N-Channel Switch

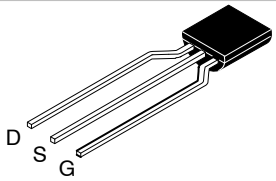
J111, J112, J113, MMBFJ111, MMBFJ112, MMBFJ113

ON Semiconductor®

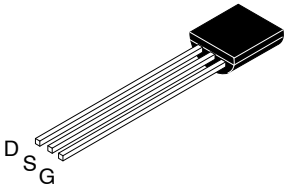
www.onsemi.com

Features

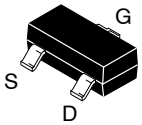
- This Device is Designed for Low Level Analog Switching, Sample and Hold Circuits and Chopper Stabilized Amplifiers
- Sourced from Process 51
- Source & Drain are Interchangeable
- These are Pb−Free Devices



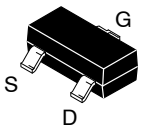
TO−92 3 4.83x4.76 LEADFORMED
CASE 135AR



TO−92 3 4.825x4.76
CASE 135AN



SOT−23 (TO−236)
CASE 318−08



SOT−23
CASE 318BM

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted) (Note 1, 2)

Symbol	Parameter	Value	Unit
V_{DG}	Drain−Gate Voltage	35	V
V_{GS}	Gate−Source Voltage	−35	V
I_{GF}	Forward Gate Current	50	mA
T_J, T_{STG}	Operating and Storage Junction Temperature Range	−55 to 150	°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.

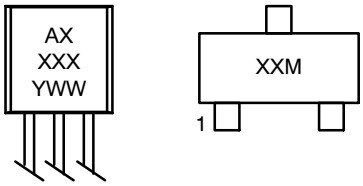
1. These ratings are based on a maximum junction temperature of 150°C.
2. These are steady−state limits. ON Semiconductor should be consulted on applications involving pulsed or low−duty−cycle operations.

THERMAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Max		Unit
		J111 / J112 / J113 (Note 3)	MMBFJ111 / MMBFJ112 / MMBFJ113 (Note 4)	
P_D	Total Device Dissipation	625	350	mW
	Derate Above 25°C	5.0	2.8	mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case	125	–	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient	200	357	°C/W

3. PCB size: FR−4, 76 mm x 114 mm x 1.57 mm (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.
4. Device mounted on FR−4 PCB 36 mm x 18 mm x 1.5 mm; mounting pad for the collector lead minimum 6 cm^2.

MARKING DIAGRAMS



XXXX, XX	= Specific Device Code
A	= Assembly Plant Code
Y	= Year
WW	= Work Week
M	= Date Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

© Semiconductor Components Industries, LLC, 1997

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition		Min	Max	Unit
OFF CHARACTERISTICS						
$V_{(BR)GSS}$	Gate−Source Breakdown Voltage	I_G = −1.0 μA, V_{DS} = 0		−35	–	V
I_{GSS}	Gate Reverse Current	V_{GS} = −15 V, V_{DS} = 0		–	−1.0	nA
V_{GS}(off)	Gate−Source Cut−Off Voltage	V_{DS} = 5 V, I_D = 1.0 μA	*111*	−3.0	−10.0	V
			112	−1.0	−5.0	
			113	−0.5	−3.0	
I_D(off)	Drain Cutoff Leakage Current	V_{DS} = 5.0 V, V_{GS} = −10 V		–	1.0	nA
ON CHARACTERISTICS						
I_{DSS}	Zero−Gate Voltage Drain Current (Note 5)	V_{DS} = 15 V, V_{GS} = 0	*111*	20	–	mA
			112	5.0	–	
			113	2.0	–	
r_{DS}(on)	Drain−Source On Resistance	V_{DS} ≤ 0.1 V, V_{GS} = 0	*111*	–	30	Ω
			112	–	50	
			113	–	100	
SMALL SIGNAL CHARACTERISTICS						
C_{dg}(on) C_{sg}(on)	Drain−Gate &Source−Gate On Capacitance	V_{DS} = 0, V_{GS} = 0, f = 1.0 MHz		–	28	pF
C_{dg}(off)	Drain−Gate Off Capacitance	V_{DS} = 0, V_{GS} = −10 V, f = 1.0 MHz		–	5.0	pF
C_{sg}(off)	Source−Gate Off Capacitance	V_{DS} = 0, V_{GS} = −10 V, f = 1.0 MHz		–	5.0	pF

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. Pulse test: pulse width ≤300 μs, duty cycle ≤2%.

