

COMPLEMENTARY NPN / PNP SMALL SIGNAL SURFACE MOUNT TRANSISTOR
Features & Benefits

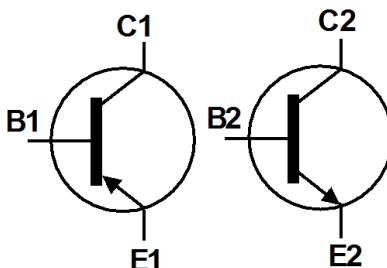
- Complementary Pairs One 2222A Type (NPN)
- One 2907A Type (PNP)
- Ideal for Low Power Amplification and Switching
- Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

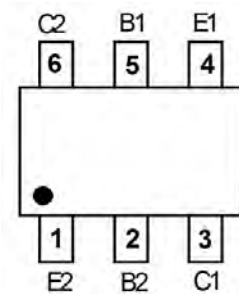
- Case: SOT363
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 
- Weight: 0.006 grams (approximate)



Top View



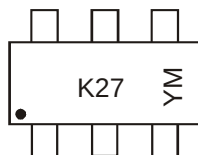
Device Symbol


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

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.)

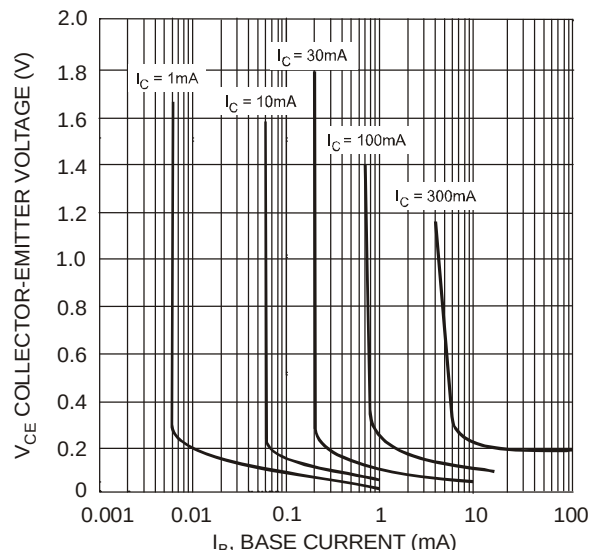
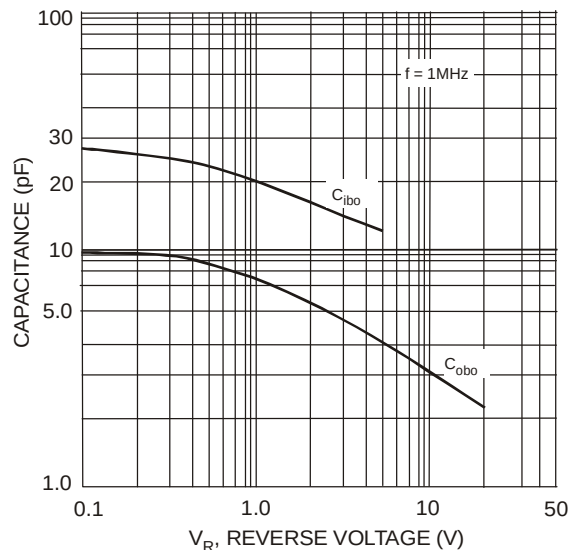
Characteristic	Symbol	Value	Unit
Power Dissipation (Notes 5)	P _D	200	mW
Thermal Resistance, Junction to Ambient (Notes 5)	R _{θJA}	625	°C/W
Thermal Resistance, Junction to Case (Note 6)	R _{θJC}	150	
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

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

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	—	—	I _C = 100μA, V _{CE} = 10V
		50	—		I _C = 1.0mA, V _{CE} = 10V
		75	—		I _C = 10mA, V _{CE} = 10V
		100	300		I _C = 150mA, V _{CE} = 10V
		40	—		I _C = 500mA, V _{CE} = 10V
		50	—		I _C = 10mA, V _{CE} = 10V, T _A = -55°C
		35	—		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,
Fall Time	t _f	—	60	ns	I _{B1} = I _{B2} = 15mA

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



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.

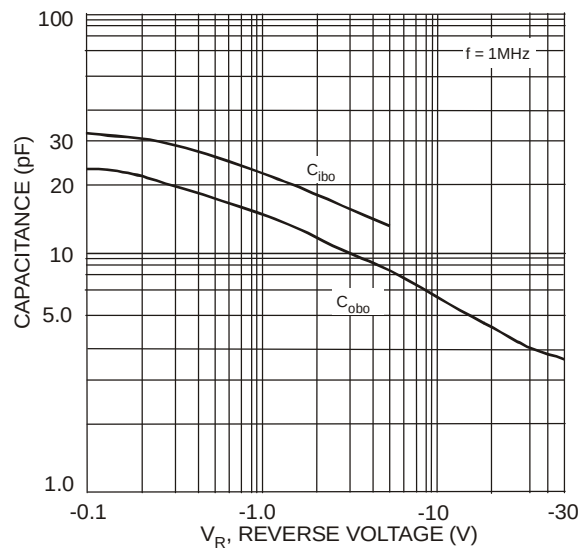


Fig. 3 (2907A) Typical Capacitance

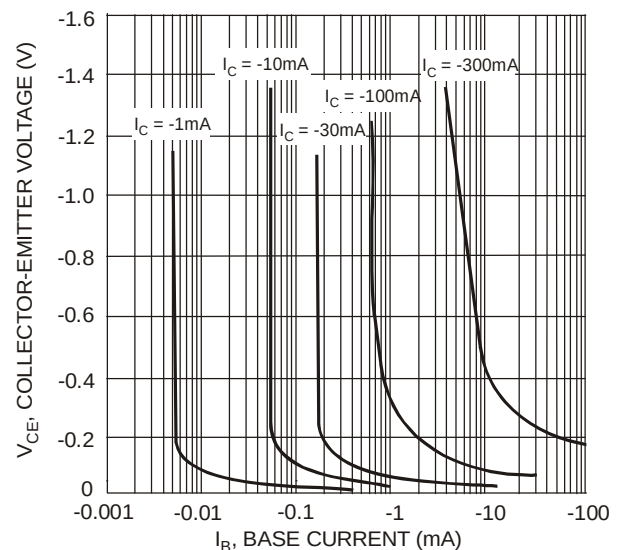
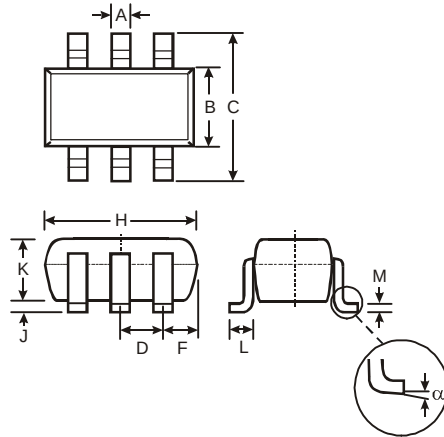


Fig. 4 Typical Collector Saturation Region (2907A Type - PNP)

Package Outline Dimensions

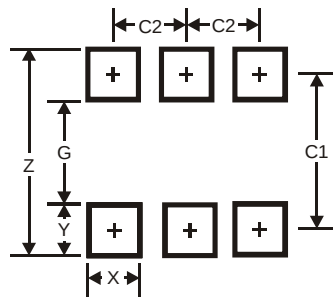
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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