PNP Multi-Chip General-Purpose Amplifier

FFB2907A, FMB2907A, MMPQ2907A

Description

This device is designed for use as a general-purpose amplifier and switch for collector currents to 500 mA. Sourced from Process 63.

Internal Connections

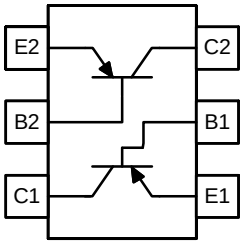


Figure 1. FFB2907A

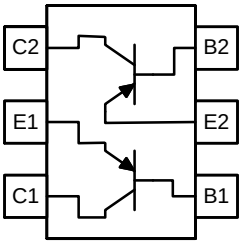


Figure 2. FMB2907A

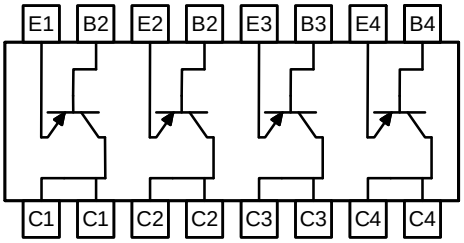


Figure 3. MMPQ2907A

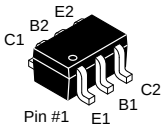
ABSOLUTE MAXIMUM RATINGS (Note 1, 2)
(T_A = 25 °C, unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{CEO}	Collector-Emitter Voltage	−60	V
V_{CBO}	Collector-Base Voltage	−60	V
V_{EBO}	Emitter-Base Voltage	−5.0	V
I_C	Collector Current − Continuous	−600	mA
T_J, T_{STG}	Junction and Storage Temperature	−55 to +150	°C

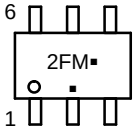
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

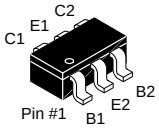
MARKING DIAGRAM



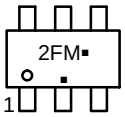
SC-88
CASE 419B



FFB2907A

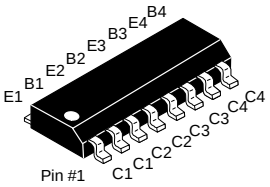


TSOT23 6-Lead
CASE 419AG



FMB2907A

2F = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)



SOIC-16, 150 mils
CASE 751BG

MMPQ2907A

MMPQ2907A = Specific Device Code
A = Assembly Site
WL = Wafer Lot Number
Y = Year of Production
WW = Work Week Number

ORDERING INFORMATION

Device	Package	Shipping†
FFB2907A	SC-88 (Pb-Free, Halide Free)	3000 / Tape & Reel
FMB2907A	TSOT23 (Pb-Free, Halide Free)	3000 / Tape & Reel
MMPQ2907A	SOIC-16 (Pb-Free, Halide Free)	2500 / 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.

THERMAL CHARACTERISTICS (Note 3) (T_A = 25 °C, unless otherwise noted)

Symbol	Parameter	Max			Unit
		FFB2907A	FMB2907A	MMPQ2907A	
P_D	Total Device Dissipation	300	700	1,000	mW
	Derate Above 25 °C	2.4	5.6	8.0	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	415	180	–	°C/W
	Thermal Resistance, Junction to Ambient, Effective 4 Die	–	–	125	
	Thermal Resistance, Junction to Ambient, Each Die	–	–	240	

