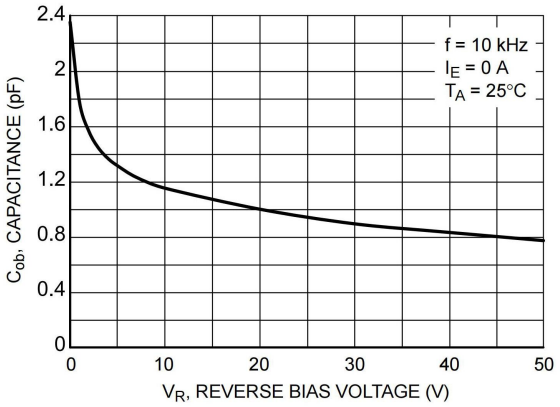


Figure 9. Output Capacitance

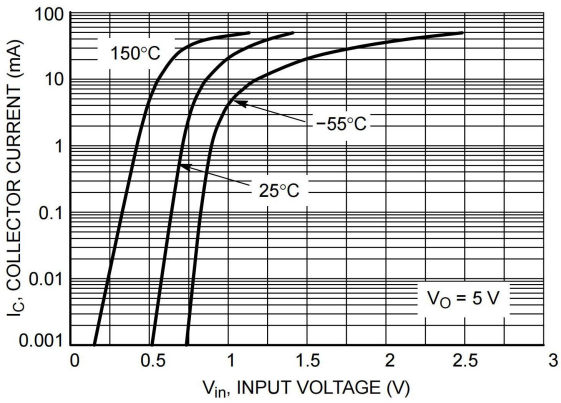


Figure 10. Output Current vs. Input Voltage

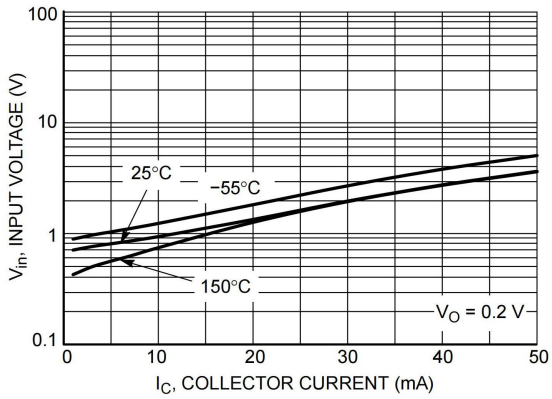
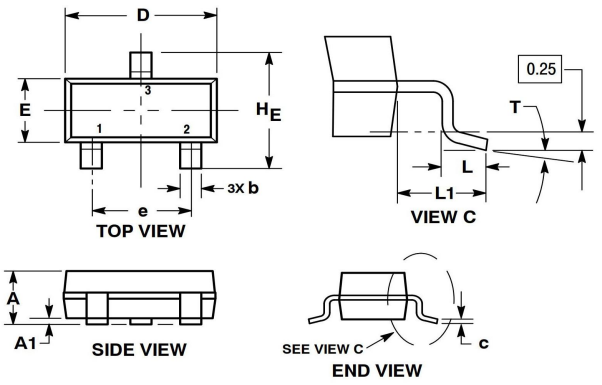


Figure 11. Input Voltage vs. Output Current

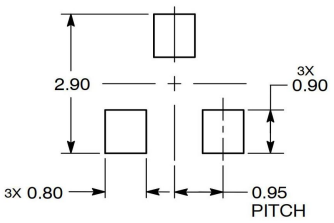
OM SENI



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H_E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

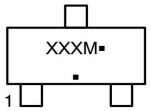
RECOMMENDED SOLDERING FOOTPRINT



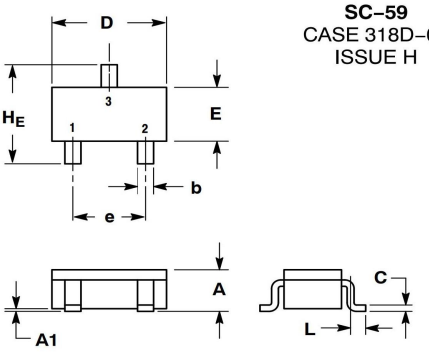
DIMENSIONS: MILLIMETERS

SOT–23 (TO–236)
CASE 318–08
ISSUE AS

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb–Free Package

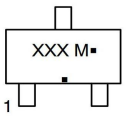


SC–59
CASE 318D–04
ISSUE H

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.15	1.30	0.039	0.045	0.051
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.35	0.43	0.50	0.014	0.017	0.020
c	0.09	0.14	0.18	0.003	0.005	0.007
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	1.70	1.90	2.10	0.067	0.075	0.083
L	0.20	0.40	0.60	0.008	0.016	0.024
H_E	2.50	2.80	3.00	0.099	0.110	0.118

GENERIC MARKING DIAGRAM

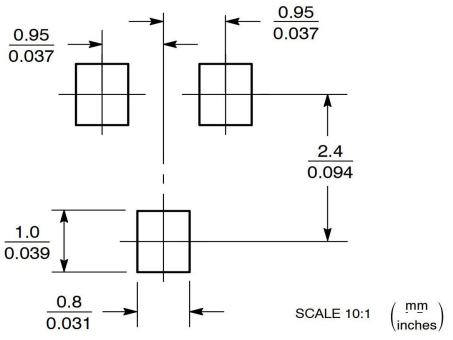


XXX = Specific Device Code
M = Date Code
▪ = Pb–Free Package*

(*Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb–Free indicator, "G" or microdot " ▪", may or may not be present.

