

General Purpose Transistors

PNP Silicon

MMBT2907AL, SMMBT2907AL

Features

- S 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

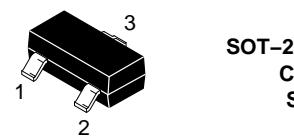
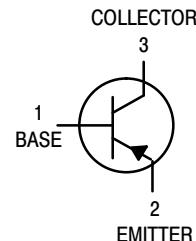
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	-60	Vdc
Collector-Base Voltage	V_{CBO}	-60	Vdc
Emitter-Base Voltage	V_{EBO}	-5.0	Vdc
Collector Current – Continuous	I_C	-600	mAdc
Collector Current – Peak (Note 3)	I_{CM}	-1200	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation – FR-5 Board (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation – Alumina Substrate, (Note 2) @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Total Device Dissipation – Heat Spreader or equivalent, (Note 4) @ $T_A = 25^\circ\text{C}$	P_D	350	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

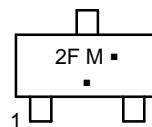
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-5 = $1.0 \times 0.75 \times 0.062$ in.
2. Alumina = $0.4 \times 0.3 \times 0.024$ in. 99.5% alumina.
3. Reference SOA curve.
4. Heat Spreader or equivalent = 450 mm^2 , 2 oz.



SOT-23 (TO-236AB)
CASE 318
STYLE 6

MARKING DIAGRAM



2F = Device Code

M = Date Code*

■ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping [†]
MMBT2907ALT1G SMMBT2907ALT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
MMBT2907ALT3G SMMBT2907ALT3G	SOT-23 (Pb-Free)	10,000 / 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.

MMBT2907AL, SMMBT2907AL

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (Note 5) ($I_C = -1.0 \text{ mA}, I_B = 0$) ($I_C = -10 \text{ mA}, I_B = 0$)	$V_{(\text{BR})\text{CEO}}$	-60 -60	-	Vdc
Collector-Base Breakdown Voltage ($I_C = -10 \mu\text{A}, I_E = 0$)	$V_{(\text{BR})\text{CBO}}$	-60	-	Vdc
Emitter-Base Breakdown Voltage ($I_E = -10 \mu\text{A}, I_C = 0$)	$V_{(\text{BR})\text{EBO}}$	-5.0	-	Vdc
Collector Cutoff Current ($V_{CE} = -30 \text{ Vdc}, V_{EB(\text{off})} = -0.5 \text{ Vdc}$)	I_{CEX}	-	-50	nAdc
Collector Cutoff Current ($V_{CB} = -50 \text{ Vdc}, I_E = 0$) ($V_{CB} = -50 \text{ Vdc}, I_E = 0, T_A = 125^\circ\text{C}$)	I_{CBO}	- -	-0.010 -10	μAdc
Base Cutoff Current ($V_{CE} = -30 \text{ Vdc}, V_{EB(\text{off})} = -0.5 \text{ Vdc}$)	I_{BL}	-	-50	nAdc
ON CHARACTERISTICS				
DC Current Gain ($I_C = -0.1 \text{ mA}, V_{CE} = -10 \text{ Vdc}$) ($I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}$) ($I_C = -10 \text{ mA}, V_{CE} = -10 \text{ Vdc}$) ($I_C = -150 \text{ mA}, V_{CE} = -10 \text{ Vdc}$) ($I_C = -500 \text{ mA}, V_{CE} = -10 \text{ Vdc}$) (Note 5)	h_{FE}	75 100 100 100 50	-	-
Collector-Emitter Saturation Voltage (Note 5) ($I_C = -150 \text{ mA}, I_B = -15 \text{ mA}$) (Note 5) ($I_C = -500 \text{ mA}, I_B = -50 \text{ mA}$)	$V_{CE(\text{sat})}$	- -	-0.4 -1.6	Vdc
Base-Emitter Saturation Voltage (Note 5) ($I_C = -150 \text{ mA}, I_B = -15 \text{ mA}$) ($I_C = -500 \text{ mA}, I_B = -50 \text{ mA}$)	$V_{BE(\text{sat})}$	- -	-1.3 -2.6	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Current-Gain - Bandwidth Product (Notes 5, 6), ($I_C = -50 \text{ mA}, V_{CE} = -20 \text{ Vdc}, f = 100 \text{ MHz}$)	f_T	200	-	MHz
Output Capacitance ($V_{CB} = -10 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$)	C_{obo}	-	8.0	pF
Input Capacitance ($V_{EB} = -2.0 \text{ Vdc}, I_C = 0, f = 1.0 \text{ MHz}$)	C_{ibo}	-	30	
SWITCHING CHARACTERISTICS				
Turn-On Time	t_{on}	-	45	ns
Delay Time	t_d	-	10	
Rise Time	t_r	-	40	
Turn-Off Time	t_{off}	-	100	
Storage Time	t_s	-	80	
Fall Time	t_f	-	30	

5. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

6. f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

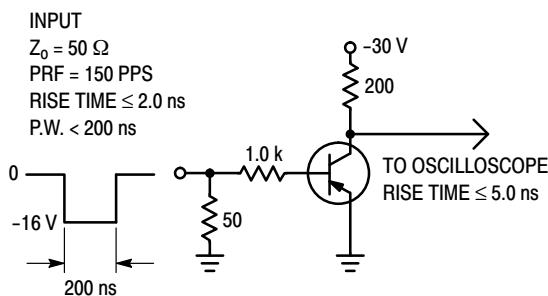


Figure 1. Delay and Rise Time Test Circuit

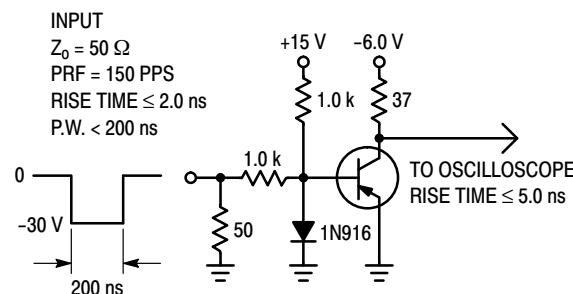


Figure 2. Storage and Fall Time Test Circuit



MMBT2907AL, SMMBT2907AL

TYPICAL CHARACTERISTICS

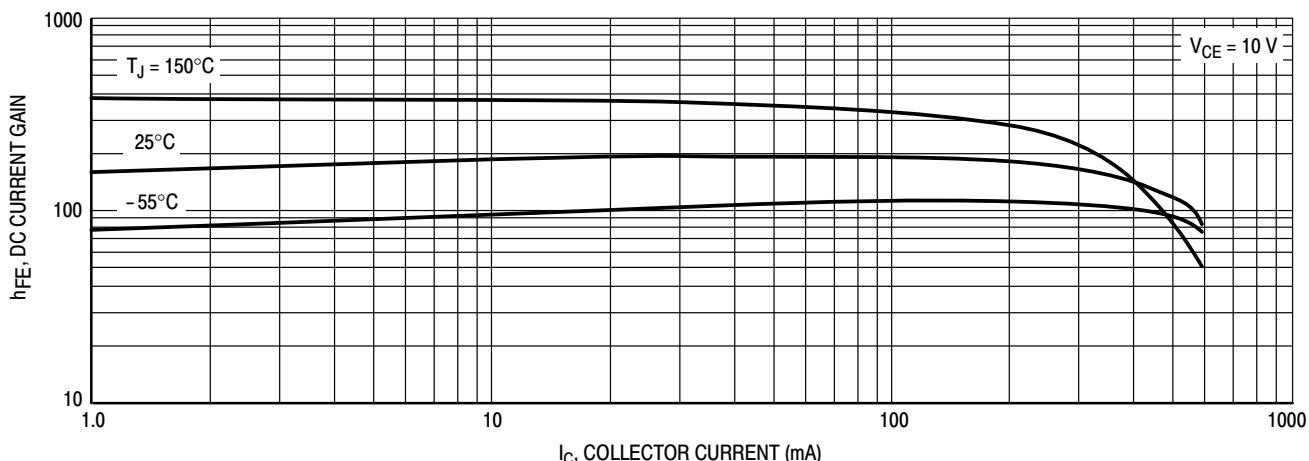


Figure 3. DC Current Gain