3. PCB size: FR-4 76 x 114 x 1.57 mm^3 (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.

ELECTRICAL CHARACTERISTICS (Note 4) (T_J = 25 °C unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 4)	I_C = −10 mA, I_B = 0	−60	–	–	V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = −10 μA, I_E = 0	−60	–	–	V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = −10 μA, I_C = 0	−5.0	–	–	V
I_{BL}	Base Cut-Off Current	V_{CE} = −30 V, V_{EB} = −0.5 V	–	–	−50	nA
I_{CEX}	Collector Cut-Off Current	V_{CE} = −30 V, V_{EB} = −0.5 V	–	–	−50	nA
I_{CBO}	Collector Cut-Off Current	V_{CB} = −50 V, I_E = 0	–	–	−0.02	μA
		V_{CB} = −50 V, I_E = 0, T_A = 125 °C	–	–	−20	
h_{FE}	DC Current Gain	I_C = −0.1 mA, V_{CE} = −10 V	75	–	–	
		I_C = −1.0 mA, V_{CE} = −10 V	100	–	–	
		I_C = −10 mA, V_{CE} = −10 V	100	–	–	
		I_C = −150 mA, V_{CE} = −10 V (Note 4)	100	–	300	
		I_C = −500 mA, V_{CE} = −10 V (Note 4)	50	–	–	
V_{CE}(sat)	Collector-Emitter Saturation Voltage (Note 4)	I_C = −150 mA, I_B = −15 mA	–	–	−0.4	V
		I_C = −500 mA, I_B = −50 mA	–	–	−1.6	
V_{BE}(sat)	Base-Emitter Saturation Voltage	I_C = −150 mA, I_B = −15 mA (Note 4)	–	–	−1.3	V
		I_C = −500 mA, I_B = −50 mA	–	–	−2.6	
f_T	Current Gain-Bandwidth Product	I_C = −50 mA, V_{CE} = −20 V, f = 100 MHz	–	250	–	MHz
C_{ob}	Output Capacitance	V_{CB} = −10 V, I_E = 0, f = 100 kHz	–	6.0	–	pF
C_{ib}	Input Capacitance	V_{EB} = −2.0 V, I_C = 0, f = 100 kHz	–	12	–	pF
t_{on}	Turn-On Time	V_{CC} = −30 V, I_C = −150 mA, I_{B1} = −15 mA	–	30	–	ns
t_d	Delay Time		–	8	–	ns
t_r	Rise Time		–	20	–	ns
t_{off}	Turn-Off Time	V_{CC} = −6.0 V, I_C = −150 mA, I_{B1} = I_{B2} = −15 mA	–	80	–	ns
t_s	Storage Time		–	60	–	ns
t_f	Fall Time		–	20	–	ns

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.