SOLDERING FOOTPRINT*



STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. N.C.
3. CATHODE

STYLE 3:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 4:
PIN 1. CATHODE
2. N.C.
3. ANODE

STYLE 5:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE/CATHODE

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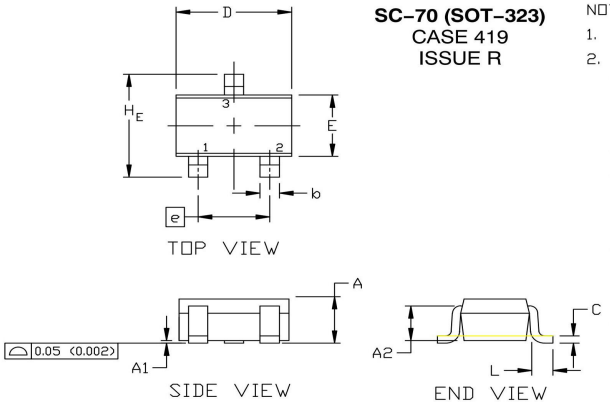
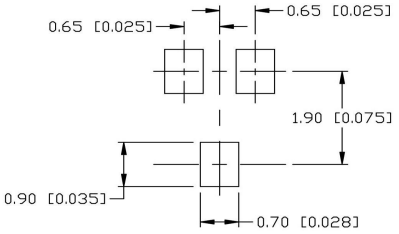


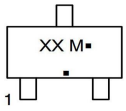
SC–70 (SOT–323)
CASE 419
ISSUE R

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH

	MILLIMETERS			INCHES		
DIM	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70 REF			0.028 BSC		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.00	2.20	0.071	0.080	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.20	0.38	0.56	0.008	0.015	0.022
H_E	2.00	2.10	2.40	0.079	0.083	0.095



GENERIC MARKING DIAGRAM



XX = Specific Device Code
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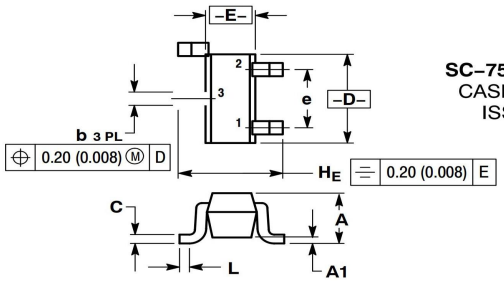


SC–75/SOT–416
CASE 463–01
ISSUE G

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.80	0.90	0.027	0.031	0.035
A1	0.00	0.05	0.10	0.000	0.002	0.004
b	0.15	0.20	0.30	0.006	0.008	0.012
C	0.10	0.15	0.25	0.004	0.006	0.010
D	1.55	1.60	1.65	0.061	0.063	0.065
E	0.70	0.80	0.90	0.027	0.031	0.035
e	1.00 BSC			0.04 BSC		
L	0.10	0.15	0.20	0.004	0.006	0.008
H_E	1.50	1.60	1.70	0.060	0.063	0.067

STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

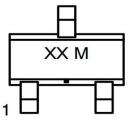
STYLE 2:
PIN 1. ANODE
2. N/C
3. CATHODE

STYLE 3:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 5:
PIN 1. GATE
2. SOURCE
3. DRAIN

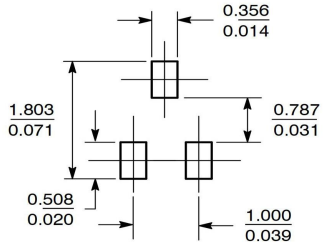
GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code
▪ = Pb–Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb–Free indicator, "G" or microdot " ▪", may or may not be present.

SOLDERING FOOTPRINT*

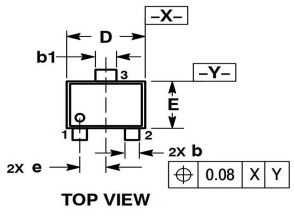


SCALE 10:1 (mm / inches)

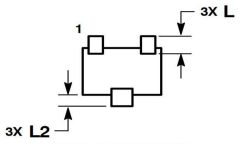
OM SENI

PACKAGE OUTLINE

DIMENSIONS: MILLIMETERS

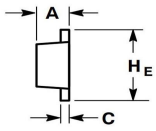


TOP VIEW



BOTTOM VIEW

SOT–723
CASE 631AA–01
ISSUE D



SIDE VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.45	0.50	0.55
b	0.15	0.21	0.27
b1	0.25	0.31	0.37
C	0.07	0.12	0.17
D	1.15	1.20	1.25
E	0.75	0.80	0.85
e		0.40 BSC	
H E	1.15	1.20	1.25
L		0.29 REF	
L2	0.15	0.20	0.25

STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. N/C
3. CATHODE

STYLE 3:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 5:
PIN 1. GATE
2. SOURCE
3. DRAIN

GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb–Free indicator, “G”, may or not be present.

RECOMMENDED SOLDERING FOOTPRINT*