TYPICAL PERFORMANCE CHARACTERISTICS

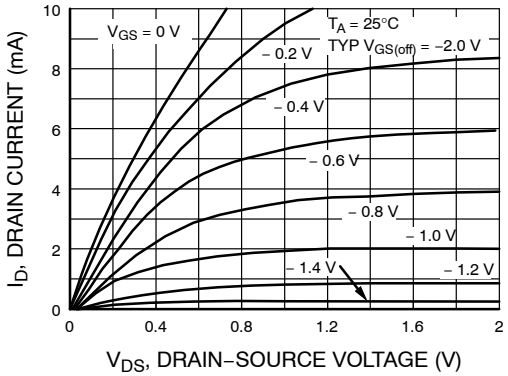


Figure 1. Common Drain−Source

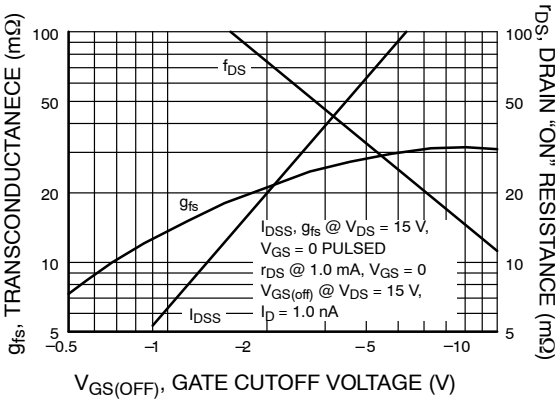


Figure 2. Parameter Interactions

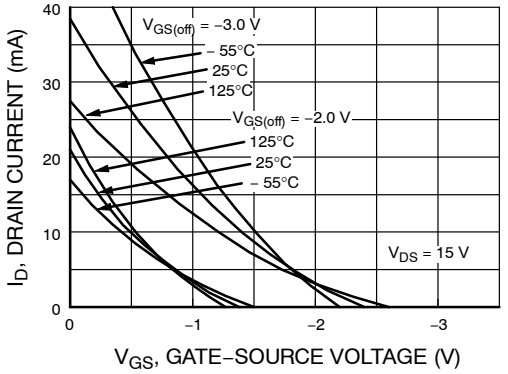


Figure 3. Transfer Characteristics

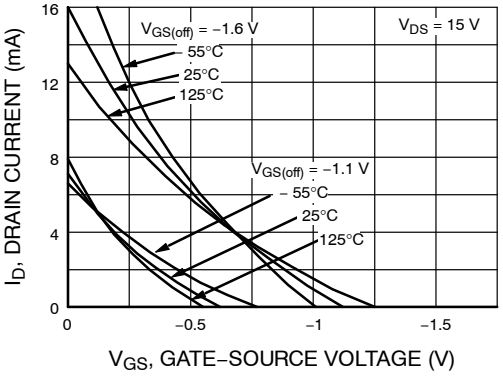


Figure 4. Transfer Characteristics

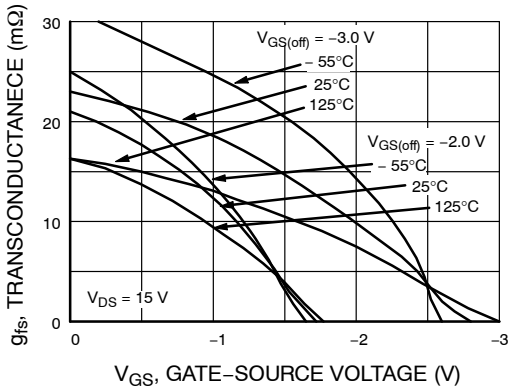


Figure 5. Transfer Characteristics

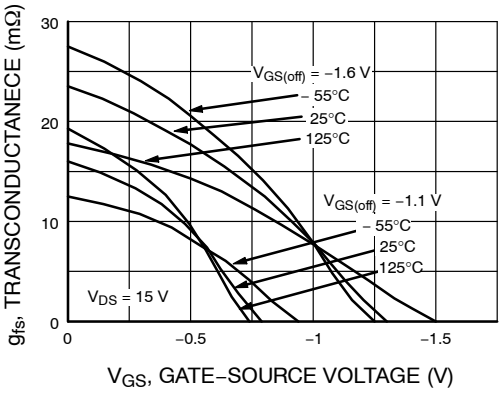


Figure 6. Transfer Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