4. Pulse test: pulse width ≤ 300 μs, duty cycle ≤ 2.0%.

TYPICAL PERFORMANCE CHARACTERISTICS

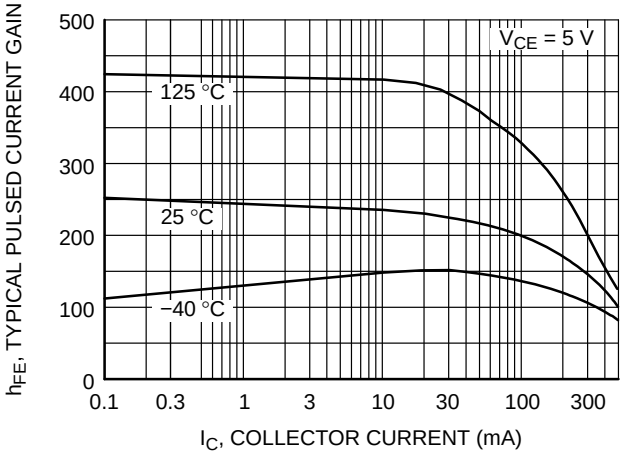


Figure 4. Typical Pulsed Current Gain vs. Collector Current

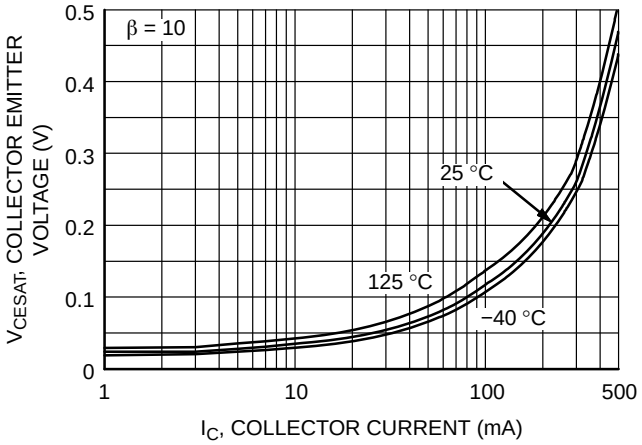


Figure 5. Collector-Emitter Saturation Voltage vs. Collector Current

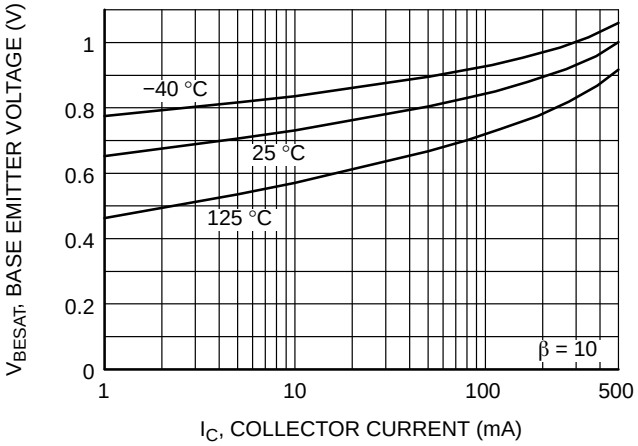


Figure 6. Base-Emitter Saturation Voltage vs. Collector Current

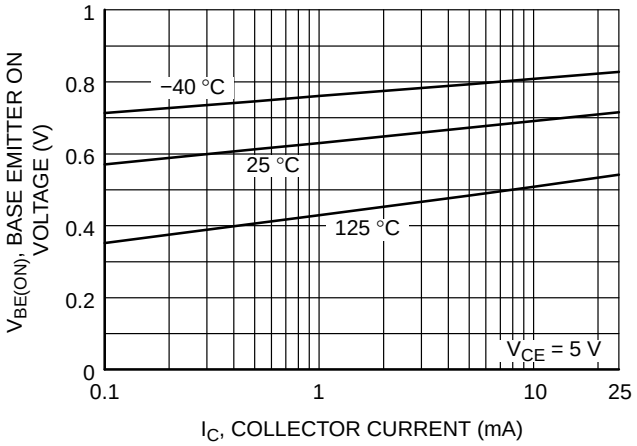


Figure 7. Base-Emitter On Voltage vs. Collector Current

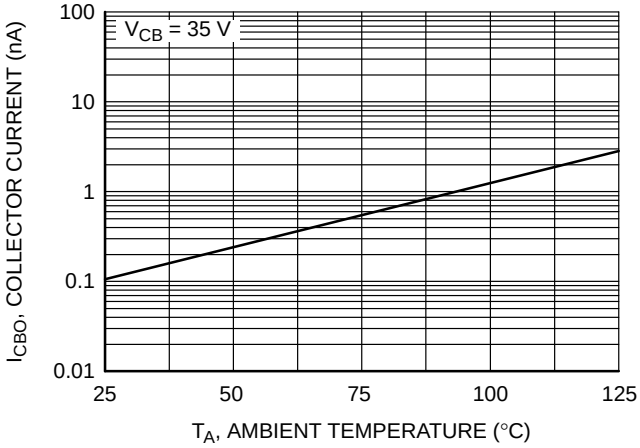


Figure 8. Collector Cut-Off Current vs. Ambient Temperature

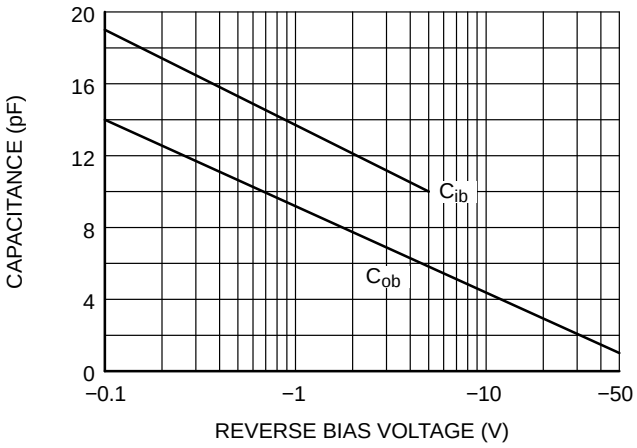


