

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.

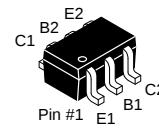
- These ratings are based on a maximum junction temperature of 150 °C.
- These are steady-state limits. onsemi should be consulted on applications involving pulsed or low-duty cycle operations.
- All voltages (V) and currents (A) are negative polarity for PNP transistors.
- These Ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

THERMAL CHARACTERISTICS (Note 5)

(T_A = 25 °C, unless otherwise noted)

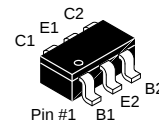
Symbol	Parameter	Maximum		Unit
		FFB2227A	FMB2227A	
P _D	Total Device Dissipation	300	700	mW
	Derate Above 25 °C	2.4	5.6	mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient	415	180	°C/W

- PCB board size: FR-4 76 x 114 x 0.6T mm³ (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.



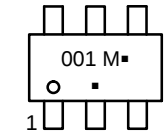
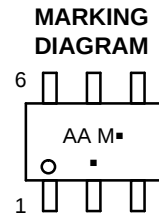
SC-88
CASE 419B-02

FFB2227A



TSOT23 6-Lead
CASE 419BL

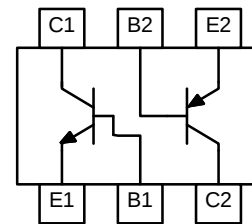
FMB2227A



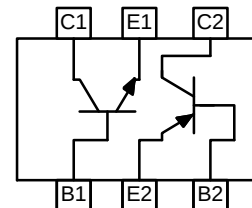
AA, 001 = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(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.

FFB2227A, FMB2227A

ELECTRICAL CHARACTERISTICS (Note 6) ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 7)	$I_C = 10\text{ mA}, I_B = 0$	30	–	–	V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10\text{ }\mu\text{A}, I_E = 0$	60	–	–	V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10\text{ }\mu\text{A}, I_C = 0$	5	–	–	V
I_{CBO}	Collector Cut-Off Current	$V_{CB} = 50\text{ V}, I_E = 0$	–	–	30	nA
I_{EBO}	Emitter Cut-Off Current	$V_{EB} = 3.0\text{ V}, I_C = 0$	–	–	30	nA

ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 1.0\text{ mA}, V_{CE} = 10\text{ V}$	50	–	–	
		$I_C = 10\text{ mA}, V_{CE} = 10\text{ V}$	75	–	–	
		$I_C = 150\text{ mA}, V_{CE} = 10\text{ V}$ (Note 7)	100	–	–	
		$I_C = 300\text{ mA}, V_{CE} = 10\text{ V}$ (Note 7)	30	–	–	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage (Note 7)	$I_C = 150\text{ mA}, I_B = 15\text{ mA}$	–	–	0.4	V
		$I_C = 300\text{ mA}, I_B = 30\text{ mA}$	–	–	1.4	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage (Note 7)	$I_C = 150\text{ mA}, I_B = 15\text{ mA}$	–	–	1.3	V

SMALL SIGNAL CHARACTERISTICS

f_T	Current Gain – Bandwidth Product	$I_C = 50\text{ mA}, V_{CE} = 20\text{ V}, f = 100\text{ MHz}$	–	250	–	MHz
C_{obo}	Output Capacitance	$V_{CB} = 10\text{ V}, I_E = 0, f = 100\text{ kHz}$	–	4.0	–	pF
C_{ibo}	Input Capacitance	$V_{EB} = 2.0\text{ V}, I_C = 0, f = 100\text{ kHz}$	–	12	–	pF
NF	Noise Figure	$I_C = 100\text{ }\mu\text{A}, V_{CE} = 10\text{ V}, R_S = 1.0\text{ k}\Omega, f = 1.0\text{ kHz}$	–	2.0	–	dB

SWITCHING CHARACTERISTICS

t_{on}	Turn-on Time	$V_{CC} = 30\text{ V}, I_C = 150\text{ mA}, I_{B1} = 15\text{ mA}$	–	30	–	ns
t_d	Delay Time		–	8.0	–	ns
t_r	Rise Time		–	20	–	ns
t_{off}	Turn-off Time	$V_{CC} = 6.0\text{ V}, I_C = 150\text{ mA}, I_{B1} = I_{B2} = 15\text{ mA}$	–	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 $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2.0\%$.

FFB2227A, FMB2227A

REVISION HISTORY

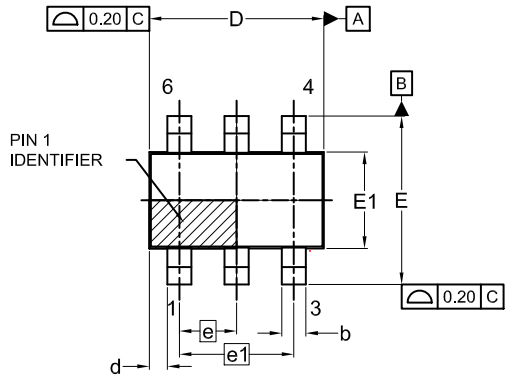
Revision	Description of Changes	Date
3	Converted the Data Sheet to onsemi format. Updated the Case Outline from 419AG to 419BL.	05/06/2025



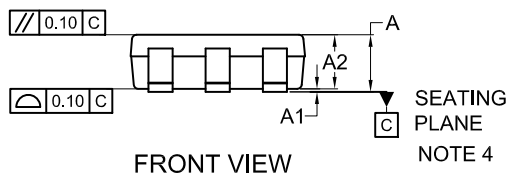
SCALE 2:1

TSOT23 6-Lead
CASE 419BL
ISSUE A

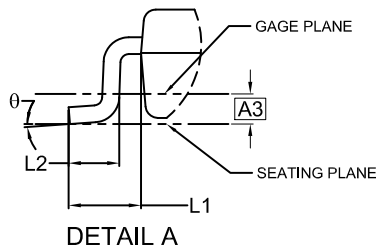
DATE 31 AUG 2020



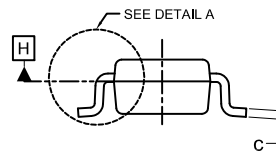
TOP VIEW



FRONT VIEW

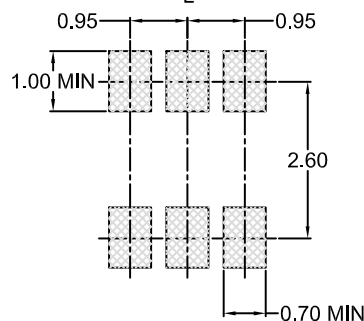


DETAIL A



SIDE VIEW

SYMM

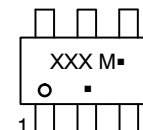

LAND PATTERN
RECOMMENDATION

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

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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.



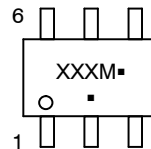
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	1.10
A1	0.00	---	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
e	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		



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

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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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