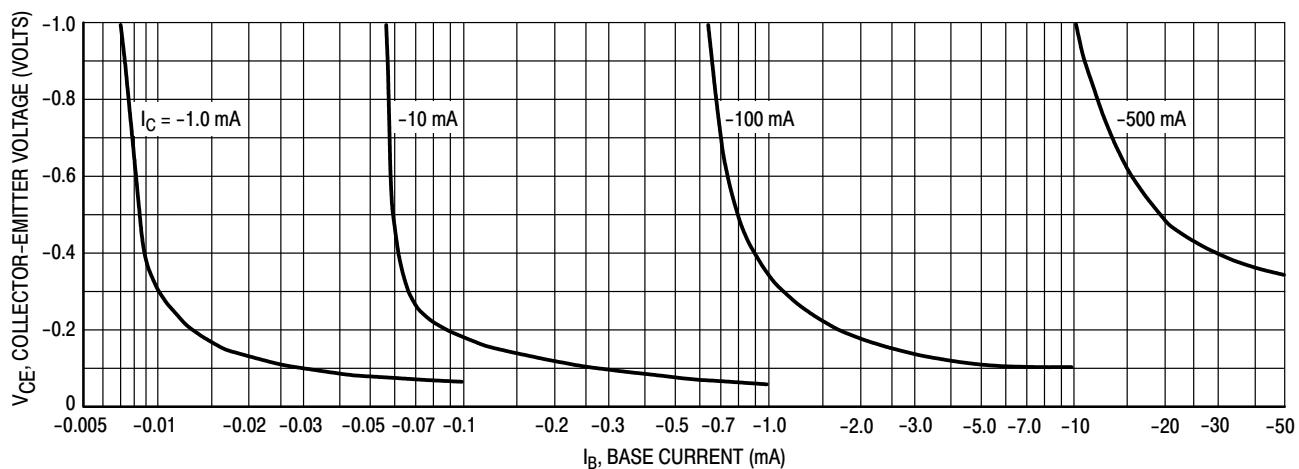


Figure 4. Collector Saturation Region

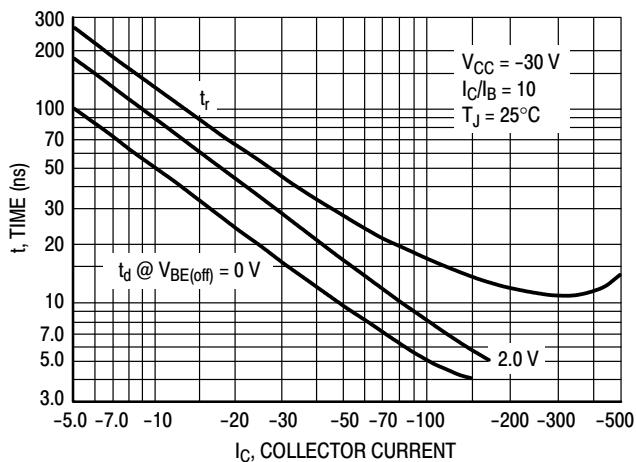


Figure 5. Turn-On Time

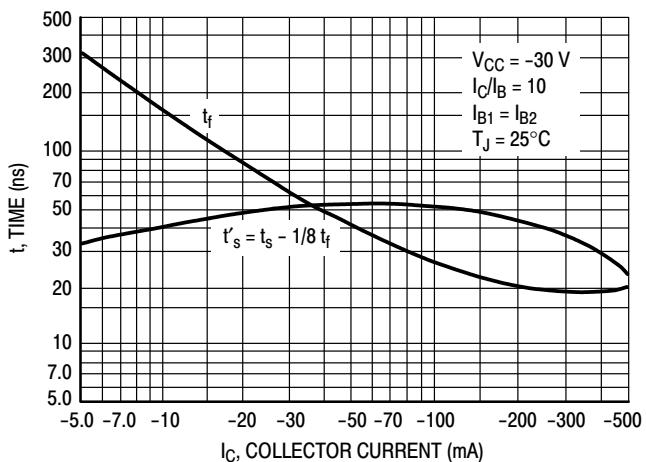


Figure 6. Turn-Off Time

MMBT2907AL, SMMBT2907AL

TYPICAL SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE

$V_{CE} = 10$ VDC, $T_A = 25^\circ\text{C}$

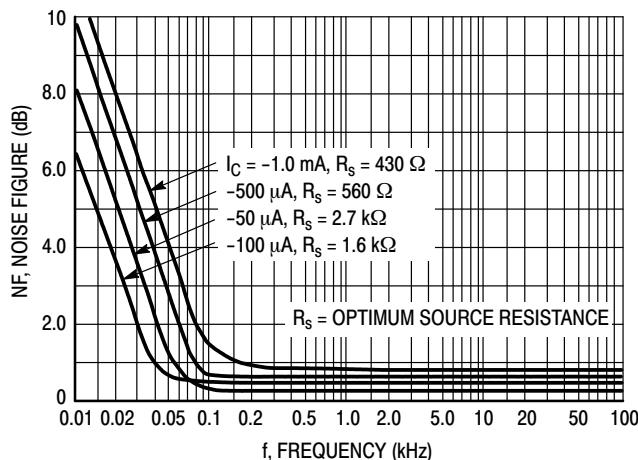


Figure 7. Frequency Effects

