THE DATASHEET OF

MMDT4146-7-F

COMPLEMENTARY NPN / PNP SMALL SIGNAL SURFACE MOUNT TRANSISTOR

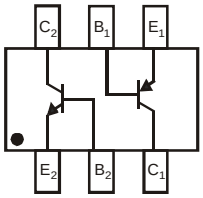
Features

- Complementary Pair One 4124-Type NPN
  One 4126-Type PNP
- Epitaxial Planar Die Construction
- Ideal for Medium Power Amplification and Switching
- Ultra-Small Surface Mount Package
- **Lead Free/RoHS Compliant (Note 3)**
- **"Green" Device (Note 4 and 5)**

Mechanical Data

- Case: SOT-363
- Case Material: Molded Plastic, "Green" Molding Compound, Note 5. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals: Matte Tin Finish annealed over Alloy 42 leadframe (Lead Free Plating) Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Marking Information: See Page 4
- Ordering Information: See Page 4
- Weight: 0.006 grams (approximate)

Top View



E1, B1, C1 = PNP4126 Section
E2, B2, C2 = NPN4124 Section

Device Schematic

Maximum Ratings, NPN 4124 Section @T_A = 25°C unless otherwise specified

Characteristic		Symbol	Value	Unit
Collector-Base Voltage		V_{CBO}	30	V
Collector-Emitter Voltage		V_{CEO}	25	V
Emitter-Base Voltage		V_{EBO}	5.0	V
Collector Current – Continuous	(Note 1)	I_C	200	mA

Maximum Ratings, PNP 4126 Section @T_A = 25°C unless otherwise specified

Characteristic		Symbol	Value	Unit
Collector-Base Voltage		V_{CBO}	-25	V
Collector-Emitter Voltage		V_{CEO}	-25	V
Emitter-Base Voltage		V_{EBO}	-4	V
Collector Current - Continuous	(Note 1)	I_C	-200	mA

Thermal Characteristics – Total Device

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 1, 2)	P_D	200	mW
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	625	°C/W

Notes:
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
2. Maximum combined dissipation.
3. No purposefully added lead.
4. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
5. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

Electrical Characteristics, NPN 4124 Section @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	30	—	V	I_C = 10μA, I_E = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	25	—	V	I_C = 1.0mA, I_B = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5.0	—	V	I_E = 10μA, I_C = 0
Collector Cutoff Current	I_{CBO}	—	50	nA	V_{CB} = 20V, I_E = 0V
Emitter Cutoff Current	I_{EBO}	—	50	nA	V_{EB} = 3.0V, I_C = 0V
ON CHARACTERISTICS (Note 6)					
DC Current Gain	h_{FE}	120 60	360 —	—	I_C = 2.0mA, V_{CE} = 1.0V I_C = 50mA, V_{CE} = 1.0V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.30	V	I_C = 50mA, I_B = 5.0mA
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	—	0.95	V	I_C = 50mA, I_B = 5.0mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	4.0	pF	V_{CB} = 5.0V, f = 1.0MHz, I_E = 0
Input Capacitance	C_{ibo}	—	8.0	pF	V_{EB} = 0.5V, f = 1.0MHz, I_C = 0
Small Signal Current Gain	h_{fe}	120	480	—	V_{CE} = 1.0V, I_C = 2.0mA, f = 1.0kHz
Current Gain-Bandwidth Product	f_T	300	—	MHz	V_{CE} = 20V, I_C = 10mA, f = 100MHz
Noise Figure	NF	—	5.0	dB	V_{CE} = 5.0V, I_C = 100μA, R_S = 1.0kΩ, f = 1.0kHz

Electrical Characteristics, PNP 4126 Section @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-25	—	V	I_C = -10μA, I_E = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-25	—	V	I_C = -1.0mA, I_B = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-4.0	—	V	I_E = -10μA, I_C = 0
Collector Cutoff Current	I_{CBO}	—	-50	nA	V_{CB} = -20V, I_E = 0V
Emitter Cutoff Current	I_{EBO}	—	-50	nA	V_{EB} = -3.0V, I_C = 0V
ON CHARACTERISTICS (Note 6)					
DC Current Gain	h_{FE}	120 60	360 —	—	I_C = -2.0mA, V_{CE} = -1.0V I_C = -50mA, V_{CE} = -1.0V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	-0.40	V	I_C = -50mA, I_B = -5.0mA
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	—	-0.95	V	I_C = -50mA, I_B = -5.0mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	4.5	pF	V_{CB} = -5.0V, f = 1.0MHz, I_E = 0
Input Capacitance	C_{ibo}	—	10	pF	V_{EB} = -0.5V, f = 1.0MHz, I_C = 0
Small Signal Current Gain	h_{fe}	120	480	—	V_{CE} = -1.0V, I_C = -2.0mA, f = 1.0kHz
Current Gain-Bandwidth Product	f_T	250	—	MHz	V_{CE} = -20V, I_C = -10mA, f = 100MHz
Noise Figure	NF	—	4.0	dB	V_{CE} = -5.0V, I_C = -100μA, R_S = 1.0kΩ, f = 1.0kHz

