

MBT2222ADW1, NSVBT2222ADW1

General Purpose Transistor

NPN Silicon

Features

- Moisture Sensitivity Level: 1
- 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

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	40	Vdc
Collector-Base Voltage	V_{CBO}	75	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	Vdc
Collector Current - Continuous	I_C	600	mAdc
Electrostatic Discharge	ESD	HBM Class 2 MM Class B	

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Package Dissipation (Note 1), $T_A = 25^\circ\text{C}$	P_D	150	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	833	$^\circ\text{C/W}$
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

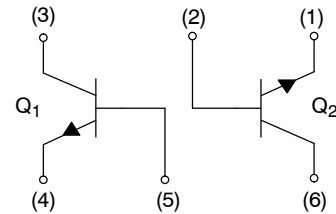
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.



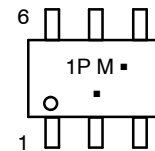
ON Semiconductor®

<http://onsemi.com>



SC-88/SC70-6/SOT-363
CASE 419B
STYLE 1

MARKING DIAGRAM



1P = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
MBT2222ADW1T1G	SOT-363 (Pb-Free)	3000 / Tape & Reel
NSVBT2222ADW1T1G	SOT-363 (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.

MBT2222ADW1, NSVB2222ADW1

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (I _C = 10 mA _{dc} , I _B = 0)	V _{(BR)CEO}	40	–	Vdc
Collector–Base Breakdown Voltage (I _C = 10 μA _{dc} , I _E = 0)	V _{(BR)CBO}	75	–	Vdc
Emitter–Base Breakdown Voltage, (I _E = 10 μA _{dc} , I _C = 0)	V _{(BR)EBO}	6.0	–	Vdc
Collector Cutoff Current (V _{CE} = 60 Vdc, V _{EB(off)} = 3.0 Vdc)	I _{CEX}	–	10	nA _{dc}
Collector Cutoff Current (V _{CB} = 60 Vdc, I _E = 0) (V _{CB} = 60 Vdc, I _E = 0, T _A = 125°C)	I _{CBO}	– –	0.01 10	μA _{dc}
Emitter Cutoff Current (V _{EB} = 3.0 Vdc, I _C = 0)	I _{EBO}	–	100	nA _{dc}
Base Cutoff Current (V _{CE} = 60 Vdc, V _{EB(off)} = 3.0 Vdc)	I _{BL}	–	20	nA _{dc}

ON CHARACTERISTICS

DC Current Gain (I _C = 0.1 mA _{dc} , V _{CE} = 10 Vdc) (I _C = 1.0 mA _{dc} , V _{CE} = 10 Vdc) (I _C = 10 mA _{dc} , V _{CE} = 10 Vdc) (I _C = 10 mA _{dc} , V _{CE} = 10 Vdc, T _A = –55°C) (I _C = 150 mA _{dc} , V _{CE} = 10 Vdc) (Note 2) (I _C = 150 mA _{dc} , V _{CE} = 1.0 Vdc) (Note 2) (I _C = 500 mA _{dc} , V _{CE} = 10 Vdc) (Note 2)	h _{FE}	35 50 75 35 100 50 40	– – – – 300 – –	–
Collector–Emitter Saturation Voltage (Note 2) (I _C = 150 mA _{dc} , I _B = 15 mA _{dc}) (I _C = 500 mA _{dc} , I _B = 50 mA _{dc})	V _{CE(sat)}	– –	0.3 1.0	Vdc
Base–Emitter Saturation Voltage (Note 2) (I _C = 150 mA _{dc} , I _B = 15 mA _{dc}) (I _C = 500 mA _{dc} , I _B = 50 mA _{dc})	V _{BE(sat)}	0.6 –	1.2 2.0	Vdc