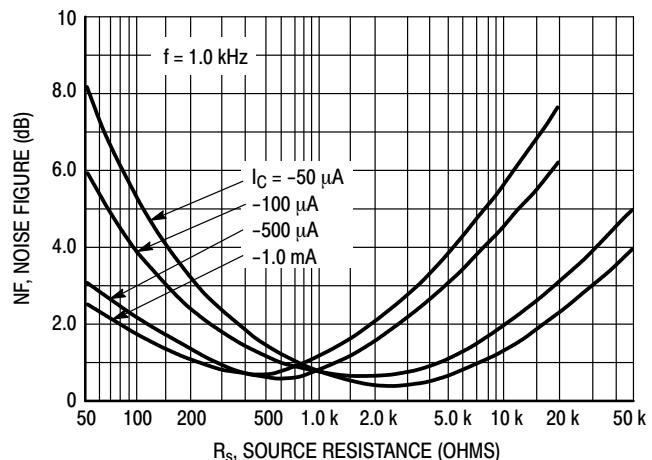


Figure 8. Source Resistance Effects

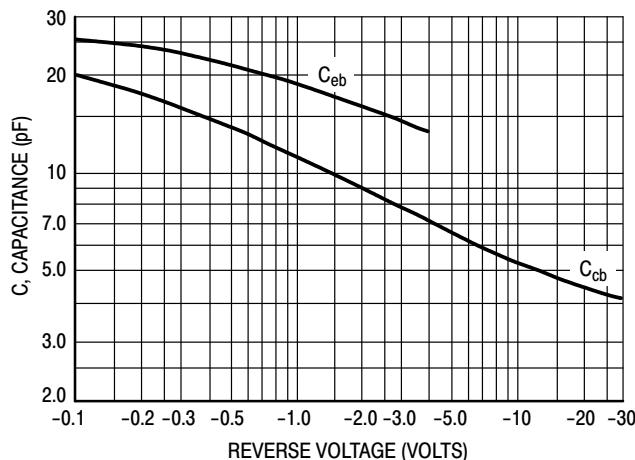


Figure 9. Capacitances

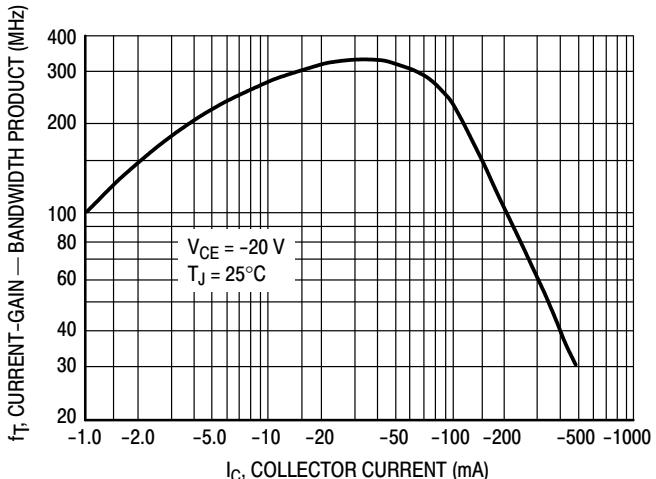


Figure 10. Current-Gain - Bandwidth Product

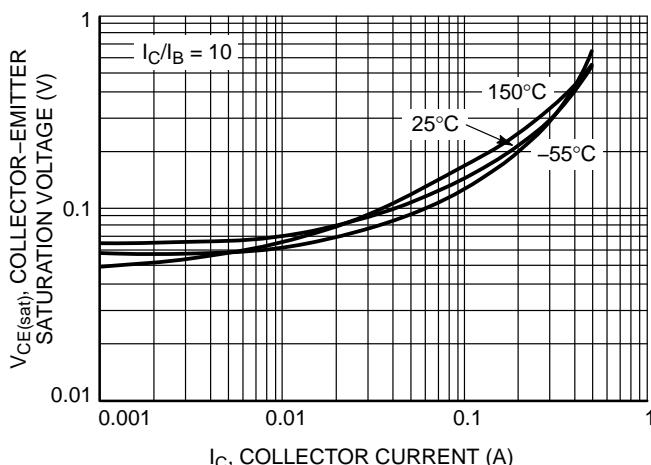


Figure 11. Collector Emitter Saturation Voltage vs. Collector Current

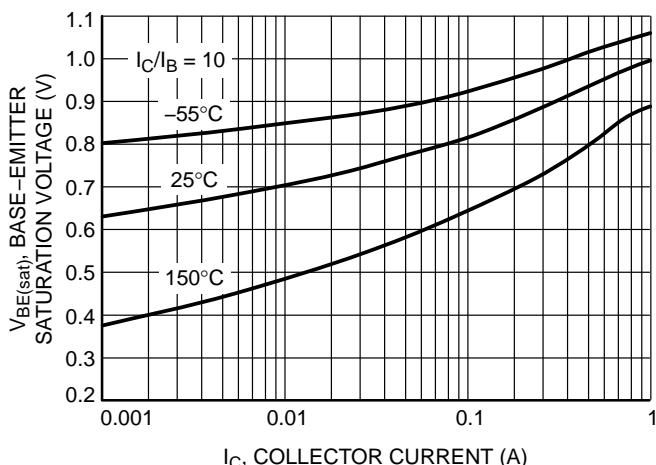


Figure 12. Base Emitter Saturation Voltage vs. Collector Current

