

MUN2136, MMUN2136L, MUN5136, DTA115EE, DTA115EM3

Digital Transistors (BRT) R1 = 100 kΩ, R2 = 100 kΩ

PNP 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
- S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- 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 _{CB0}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current - Continuous	I _C	100	mAdc
Input Forward Voltage	V _{IN(fwd)}	40	Vdc
Input Reverse Voltage	V _{IN(rev)}	10	Vdc

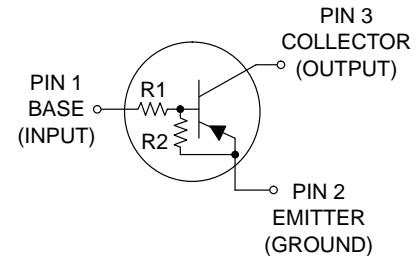
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



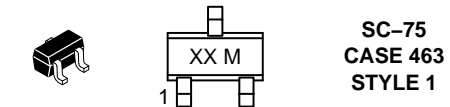
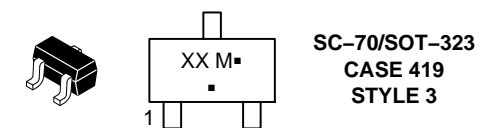
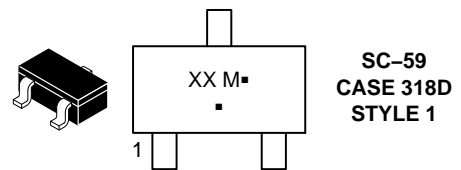
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PIN CONNECTIONS



MARKING DIAGRAMS



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

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering, marking, and shipping information in the package dimensions section on page 2 of this data sheet.

MUN2136, MMUN2136L, MUN5136, DTA115EE, DTA115EM3

Table 1. ORDERING INFORMATION

Device	Part Marking	Package	Shipping†
MUN2136T1G	6N	SC-59 (Pb-Free)	3000 / Tape & Reel
MMUN2136LT1G, NSVMUN2136LT1G*	ACG	SOT-23 (Pb-Free)	3000 / Tape & Reel
MUN5136T1G, NSVMUN5136T1G*	6N	SC-70/SOT-323 (Pb-Free)	3000 / Tape & Reel
DTA115EET1G, NSVDTA115EET1G*	6N	SC-75 (Pb-Free)	3000 / Tape & Reel
DTA115EM3T5G	6N	SOT-723 (Pb-Free)	8000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.



- (1) SC-75 and SC-70/SOT323; Minimum Pad
- (2) SC-59; Minimum Pad
- (3) SOT-23; Minimum Pad
- (4) SOT-723; Minimum Pad

Figure 1. Derating Curve

MUN2136, MMUN2136L, MUN5136, DTA115EE, DTA115EM3

Table 2. THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
THERMAL CHARACTERISTICS (SC-59) (MUN2136)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2) P_D	230 338 1.8 2.7	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2) $R_{\theta JA}$	540 370	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 1) (Note 2) $R_{\theta JL}$	264 287	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
THERMAL CHARACTERISTICS (SOT-23) (MMUN2136L)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2) P_D	246 400 2.0 3.2	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2) $R_{\theta JA}$	508 311	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 1) (Note 2) $R_{\theta JL}$	174 208	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
THERMAL CHARACTERISTICS (SC-70/SOT-323) (MUN5136)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2) P_D	202 310 1.6 2.5	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2) $R_{\theta JA}$	618 403	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 1) (Note 2) $R_{\theta JL}$	280 332	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
THERMAL CHARACTERISTICS (SC-75) (DTA115EE)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2) P_D	200 300 1.6 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2) $R_{\theta JA}$	600 400	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
THERMAL CHARACTERISTICS (SOT-723) (DTA115EM3)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2) P_D	260 600 2.0 4.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2) $R_{\theta JA}$	480 205	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

