COMPLEMENTARY NPN / PNP SMALL SIGNAL SURFACE MOUNT TRANSISTOR

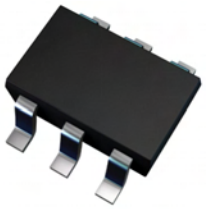
Features & Benefits

- Complementary Pairs One 2222A Type (NPN)
- One 2907A Type (PNP)
- Ideal for Low Power Amplification and Switching
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

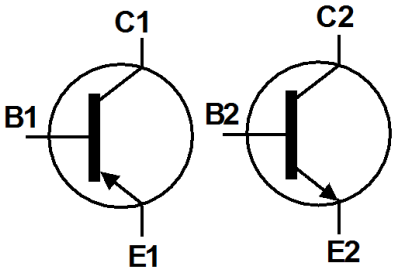
Mechanical Data

- Case: SOT363
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.006 grams (approximate)

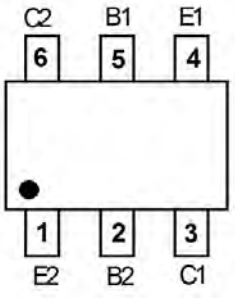
SOT363



Top View



Device Symbol



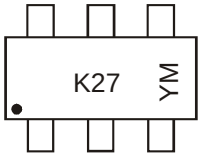
Top View
Pin-Out

Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MMDT2227-7-F	K27	7	8	3,000

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at http://www.diodes.com.

Marking Information



K27 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: X = 2010)
M = Month (ex: 9 = September)

Date Code Key

Year	2010	2011	2012	2013	2014	2015	2016	2017
Code	X	Y	Z	A	B	C	D	E

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

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Maximum Ratings, 2222A Type (NPN) (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	75	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	600	mA

Maximum Ratings, 2907A Type (PNP) (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-60	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-6.0	V
Continuous Collector Current	I_C	-600	mA

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Power Dissipation	(Notes 5)	P_D	200	mW
Thermal Resistance, Junction to Ambient	(Notes 5)	$R_{\theta JA}$	625	°C/W
Thermal Resistance, Junction to Case	(Note 6)	$R_{\theta JC}$	150	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 5. Device mounted on 1 inch x 0.85 inch x 0.062 inch FR-4 PCB
6. Thermal resistance from junction to the top of package

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Electrical Characteristics, 2222A Type (NPN) (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)					
Collector-Base Breakdown Voltage	BV_{CBO}	75	—	V	I_C = 100μA, I_E = 0
Collector-Emitter Breakdown Voltage	BV_{CEO}	40	—	V	I_C = 10mA, I_B = 0
Emitter-Base Breakdown Voltage	BV_{EBO}	6.0	—	V	I_E = 100μA, I_C = 0
Collector Cutoff Current	I_{CBO}	—	10	nA μA	V_{CB} = 60V, I_E = 0 V_{CB} = 60V, I_E = 0, T_A = +150°C
Collector Cutoff Current	I_{CEX}	—	10	nA	V_{CE} = 60V, $V_{EB(off)}$ = 3.0V
Emitter Cutoff Current	I_{EBO}	—	10	nA	V_{EB} = 5.0V, I_C = 0
Base Cutoff Current	I_{BL}	—	20	nA	V_{CE} = 60V, $V_{EB(off)}$ = 3.0V
ON CHARACTERISTICS (Note 7)					
DC Current Gain	h_{FE}	35 50 75 100 40 50 35	— — — 300 — — —	—	I_C = 100μA, V_{CE} = 10V I_C = 1.0mA, V_{CE} = 10V I_C = 10mA, V_{CE} = 10V I_C = 150mA, V_{CE} = 10V I_C = 500mA, V_{CE} = 10V I_C = 10mA, V_{CE} = 10V, T_A = -55°C I_C = 150mA, V_{CE} = 1.0V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	0.3 1.0	V	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.6 —	1.2 2.0	V	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	8	pF	V_{CB} = 10V, f = 1.0MHz, I_E = 0
Input Capacitance	C_{ibo}	—	25	pF	V_{EB} = 0.5V, f = 1.0MHz, I_C = 0
Current Gain-Bandwidth Product	f_T	300	—	MHz	V_{CE} = 20V, I_C = 20mA, f = 100MHz
Noise Figure	NF	—	4.0	dB	V_{CE} = 10V, I_C = 100μA, R_S = 1.0kΩ, f = 1.0kHz
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	10	ns	V_{CC} = 30V, I_C = 150mA, $V_{BE(off)}$ = - 0.5V, I_{B1} = 15mA
Rise Time	t_r	—	25	ns	
Storage Time	t_s	—	225	ns	V_{CC} = 30V, I_C = 150mA, I_{B1} = I_{B2} = 15mA
Fall Time	t_f	—	60	ns	

Notes: 7. Pulse test: Pulse width ≤ 300μs, duty cycle ≤ 2%.