SMALL–SIGNAL CHARACTERISTICS

Current–Gain – Bandwidth Product (Note 3) (I _C = 20 mA _{dc} , V _{CE} = 20 Vdc, f = 100 MHz)	f _T	300	–	MHz
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 1.0 MHz)	C _{obo}	–	8.0	pF
Input Capacitance (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz)	C _{ibo}	–	25	pF
Input Impedance (I _C = 1.0 mA _{dc} , V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mA _{dc} , V _{CE} = 10 Vdc, f = 1.0 kHz)	h _{ie}	2.0 0.25	8.0 1.25	kΩ
Voltage Feedback Ratio (I _C = 1.0 mA _{dc} , V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mA _{dc} , V _{CE} = 10 Vdc, f = 1.0 kHz)	h _{re}	– –	8.0 4.0	X 10 ^{–4}
Small–Signal Current Gain (I _C = 1.0 mA _{dc} , V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mA _{dc} , V _{CE} = 10 Vdc, f = 1.0 kHz)	h _{fe}	50 75	300 375	–
Output Admittance (I _C = 1.0 mA _{dc} , V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mA _{dc} , V _{CE} = 10 Vdc, f = 1.0 kHz)	h _{oe}	5.0 25	35 200	μmhos
Collector Base Time Constant (I _E = 20 mA _{dc} , V _{CB} = 20 Vdc, f = 31.8 MHz)	r _b , C _c	–	150	ps
Noise Figure (I _C = 100 μA _{dc} , V _{CE} = 10 Vdc, R _S = 1.0 kΩ, f = 1.0 kHz)	NF	–	4.0	dB

SWITCHING CHARACTERISTICS

Delay Time	(V _{CC} = 30 Vdc, V _{BE(off)} = –0.5 Vdc, I _C = 150 mA _{dc} , I _{B1} = 15 mA _{dc})	t _d	–	10	ns
Rise Time		t _r	–	25	
Storage Time	(V _{CC} = 30 Vdc, I _C = 150 mA _{dc} , I _{B1} = I _{B2} = 15 mA _{dc})	t _s	–	225	ns
Fall Time		t _f	–	60	

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

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

MBT2222ADW1, NSVBT2222ADW1

SWITCHING TIME EQUIVALENT TEST CIRCUITS

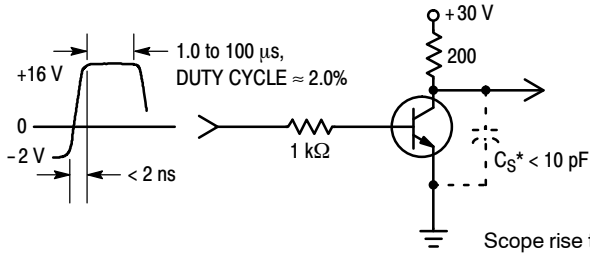


Figure 1. Turn-On Time

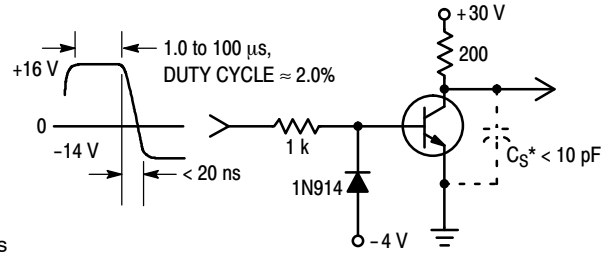


Figure 2. Turn-Off Time

Scope rise time <math>< 4 \text{ ns}</math>
 *Total shunt capacitance of test jig, connectors, and oscilloscope.