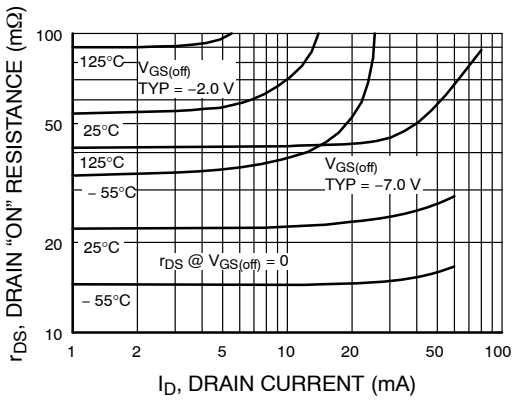


Figure 7. On Resistance vs. Drain Current

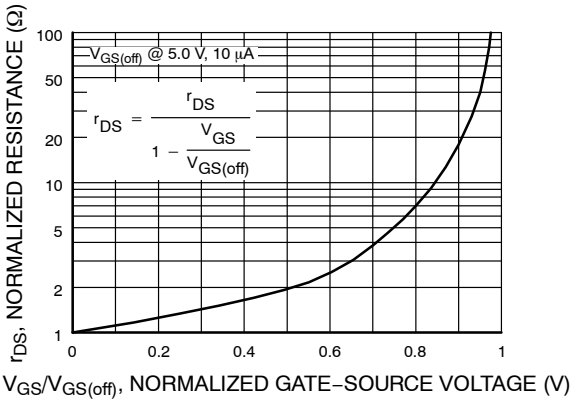


Figure 8. Normalized Drain Resistance vs. Bias Voltage

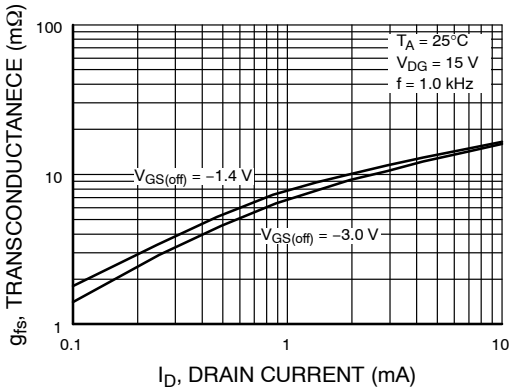


Figure 9. Transconductance vs. Drain Current

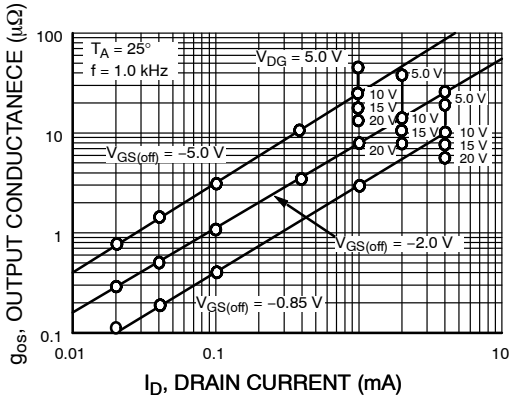


Figure 10. Output Conductance vs. Drain Current

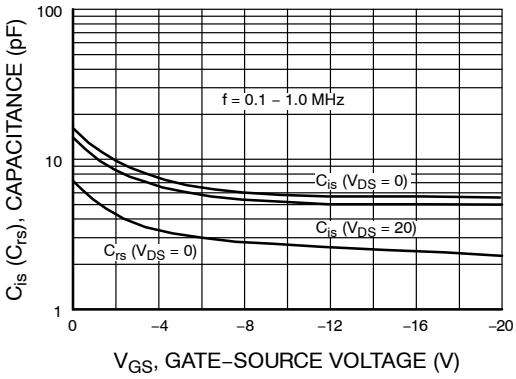


Figure 11. Capacitance vs. Voltage

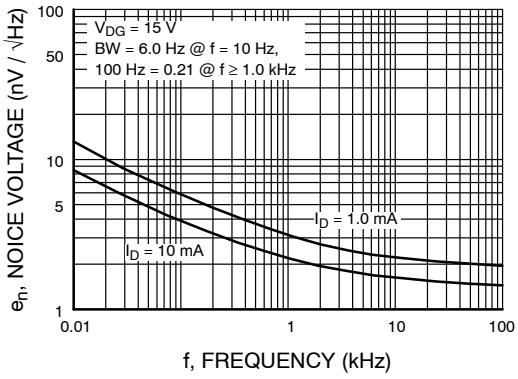


Figure 12. Noise Voltage vs. Frequency