1. FR-4 @ Minimum Pad.
2. FR-4 @ 1.0 x 1.0 Inch Pad.

MUN2136, MMUN2136L, MUN5136, DTA115EE, DTA115EM3

Table 3. ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$)	I_{CBO}	–	–	100	nAdc
Collector–Emitter Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$)	I_{CEO}	–	–	500	nAdc
Emitter–Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$)	I_{EBO}	–	–	0.05	mAdc
Collector–Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	50	–	–	Vdc
Collector–Emitter Breakdown Voltage (Note 3) ($I_C = 2.0\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	50	–	–	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 3) ($I_C = 5.0\text{ mA}$, $V_{CE} = 10\text{ V}$)	h_{FE}	80	150	–	
Collector–Emitter Saturation Voltage (Note 3) ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$)	$V_{CE(sat)}$	–	–	0.25	Vdc
Input Voltage (off) ($V_{CE} = 5.0\text{ V}$, $I_C = 100\ \mu\text{A}$)	$V_{i(off)}$	–	1.2	0.5	Vdc
Input Voltage (on) ($V_{CE} = 0.3\text{ V}$, $I_C = 1.0\text{ mA}$)	$V_{i(on)}$	3.0	1.6	–	Vdc
Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 5.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	V_{OL}	–	–	0.2	Vdc
Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	V_{OH}	4.9	–	–	Vdc
Input Resistor	R_1	70	100	130	$\text{k}\Omega$
Resistor Ratio	R_1/R_2	0.8	1.0	1.2	

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.

3. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS
MUN2136, MMUN2136L, MUN5136, DTA115EE, DTA115EM3



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

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SOT-23 (TO-236)
CASE 318
ISSUE AT

DATE 01 MAR 2023

SCALE 4:1



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.

DIM	MILLIMETERS			INCHES		
	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°

GENERIC MARKING DIAGRAM*



- XXX = 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. Some products may not follow the Generic Marking.



RECOMMENDED MOUNTING FOOTPRINT

* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLES ON PAGE 2

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MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



SOT-23 (TO-236)
CASE 318
ISSUE AT

DATE 01 MAR 2023

- | | | | | | |
|---|---|---|---|---|---|
| STYLE 1 THRU 5:
CANCELLED | STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR | STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR | STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE | | |
| STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE | STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE | STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE-ANODE | STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE | STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE | STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE |
| STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE | STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE | STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE | STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE | STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE-ANODE | STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE |
| STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN | STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT | STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE | STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE | STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE | STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION |
| STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE | STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE | | | | |

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 4:1

SC-70 (SOT-323) CASE 419 ISSUE R

DATE 11 OCT 2022



NOTES:

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

DIM	MILLIMETERS			INCHES		
	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
- 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. Some products may not follow the Generic Marking.



* For additional information on our Pb-Free strategy and soldering details, please download the DN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

SOLDERING FOOTPRINT

- | | | | | | |
|---|---|---|--|---|---|
| STYLE 1:
CANCELLED | STYLE 2:
PIN 1. ANODE
2. N.C.
3. CATHODE | STYLE 3:
PIN 1. BASE
2. EMITTER
3. COLLECTOR | STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. ANODE | STYLE 5:
PIN 1. ANODE
2. ANODE
3. CATHODE | |
| STYLE 6:
PIN 1. EMITTER
2. BASE
3. COLLECTOR | STYLE 7:
PIN 1. BASE
2. EMITTER
3. COLLECTOR | STYLE 8:
PIN 1. GATE
2. SOURCE
3. DRAIN | STYLE 9:
PIN 1. ANODE
2. CATHODE
3. CATHODE-ANODE | STYLE 10:
PIN 1. CATHODE
2. ANODE
3. ANODE-CATHODE | STYLE 11:
PIN 1. CATHODE
2. CATHODE
3. CATHODE |

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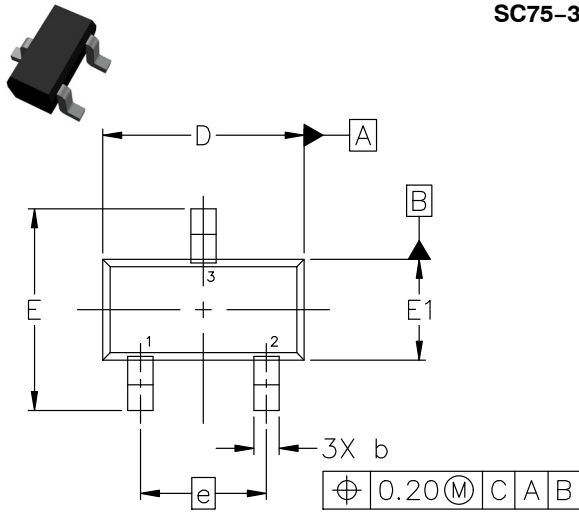
MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