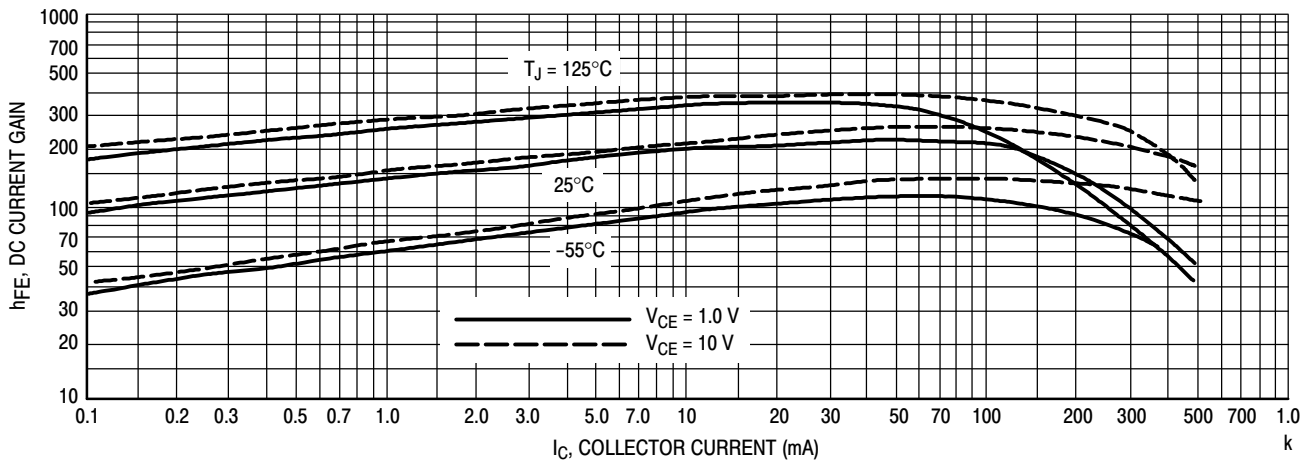


Figure 3. DC Current Gain

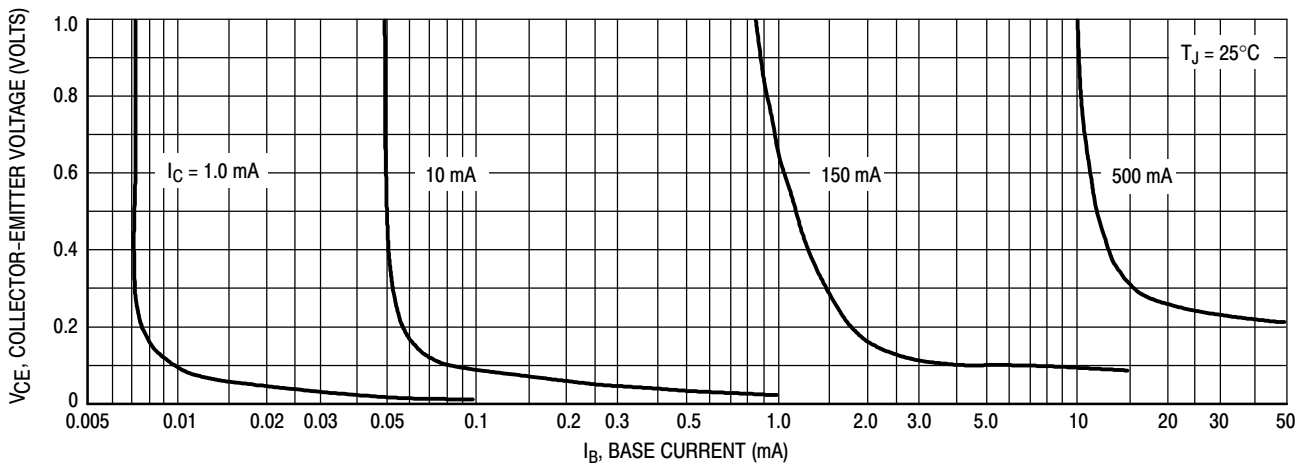


Figure 4. Collector Saturation Region

MBT2222ADW1, NSVBT2222ADW1

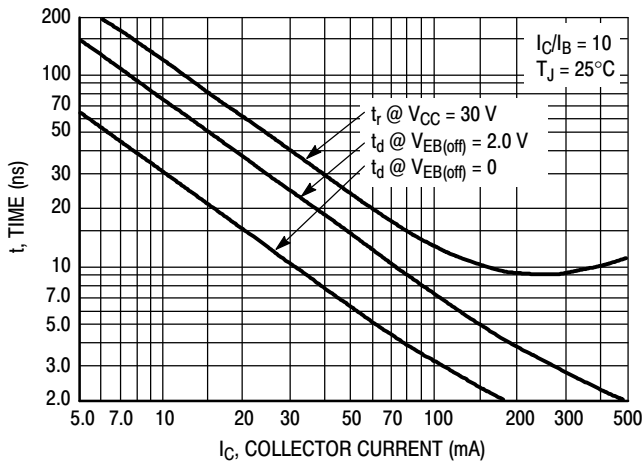


Figure 5. Turn-On Time

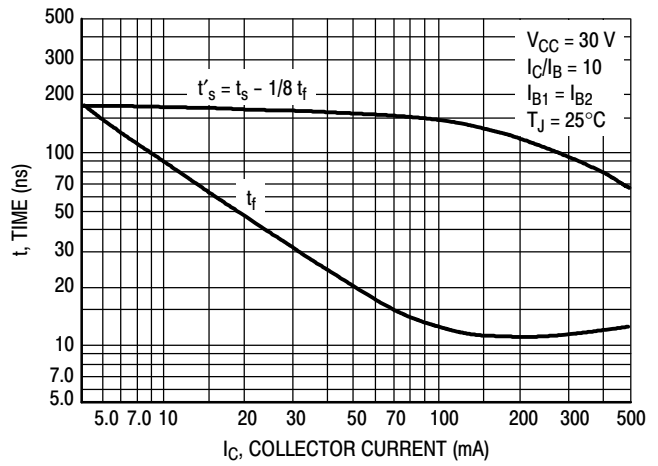


Figure 6. Turn-Off Time