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

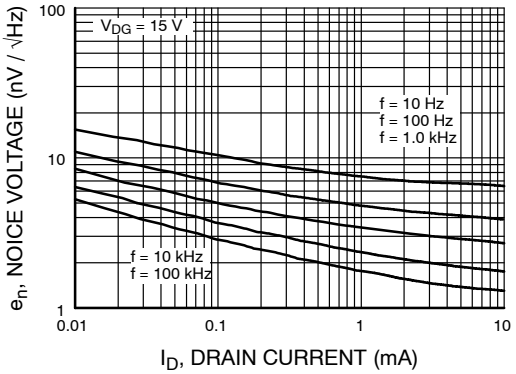


Figure 13. Noise Voltage vs. Current

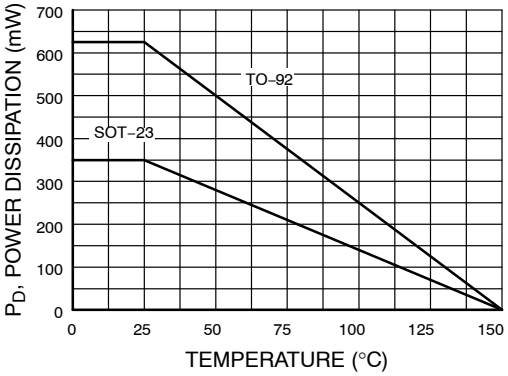


Figure 14. Power Dissipation vs. Ambient Temperature

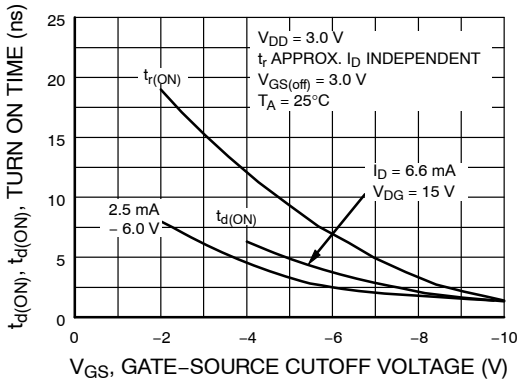


Figure 15. Switching Turn−On Time vs. Gate−Source Voltage

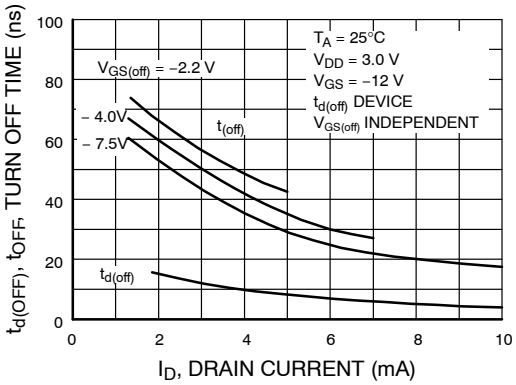


Figure 16. Switching Turn−Off Time vs. Drain Current

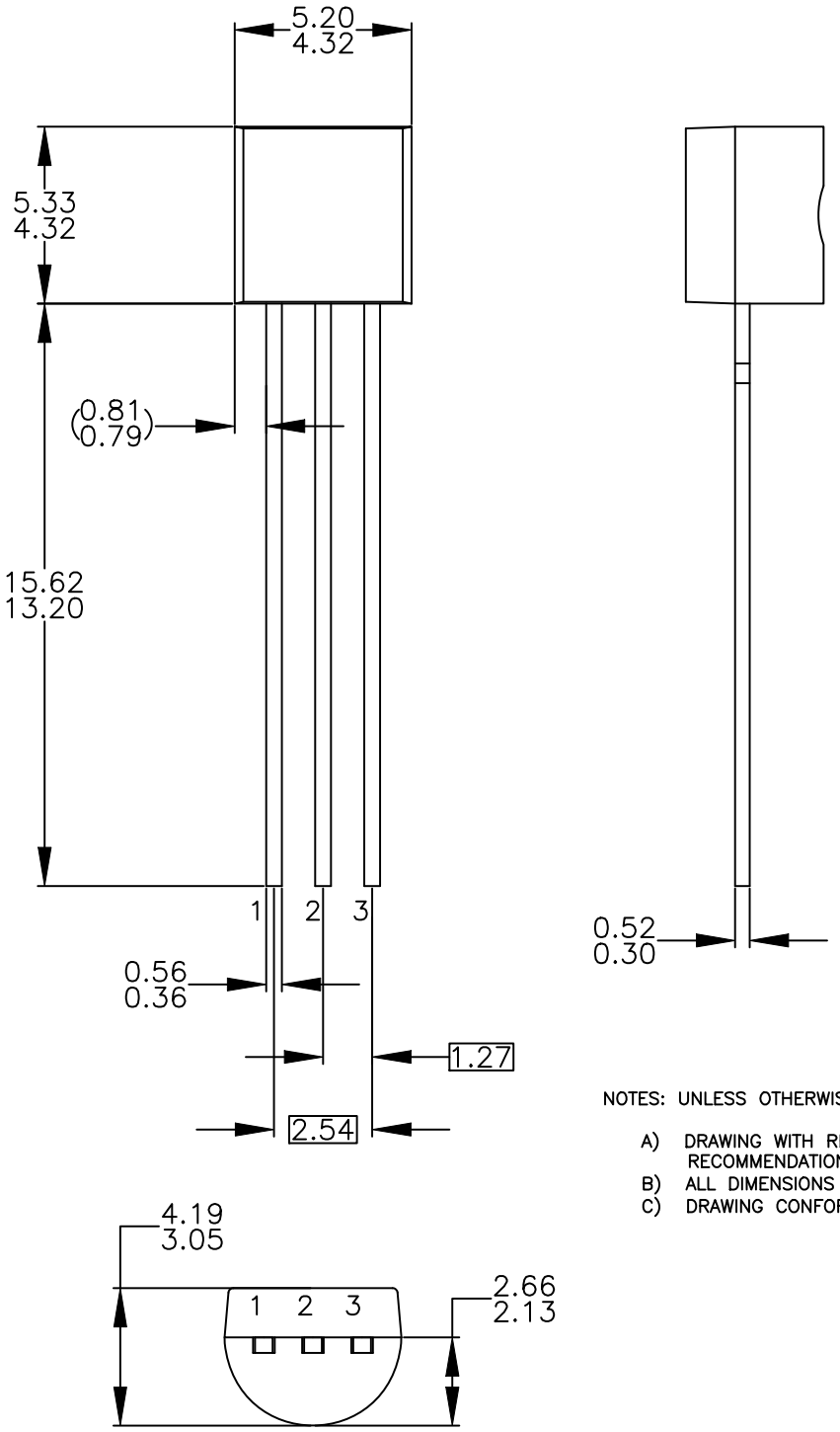
ORDERING INFORMATION

Part Number	Top Mark	Package	Shipping†