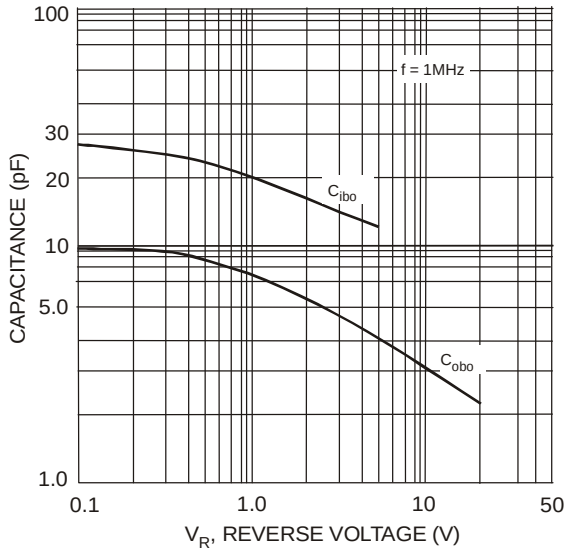

Fig. 1 (2222A) Typical Capacitance

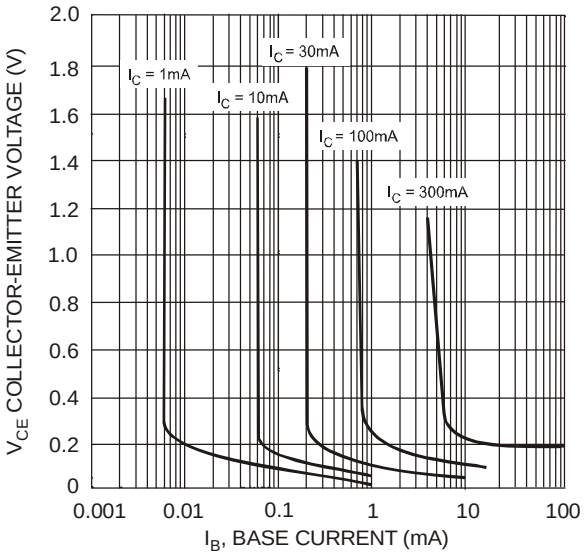

Fig. 2 Typical Collector Saturation Region (2222A Type - NPN)

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Electrical Characteristics, 2907A Type (PNP) (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)					
Collector-Base Breakdown Voltage	BV_{CBO}	-60	—	V	I_C = -100μA, I_E = 0
Collector-Emitter Breakdown Voltage	BV_{CEO}	-60	—	V	I_C = -10mA, I_B = 0
Emitter-Base Breakdown Voltage	BV_{EBO}	-6.0	—	V	I_E = -100μA, I_C = 0
Collector Cutoff Current	I_{CBO}	—	-10	nA μA	V_{CB} = -50V, I_E = 0 V_{CB} = -50V, I_E = 0, T_A = +125°C
Collector Cutoff Current	I_{CEX}	—	-50	nA	V_{CE} = -30V, $V_{EB(off)}$ = -0.5V
Base Cutoff Current	I_{BL}	—	-50	nA	V_{CE} = -30V, $V_{EB(off)}$ = -0.5V
ON CHARACTERISTICS (Note 8)					
DC Current Gain	h_{FE}	75 100 100 100 50	— — — 300 —	—	I_C = -100μA, V_{CE} = -10V I_C = -1.0mA, V_{CE} = -10V I_C = -10mA, V_{CE} = -10V I_C = -150mA, V_{CE} = -10V I_C = -500mA, V_{CE} = -10V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	-0.4 -1.6	V	I_C = -150mA, I_B = -15mA I_C = -500mA, I_B = -50mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	-1.3 -2.6	V	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	8.0	pF	V_{CB} = -10V, f = 1.0MHz, I_E = 0
Input Capacitance	C_{ibo}	—	30	pF	V_{EB} = -2.0V, f = 1.0MHz, I_C = 0
Current Gain-Bandwidth Product	f_T	200	—	MHz	V_{CE} = -20V, I_C = -50mA, f = 100MHz
SWITCHING CHARACTERISTICS					
Turn-On Time	t_{on}	—	45	ns	—
Delay Time	t_d	—	10	ns	V_{CC} = -30V, I_C = -150mA, I_{B1} = -15mA
Rise Time	t_r	—	40	ns	
Turn-Off Time	t_{off}	—	100	ns	—
Storage Time	t_s	—	80	ns	V_{CC} = -6.0V, I_C = -150mA, I_{B1} = I_{B2} = -15mA
Fall Time	t_f	—	30	ns	

Notes: 8. Short duration pulse test used to minimize self-heating effect.