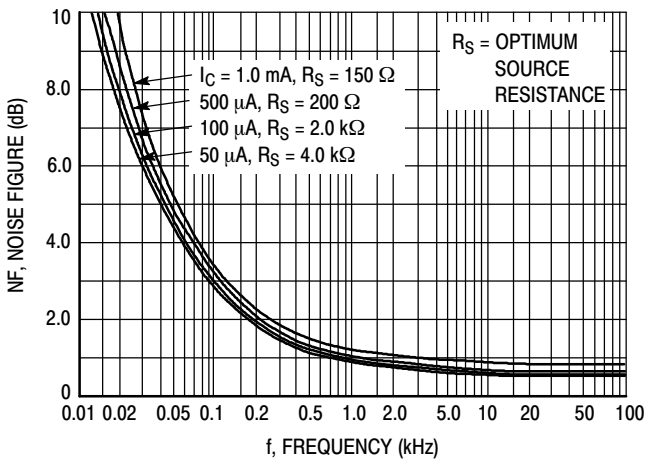


Figure 7. Frequency Effects

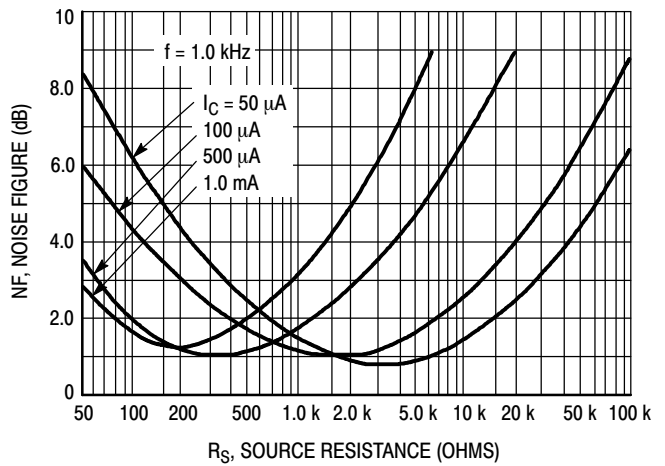


Figure 8. Source Resistance Effects

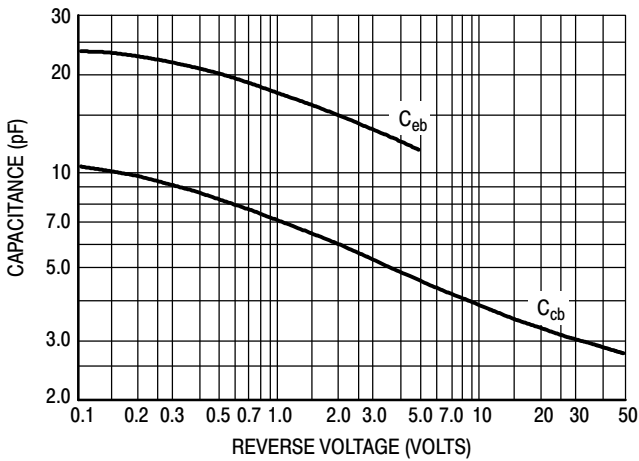


Figure 9. Capacitances

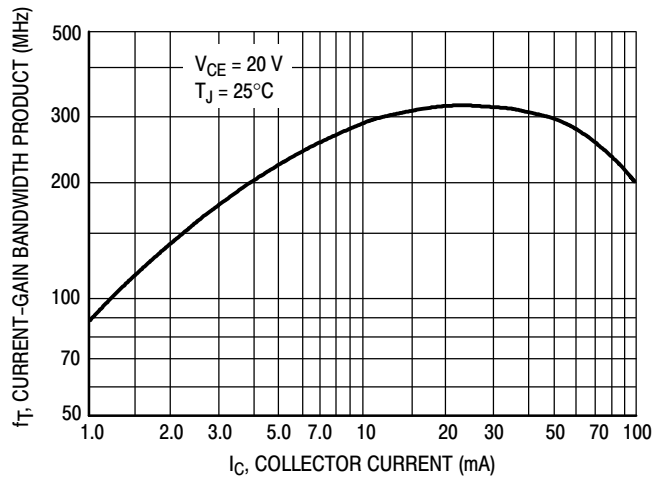


Figure 10. Current-Gain Bandwidth Product

MBT2222ADW1, NSVBT2222ADW1