J111	AJ 111 YWW	TO−92 3L (Pb−Free)	10000 Units / Bulk
J111−D26Z	AJ 111 YWW	TO−92 3L (Pb−Free)	2000 / Tape & Reel
J111−D74Z	AJ 111 YWW	TO−92 3L (Pb−Free)	2000 / Ammo
J112	AJ 112 YWW	TO−92 3L (Pb−Free)	10000 Units / Bulk
J112−D26Z	AJ 112 YWW	TO−92 3L (Pb−Free)	2000 / Tape & Reel
J112−D27Z	AJ 112 YWW	TO−92 3L (Pb−Free)	2000 / Tape & Reel
J112−D74Z	AJ 112 YWW	TO−92 3L (Pb−Free)	2000 / Ammo
J113	AJ 113 YWW	TO−92 3L (Pb−Free)	10000 Units / Bulk
J113−D74Z	AJ 113 YWW	TO−92 3L (Pb−Free)	2000 / Ammo
MMBFJ111	6P	SOT−23 3L (Pb−Free)	3000 / Tape & Reel
MMBFJ112	6R	SOT−23 3L (Pb−Free)	3000 / Tape & Reel
MMBFJ113	6S	SOT−23 3L (Pb−Free)	3000 / 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.

TO−92 3 4.825x4.76
CASE 135AN
ISSUE O

DATE 31 JUL 2016



NOTES: UNLESS OTHERWISE SPECIFIED

A) DRAWING WITH REFERENCE TO JEDEC TO−92 RECOMMENDATIONS.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DRAWING CONFORMS TO ASME Y14.5M−2009.

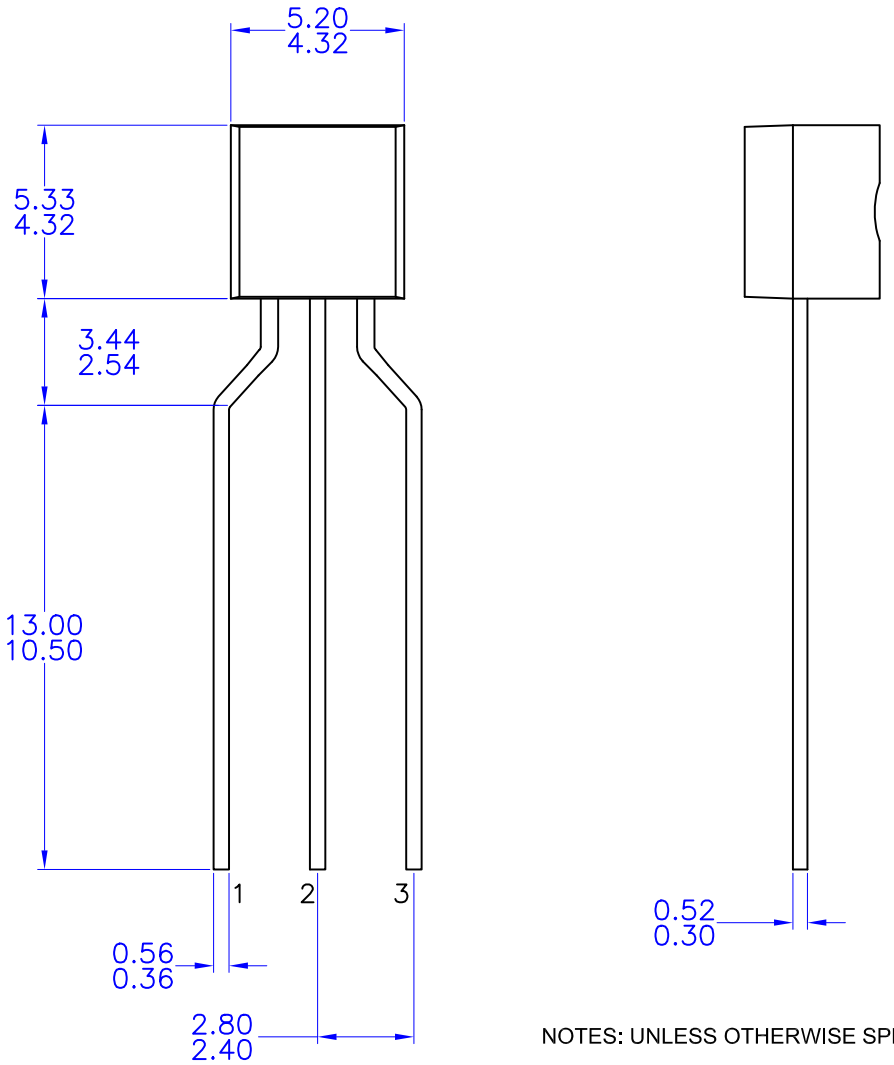
DOCUMENT NUMBER:	**98AON13880G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**TO−92 3 4.825X4.76**	**PAGE 1 OF 1**