Notes: 6. Short duration pulse test used to minimize self-heating effect.

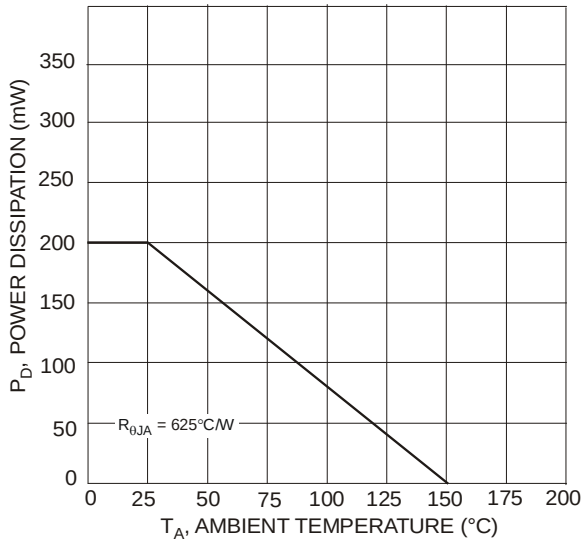


Fig. 1 Power Dissipation vs.
Ambient Temperature (Total Device, Note 1)

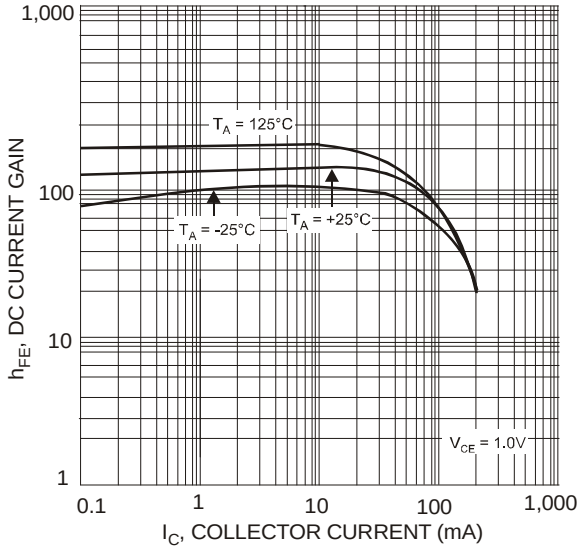


Fig. 2 Typical DC Current Gain
vs. Collector Current (PNP-4126)

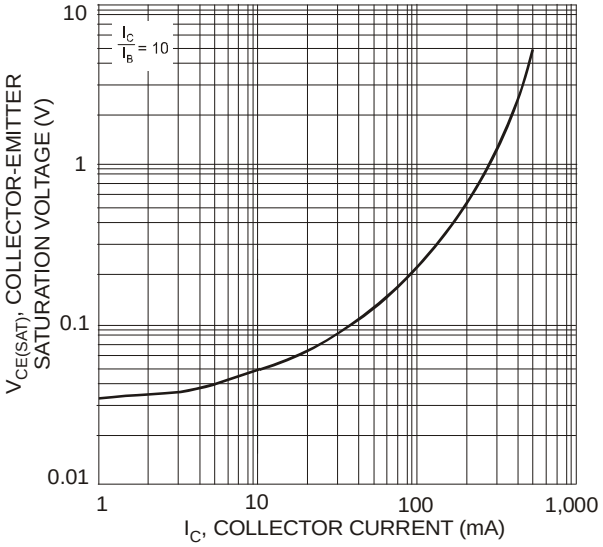


Fig. 3 Typical Collector-Emitter Saturation Voltage
vs. Collector Current (PNP-4126)