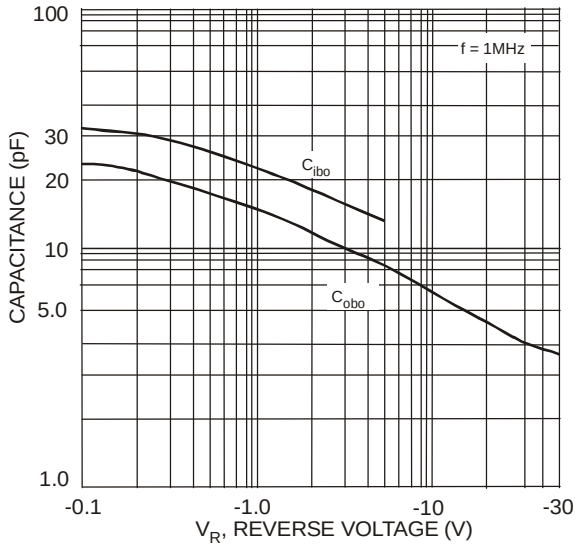

Fig. 3 (2907A) Typical Capacitance

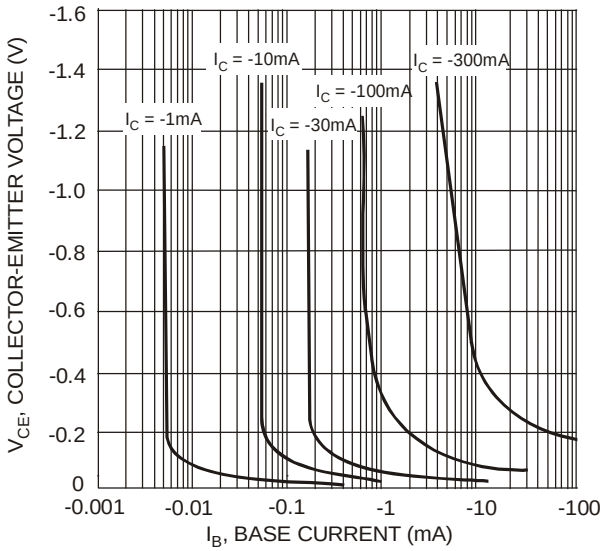

Fig. 4 Typical Collector Saturation Region (2907A Type - PNP)

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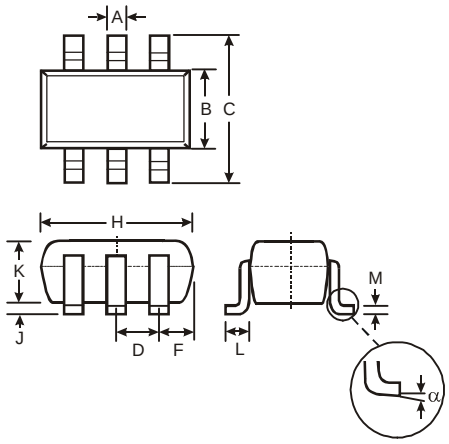
Package Outline Dimensions

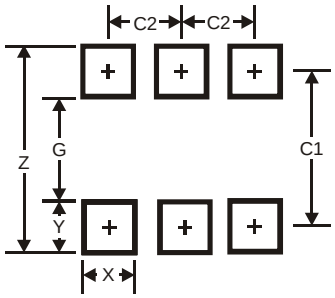
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



SOT363			
Dim	**Min**	**Max**	**Typ**
A	0.10	0.30	0.25
B	1.15	1.35	1.30
C	2.00	2.20	2.10
D	0.65 Typ		
F	0.40	0.45	0.425
H	1.80	2.20	2.15
J	0	0.10	0.05
K	0.90	1.00	1.00
L	0.25	0.40	0.30
M	0.10	0.22	0.11
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.



Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65

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