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

© Semiconductor Components Industries, LLC, 2019

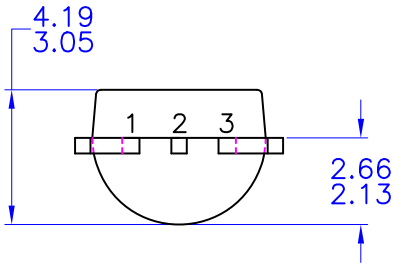
TO−92 3 4.83x4.76 LEADFORMED
CASE 135AR
ISSUE O

DATE 30 SEP 2016



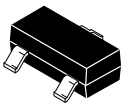
NOTES: UNLESS OTHERWISE SPECIFIED

A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DRAWING CONFORMS TO ASME Y14.5M-1994



DOCUMENT NUMBER:	**98AON13879G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**TO−92 3 4.83X4.76 LEADFORMED**	**PAGE 1 OF 1**

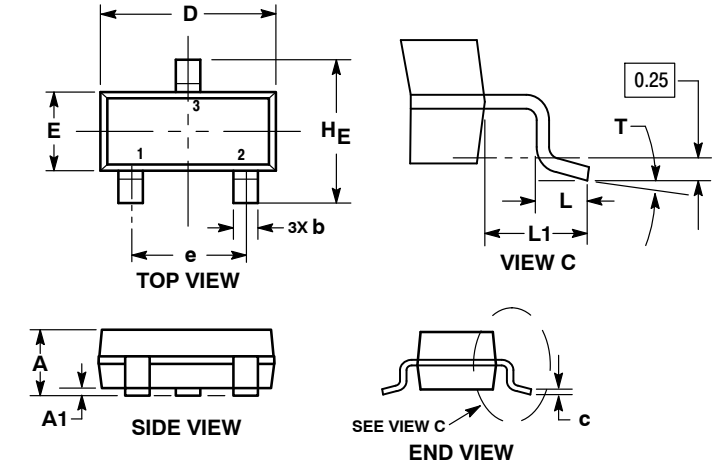
ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.



SCALE 4:1

SOT−23 (TO−236)
CASE 318−08
ISSUE AS

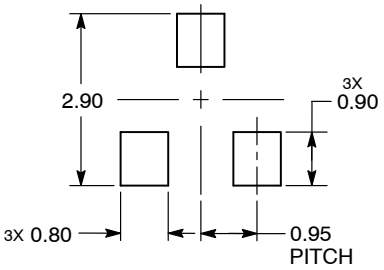
DATE 30 JAN 2018



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.

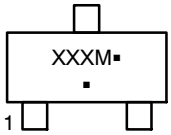
	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	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

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.