Figure 9. Input and Output Capacitance vs. Reverse Bias Voltage

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

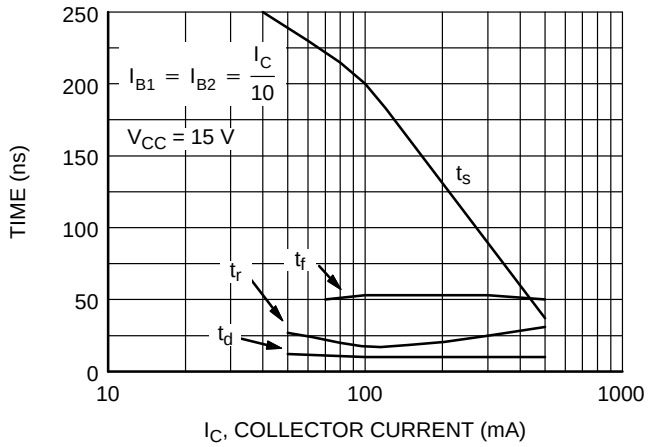


Figure 10. Switching Times vs. Collector Current

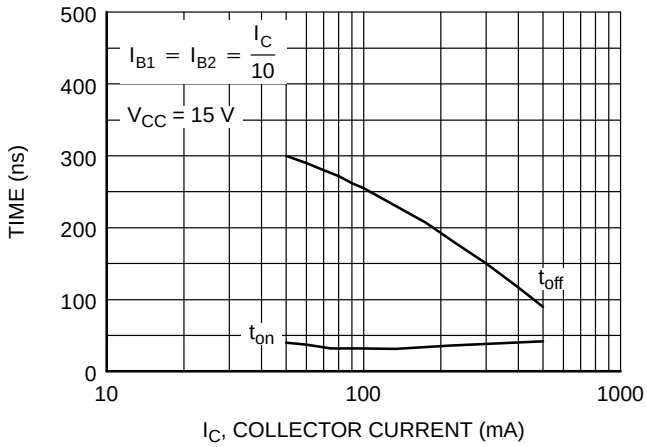


Figure 11. Turn-On and Turn-Off Times vs. Collector Current

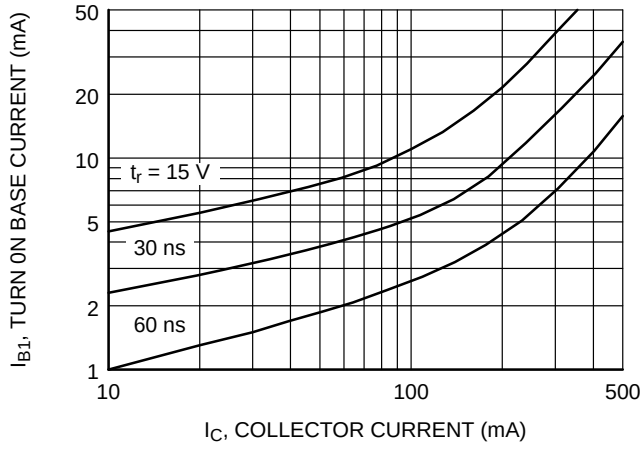


Figure 12. Rise Time vs. Collector and Turn-On Base Current

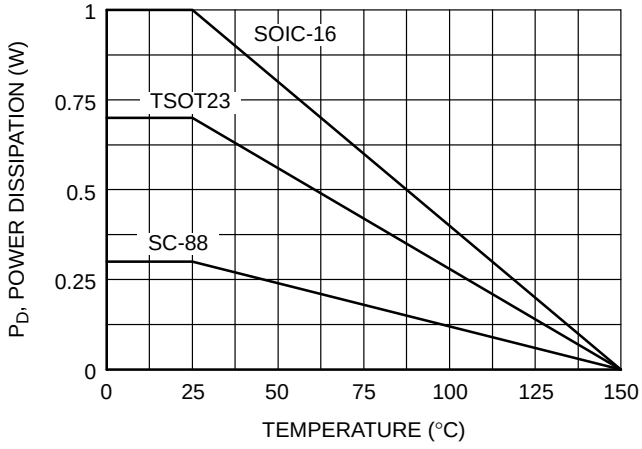
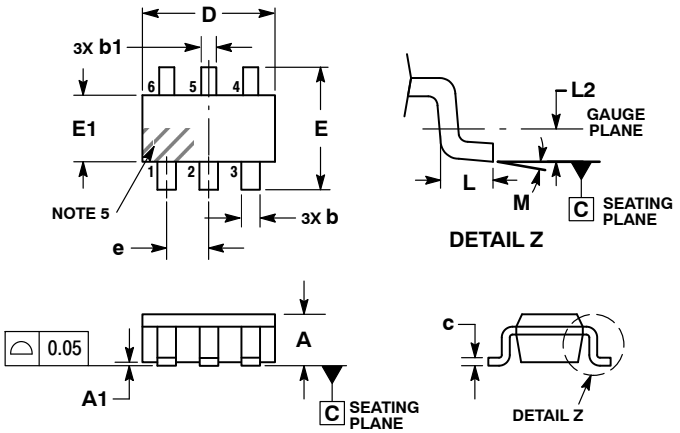


Figure 13. Power Dissipation vs. Ambient Temperature

1
SCALE 2:1

TSOT23 6−Lead
CASE 419AG−01
ISSUE O

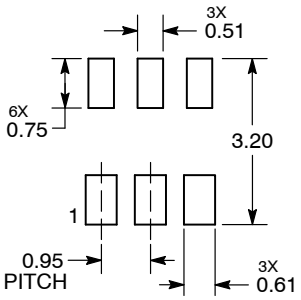
DATE 01 FEB 2010



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 E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

	MILLIMETERS		
DIM	**MIN**	**NOM**	**MAX**
A	0.75	0.82	0.90
A1	−−−	−−−	0.10
b	0.40	0.45	0.50
b1	0.30	0.35	0.40
c	0.08	0.14	0.20
D	2.80	2.90	3.00
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e		0.95 BSC	
L	0.30	0.45	0.60
L2		0.25 BSC	
M	0°	–	8°

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

GENERIC MARKING DIAGRAMS*

IC

XXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb−Free Package

STANDARD

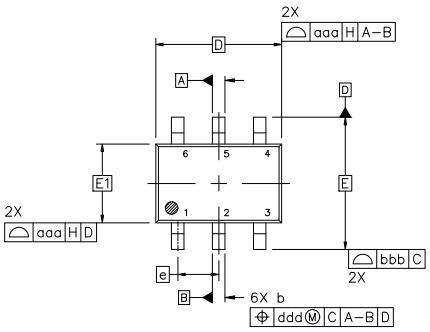
XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

*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.