MMBT2907AL, SMMBT2907AL

TYPICAL SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE

$V_{CE} = 10$ VDC, $T_A = 25^\circ\text{C}$

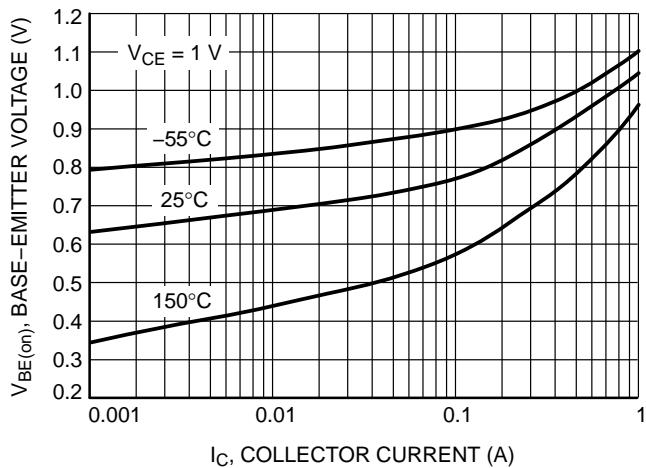


Figure 13. Base Emitter Voltage vs. Collector Current

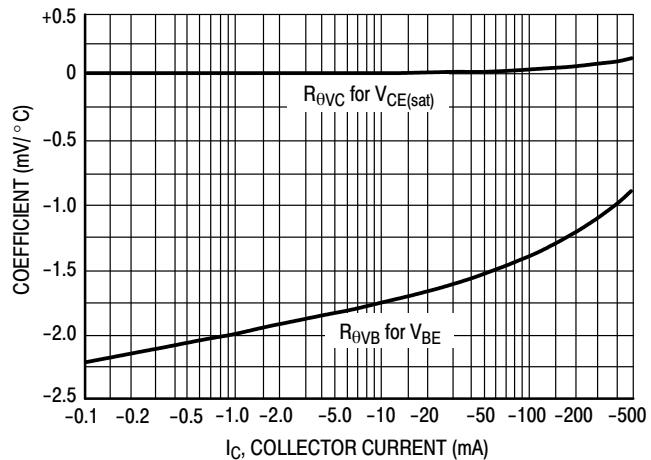


Figure 14. Temperature Coefficients

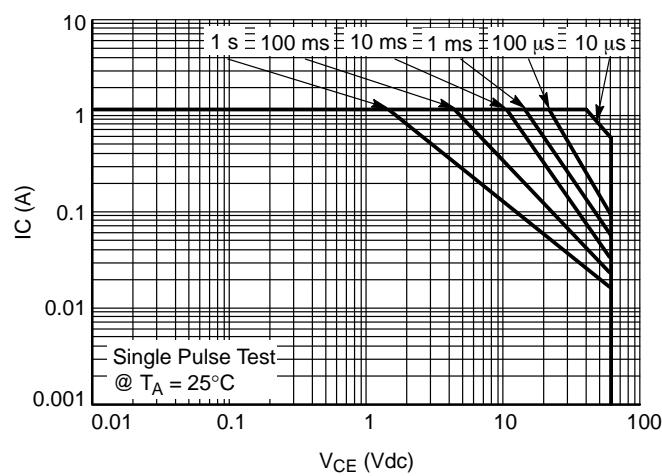
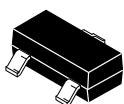


