NPN & PNP General-Purpose Amplifier

FFB2227A, FMB2227A

Description

This complementary device is a medium-power amplifier and switch, requiring collector currents up to 500 mA. Sourced from Process 19 and 63. See FFB2222A (NPN) and FFB2907A (PNP) for characteristics.

ABSOLUTE MAXIMUM RATINGS (Note 1)

(T_A = 25 °C, unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{CEO}	Collector-Emitter Voltage	30	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	5	V
I_C	Collector Current − Continuous	500	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. **onsemi** should be consulted on applications involving pulsed or low-duty cycle operations.
3. All voltages (V) and currents (A) are negative polarity for PNP transistors.
4. These Ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

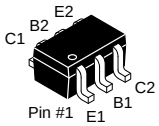
THERMAL CHARACTERISTICS (Note 5)

(T_A = 25 °C, unless otherwise noted)

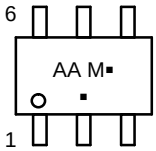
Symbol	Parameter	Maximum		Unit
		FFB2227A	FMB2227A	
P_D	Total Device Dissipation	300	700	mV
	Derate Above 25 °C	2.4	5.6	mV/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	415	180	°C/W

5. PCB board size: FR-4 76 x 114 x 0.6T mm^3 (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.

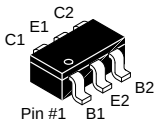
MARKING DIAGRAM



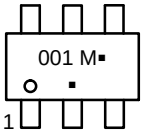
SC-88
CASE 419B-02



FFB2227A



TSOT23 6-Lead
CASE 419BL

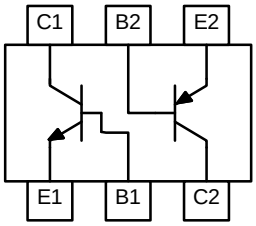


FMB2227A

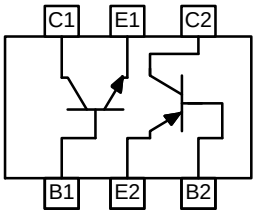
AA, 001 = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

INTERNAL CONNECTION



FFB2227A



FMB2227A

TRANSISTOR TYPE	
C1 B1 E1	NPN
C2 B2 E2	PNP

ORDERING INFORMATION

Device	Package	Shipping†
FFB2227A	SC-88 (Pb-Free, Halide Free)	3000 / Tape & Reel
FMB2227A	TSOT23 (Pb-Free, Halide 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.

ELECTRICAL CHARACTERISTICS (Note 6) (T_J = 25 °C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 7)	I_C = 10 mA, I_B = 0	30	–	–	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	–	–	V
I_{CBO}	Collector Cut-Off Current	V_{CB} = 50 V, I_E = 0	–	–	30	nA
I_{EBO}	Emitter Cut-Off Current	V_{EB} = 3.0 V, I_C = 0	–	–	30	nA
ON CHARACTERISTICS						
h_{FE}	DC Current Gain	I_C = 1.0 mA, V_{CE} = 10 V	50	–	–	
		I_C = 10 mA, V_{CE} = 10 V	75	–	–	
		I_C = 150 mA, V_{CE} = 10 V (Note 7)	100	–	–	
		I_C = 300 mA, V_{CE} = 10 V (Note 7)	30	–	–	
V_{CE}(sat)	Collector-Emitter Saturation Voltage (Note 7)	I_C = 150 mA, I_B = 15 mA	–	–	0.4	V
		I_C = 300 mA, I_B = 30 mA	–	–	1.4	V
V_{BE}(sat)	Base-Emitter Saturation Voltage (Note 7)	I_C = 150 mA, I_B = 15 mA	–	–	1.3	V
SMALL SIGNAL CHARACTERISTICS						
f_T	Current Gain − Bandwidth Product	I_C = 50 mA, V_{CE} = 20 V, f = 100 MHz	–	250	–	MHz
C_{obo}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 100 kHz	–	4.0	–	pF
C_{ibo}	Input Capacitance	V_{EB} = 2.0 V, I_C = 0, f = 100 kHz	–	12	–	pF
NF	Noise Figure	I_C = 100 μA, V_{CE} = 10 V, R_S = 1.0 kΩ, f = 1.0 kHz	–	2.0	–	dB
SWITCHING CHARACTERISTICS						
t_{on}	Turn-on Time	V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 15 mA	–	30	–	ns
t_d	Delay Time		–	8.0	–	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.

6. All voltages (V) and currents (A) are negative polarity for PNP transistors.
7. Pulse test: pulse width ≤ 300 μs, duty cycle ≤ 2.0%.