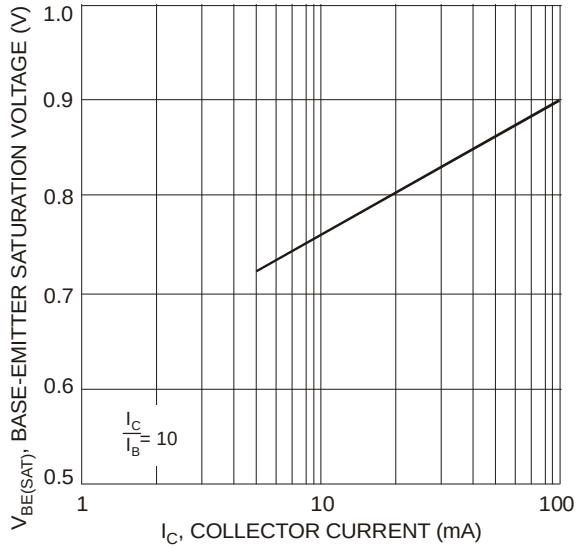


Fig. 4 Typical Base-Emitter Saturation Voltage
vs. Collector Current (PNP-4126)

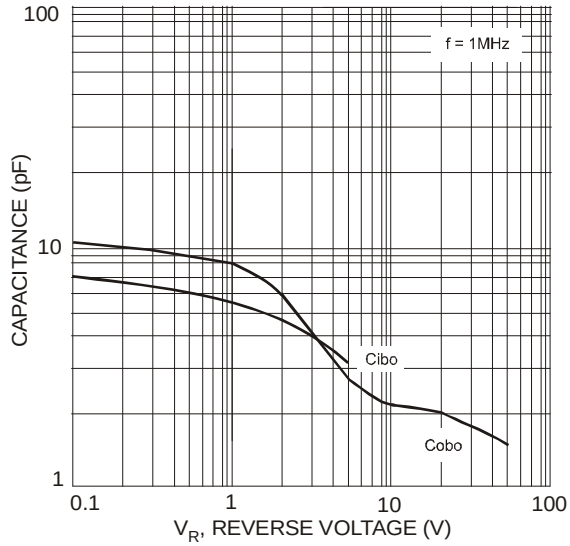


Fig. 5 Typical Capacitance Characteristics (PNP-4126)

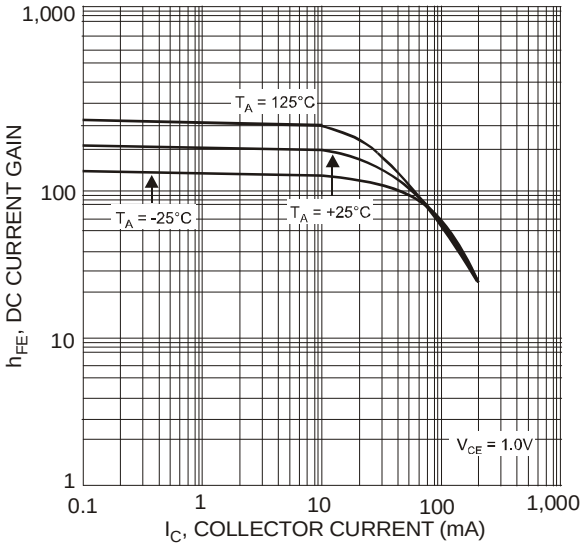


Fig. 6 Typical DC Current Gain
vs. Collector Current (NPN-4124)

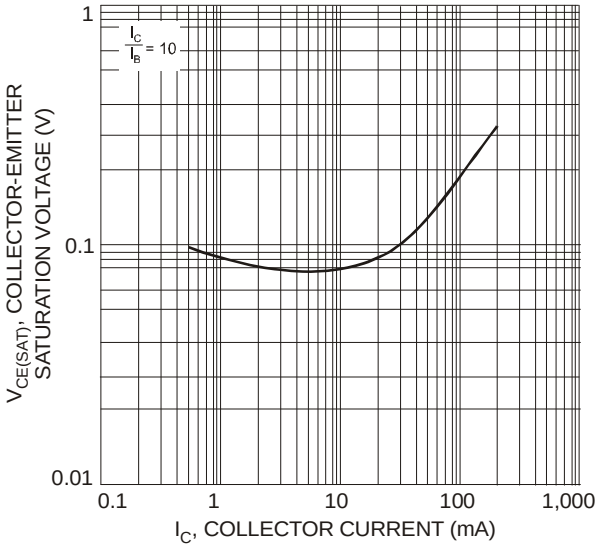


Fig. 7 Typical Collector-Emitter Saturation Voltage vs. Collector Current (NPN-4124)