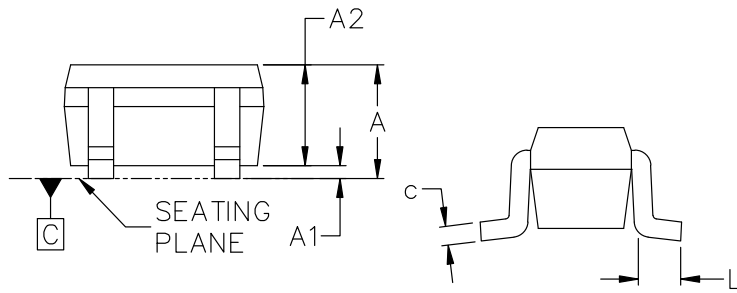


SC75-3 1.60x0.80x0.80, 1.00P
CASE 463
ISSUE H

DATE 01 FEB 2024



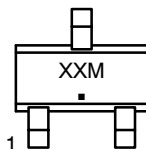
TOP VIEW



SIDE VIEW

END VIEW

GENERIC MARKING DIAGRAM*



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

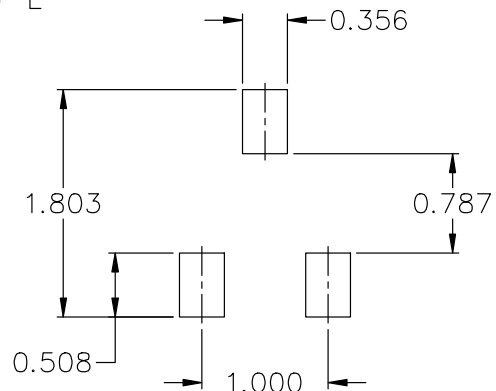
*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

- | | | |
|---|--|--|
| 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 | |

NOTES:

- DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
- ALL DIMENSION ARE IN MILLIMETERS.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.80	0.90
A1	0.00	0.05	0.10
A2	0.80 REF.		
b	0.15	0.20	0.30
c	0.10	0.15	0.25
D	1.55	1.60	1.65
E	1.50	1.60	1.70
E1	0.70	0.80	0.90
e	1.00 BSC		
L	0.10	0.15	0.20



RECOMMENDED MOUNTING FOOTPRINT*

* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



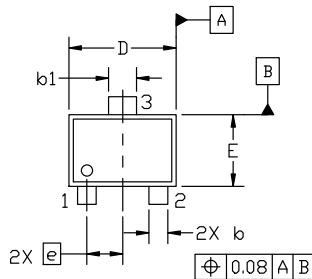
SOT-723 1.20x0.80x0.50, 0.40P
CASE 631AA
ISSUE E

DATE 24 JAN 2024

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
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.

DIM	MILLIMETERS		
	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	1.15	1.20	1.25
L	0.29 REF		
L2	0.15	0.20	0.25



TOP VIEW



SIDE VIEW



BOTTOM VIEW



RECOMMENDED MOUNTING FOOTPRINT

GENERIC MARKING DIAGRAM*



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M = Date Code

*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. Some products may not follow the Generic Marking.

*For additional information on our Pb-Free strategy and soldering details, please download the DN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLE 1:	STYLE 2:	STYLE 3:	STYLE 4:	STYLE 5:
PIN 1. BASE	PIN 1. ANODE	PIN 1. ANODE	PIN 1. CATHODE	PIN 1. GATE
2. EMITTER	2. N/C	2. ANODE	2. CATHODE	2. SOURCE
3. COLLECTOR	3. CATHODE	3. CATHODE	3. ANODE	3. DRAIN

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DESCRIPTION:	SOT-723 1.20x0.80x0.50, 0.40P	PAGE 1 OF 1

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