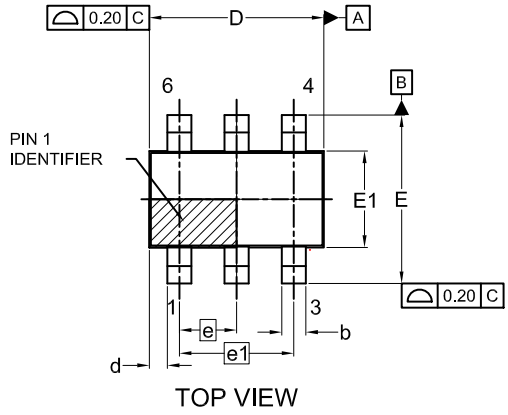
REVISION HISTORY

Revision	Description of Changes	Date
3	Converted the Data Sheet to **onsemi** format. Updated the Case Outline from 419AG to 419BL.	05/06/2025

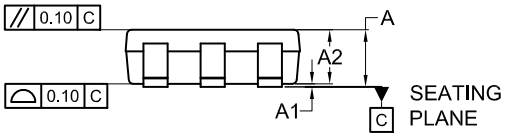
1
SCALE 2:1

TSOT23 6−Lead
CASE 419BL
ISSUE A

DATE 31 AUG 2020

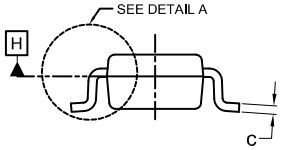


TOP VIEW

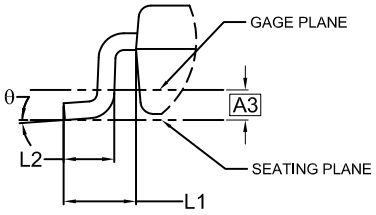


FRONT VIEW

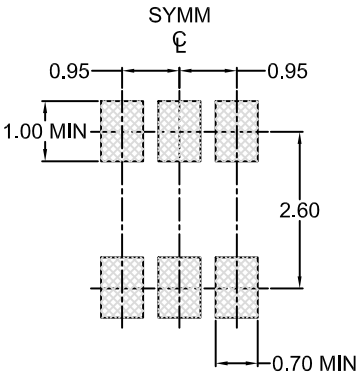
NOTE 4



SIDE VIEW



DETAIL A



LAND PATTERN
RECOMMENDATION

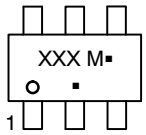
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.25MM PER END. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
4. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	0.05	0.10
A2	0.70	0.85	1.00
A3		0.25 BSC	
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.80	2.95	3.10
d		0.30 REF	
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e		0.95 BSC	
e1		1.90 BSC	
L1		0.60 REF	
L2	0.20	0.40	0.60
θ	0°	---	10°

GENERIC MARKING DIAGRAM*



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

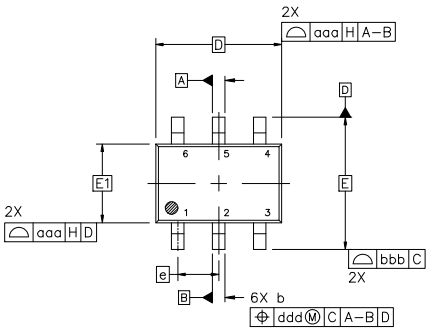
(Note: Microdot may be in either location)

*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.

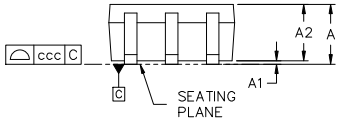
DOCUMENT NUMBER:	**98AON83292G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**TSOT23 6−Lead**	**PAGE 1 OF 1**

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

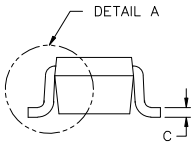
DATE 18 APR 2024



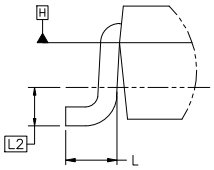
TOP VIEW



SIDE VIEW



END VIEW

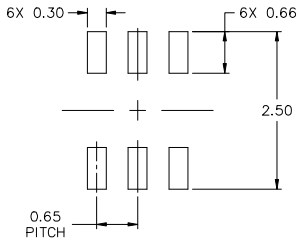


DETAIL A
SCALE 2:1

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.

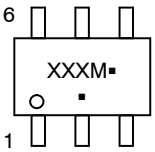
	MILLIMETERS		
DIM	MIN.	NOM.	MAX.
A	−−−	−−−	1.10
A1	0.00	−−−	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
e	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		



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.

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DESCRIPTION:	**SC−88 2.00x1.25x0.90, 0.65P**		**PAGE 2 OF 2**

ADDITIONAL INFORMATION

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onsemi Website: www.onsemi.com

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