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

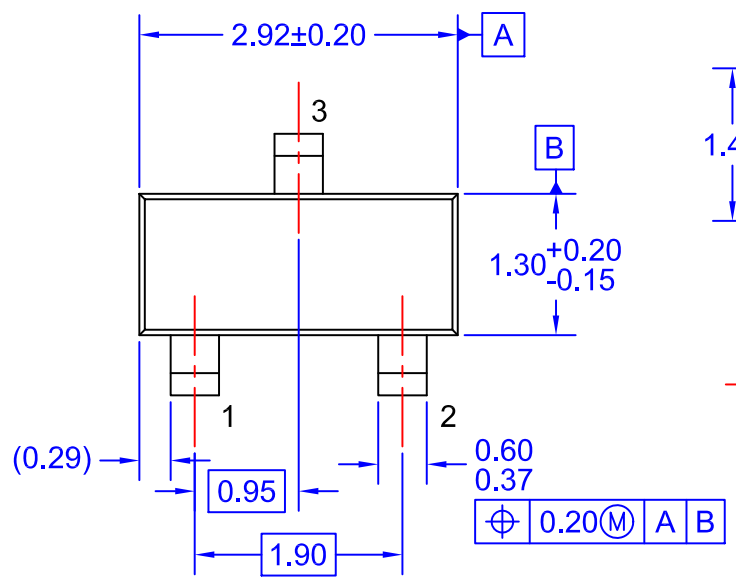
DOCUMENT NUMBER:	**98ASB42226B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**SOT−23 (TO−236)**	**PAGE 1 OF 1**

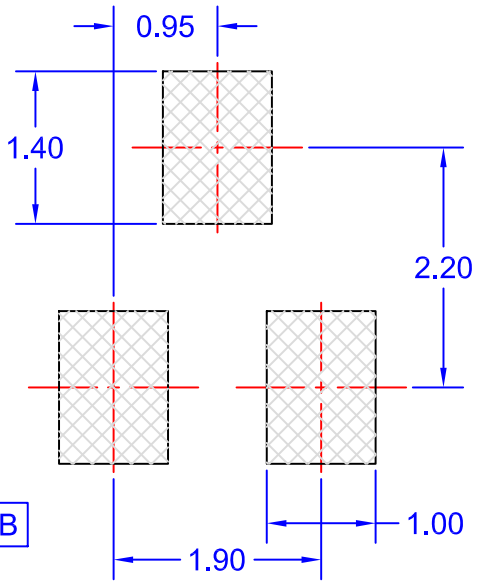
ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

© Semiconductor Components Industries, LLC, 2019

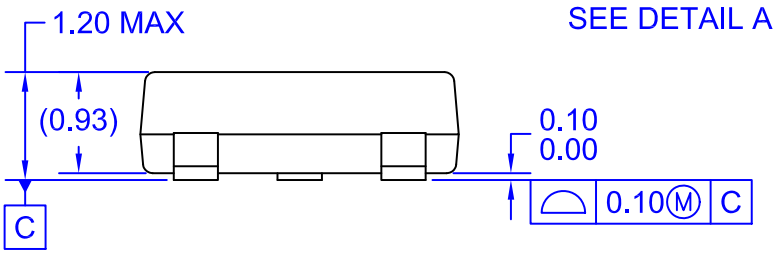
SOT–23
CASE 318BM
ISSUE O

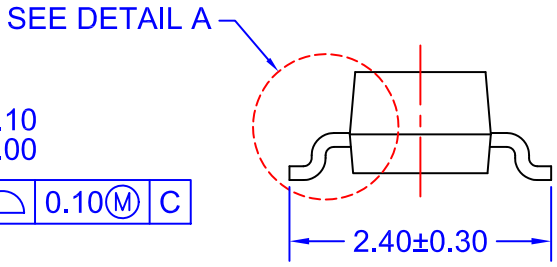
DATE 31 AUG 2016

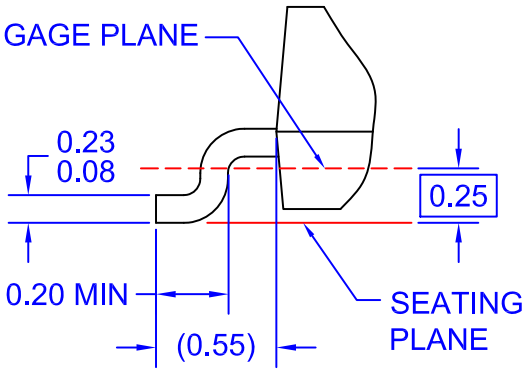




LAND PATTERN
RECOMMENDATION







DETAIL A
SCALE: 2X

NOTES: UNLESS OTHERWISE SPECIFIED

A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 2009.

DOCUMENT NUMBER:	**98AON13784G**	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**	**PAGE 1 OF 1**

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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 ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor 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 ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