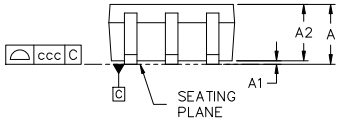
DOCUMENT NUMBER:	**98AON47619E**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**TSOT23 6−LEAD**	**PAGE 1 OF 1**

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

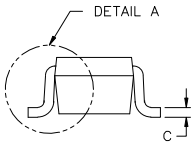
DATE 18 APR 2024



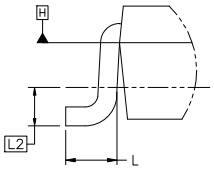
TOP VIEW



SIDE VIEW



END VIEW

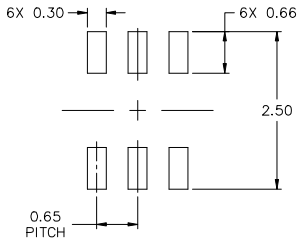


DETAIL A
SCALE 2:1

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.

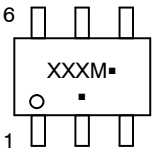
	MILLIMETERS		
DIM	MIN.	NOM.	MAX.
A	−−−	−−−	1.10
A1	0.00	−−−	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
e	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		



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.

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**

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. I OUT
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

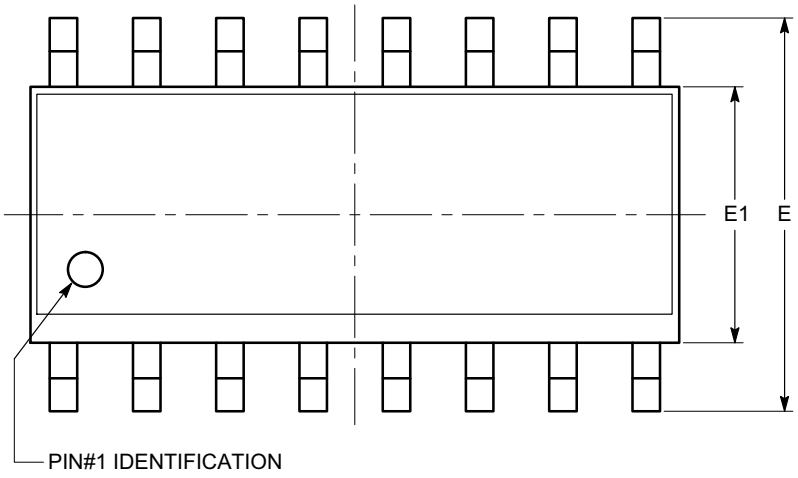
STYLE 30:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1

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**

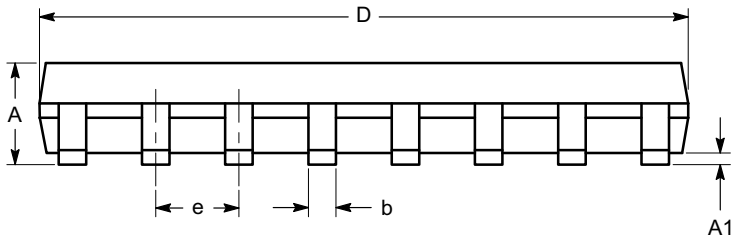
SOIC−16, 150 mils
CASE 751BG
ISSUE O

DATE 19 DEC 2008

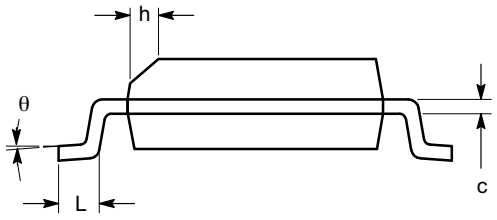


TOP VIEW

SYMBOL	MIN	NOM	MAX
A	1.35		1.75
A1	0.10		0.25
b	0.33		0.51
c	0.19		0.25
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
h	0.25		0.50
L	0.40		1.27
θ	0º		8º



SIDE VIEW



END VIEW

Notes:
(1) All dimensions are in millimeters. Angles in degrees.
(2) Complies with JEDEC MS-012.

DOCUMENT NUMBER:	**98AON34275E**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	**SOIC−16, 150 mils**		**PAGE 1 OF 1**

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