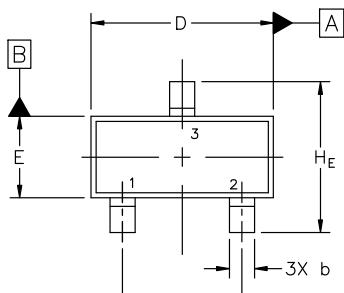
Figure 15. Safe Operating Area



SCALE 4:1

SOT-23 (TO-236) 2.90x1.30x1.00 1.90P
CASE 318
ISSUE AU

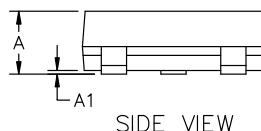
DATE 14 AUG 2024



TOP VIEW

DETAIL "A"

Scale 3:1

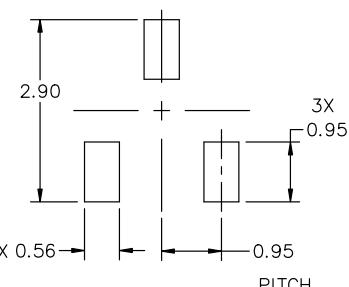


SIDE VIEW

DETAIL "A"

END VIEW

SEATING PLANE

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.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: 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.

RECOMMENDED
MOUNTING FOOTPRINT

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

STYLES ON PAGE 2

DOCUMENT NUMBER:	98ASB42226B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOT-23 (TO-236) 2.90x1.30x1.00 1.90P	PAGE 1 OF 2

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

SOT-23 (TO-236) 2.90x1.30x1.00 1.90P

CASE 318

ISSUE AU

DATE 14 AUG 2024

STYLE 1 THRU 5:
CANCELLEDSTYLE 6:
PIN 1. BASE
2. Emitter
3. CollectorSTYLE 7:
PIN 1. Emitter
2. Base
3. CollectorSTYLE 8:
PIN 1. Anode
2. No Connection
3. CathodeSTYLE 9:
PIN 1. Anode
2. Anode
3. CathodeSTYLE 10:
PIN 1. Drain
2. Source
3. GateSTYLE 11:
PIN 1. Anode
2. Cathode
3. Cathode-AnodeSTYLE 12:
PIN 1. Cathode
2. Cathode
3. AnodeSTYLE 13:
PIN 1. Source
2. Drain
3. GateSTYLE 14:
PIN 1. Cathode
2. Gate
3. AnodeSTYLE 15:
PIN 1. Gate
2. Cathode
3. AnodeSTYLE 16:
PIN 1. Anode
2. Cathode
3. CathodeSTYLE 17:
PIN 1. No Connection
2. Anode
3. CathodeSTYLE 18:
PIN 1. No Connection
2. Cathode
3. AnodeSTYLE 19:
PIN 1. Cathode
2. Anode
3. Cathode-AnodeSTYLE 20:
PIN 1. Cathode
2. Anode
3. GateSTYLE 21:
PIN 1. Gate
2. Source
3. DrainSTYLE 22:
PIN 1. Return
2. Output
3. InputSTYLE 23:
PIN 1. Anode
2. Anode
3. CathodeSTYLE 24:
PIN 1. Gate
2. Drain
3. SourceSTYLE 25:
PIN 1. Anode
2. Cathode
3. GateSTYLE 26:
PIN 1. Cathode
2. Anode
3. No ConnectionSTYLE 27:
PIN 1. Cathode
2. Cathode
3. CathodeSTYLE 28:
PIN 1. Anode
2. Anode
3. Anode

DOCUMENT NUMBER:	98ASB42226B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOT-23 (TO-236) 2.90x1.30x1.00 1.90P	PAGE 2 OF 2

onsemi and **ONSEMI** are trademarks of Semiconductor Components Industries, LLC dba **onsemi** or its subsidiaries in the United States and/or other countries. **onsemi** reserves the right to make changes without further notice to any products herein. **onsemi** makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. **onsemi** does not convey any license under its patent rights nor the rights of others.

onsemi, **ONSEMI**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales