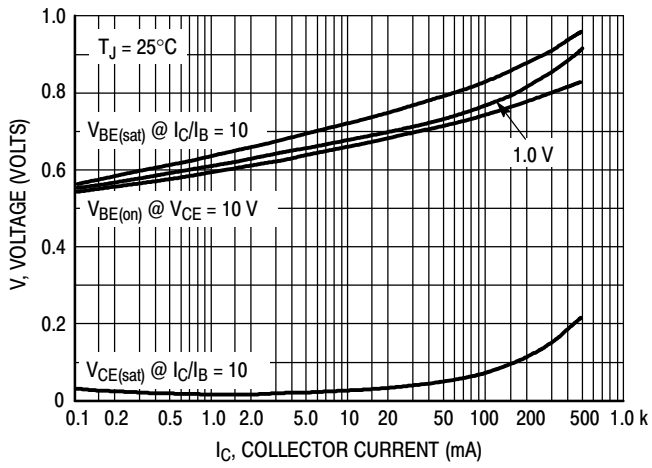


Figure 11. "On" Voltages

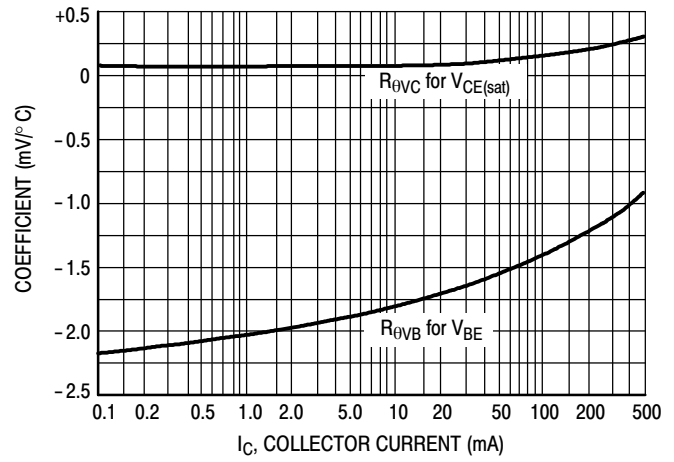


Figure 12. Temperature Coefficients

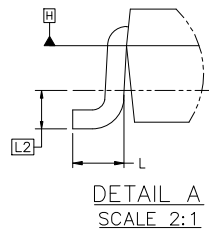
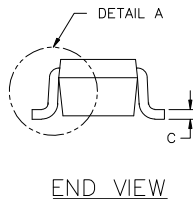
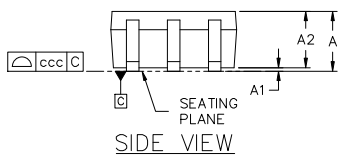
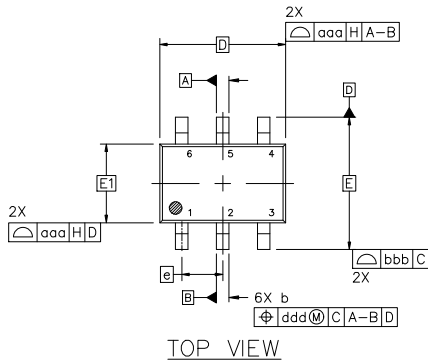


SC-88 2.00x1.25x0.90, 0.65P
CASE 419B-02
ISSUE Z

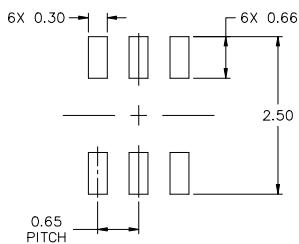
DATE 18 APR 2024

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

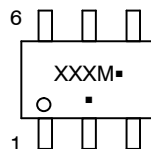


DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	1.10
A1	0.00	---	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
e	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		



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

GENERIC MARKING DIAGRAM*



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

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing 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. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

DOCUMENT NUMBER:	98ASB42985B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SC-88 2.00x1.25x0.90, 0.65P	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.

SC-88 2.00x1.25x0.90, 0.65P
CASE 419B-02
ISSUE Z

DATE 18 APR 2024

STYLE 1: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	STYLE 2: CANCELLED	STYLE 3: CANCELLED	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. COLLECTOR 4. EMITTER 5. BASE 6. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 6: PIN 1. ANODE 2 2. N/C 3. CATHODE 1 4. ANODE 1 5. N/C 6. CATHODE 2
STYLE 7: PIN 1. SOURCE 2 2. DRAIN 2 3. GATE 1 4. SOURCE 1 5. DRAIN 1 6. GATE 2	STYLE 8: CANCELLED	STYLE 9: PIN 1. EMITTER 2 2. EMITTER 1 3. COLLECTOR 1 4. BASE 1 5. BASE 2 6. COLLECTOR 2	STYLE 10: PIN 1. SOURCE 2 2. SOURCE 1 3. GATE 1 4. DRAIN 1 5. DRAIN 2 6. GATE 2	STYLE 11: PIN 1. CATHODE 2 2. CATHODE 2 3. ANODE 1 4. CATHODE 1 5. CATHODE 1 6. ANODE 2	STYLE 12: PIN 1. ANODE 2 2. ANODE 2 3. CATHODE 1 4. ANODE 1 5. ANODE 1 6. CATHODE 2
STYLE 13: PIN 1. ANODE 2. N/C 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 14: PIN 1. VREF 2. GND 3. GND 4. IOUT 5. VEN 6. VCC	STYLE 15: PIN 1. ANODE 1 2. ANODE 2 3. ANODE 3 4. CATHODE 3 5. CATHODE 2 6. CATHODE 1	STYLE 16: PIN 1. BASE 1 2. EMITTER 2 3. COLLECTOR 2 4. BASE 2 5. EMITTER 1 6. COLLECTOR 1	STYLE 17: PIN 1. BASE 1 2. EMITTER 1 3. COLLECTOR 2 4. BASE 2 5. EMITTER 2 6. COLLECTOR 1	STYLE 18: PIN 1. VIN1 2. VCC 3. VOUT2 4. VIN2 5. GND 6. VOUT1
STYLE 19: PIN 1. IOUT 2. GND 3. GND 4. V CC 5. V EN 6. V REF	STYLE 20: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR	STYLE 21: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. N/C 6. CATHODE 1	STYLE 22: PIN 1. D1 (i) 2. GND 3. D2 (i) 4. D2 (c) 5. VBUS 6. D1 (c)	STYLE 23: PIN 1. Vn 2. CH1 3. Vp 4. N/C 5. CH2 6. N/C	STYLE 24: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE
STYLE 25: PIN 1. BASE 1 2. CATHODE 3. COLLECTOR 2 4. BASE 2 5. EMITTER 6. COLLECTOR 1	STYLE 26: PIN 1. SOURCE 1 2. GATE 1 3. DRAIN 2 4. SOURCE 2 5. GATE 2 6. DRAIN 1	STYLE 27: PIN 1. BASE 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. EMITTER 2 6. COLLECTOR 2	STYLE 28: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN	STYLE 29: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE/ANODE 6. CATHODE	STYLE 30: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

DOCUMENT NUMBER:	98ASB42985B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SC-88 2.00x1.25x0.90, 0.65P	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