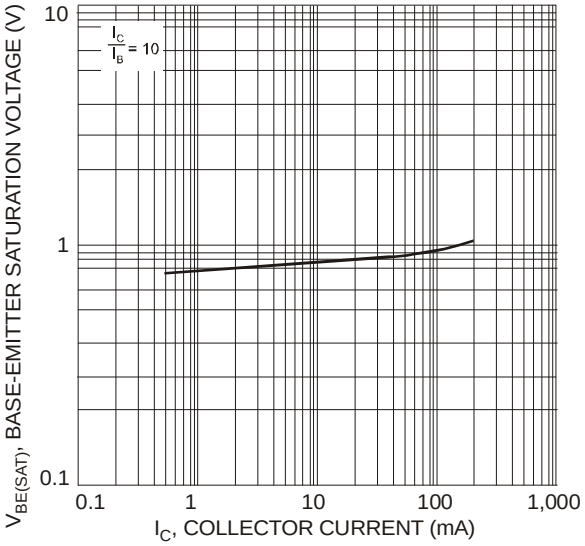


Fig. 8 Typical Base-Emitter Saturation Voltage vs. Collector Current (NPN-4124)

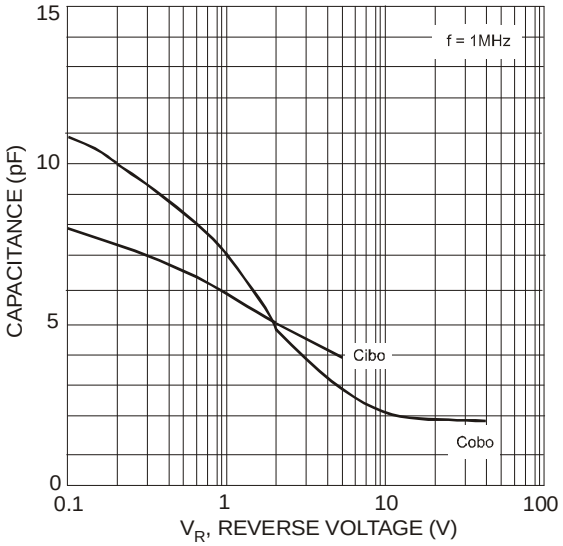


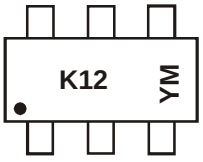
Fig. 9 Typical Capacitance Characteristics (NPN-4124)

Ordering Information (Note 7)

Part Number	Case	Packaging
MMDT4146-7-F	SOT-363	3000/Tape & Reel

Notes: 7. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

Marking Information



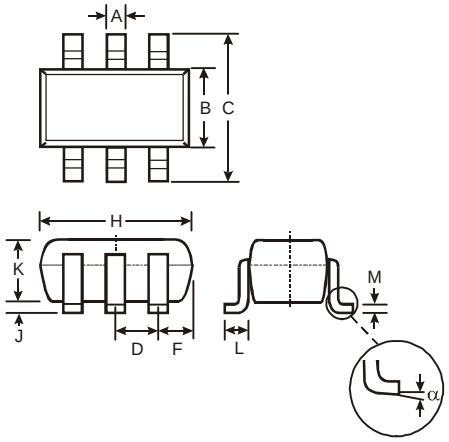
K12 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: N = 2002)
M = Month (ex: 9 = September)

Date Code Key

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Code	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z	A	B	C

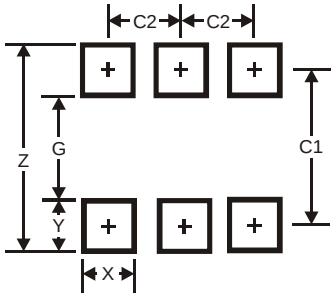
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

Package Outline Dimensions



SOT-363		
Dim	**Min**	**Max**
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Typ	
F	0.40	0.45
H	1.80	2.20
J	0	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.22
α	0°	8°
All Dimensions in mm		

Suggested Pad Layout



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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- Alternative Solution
- Excess Inventory Management