

**Features**

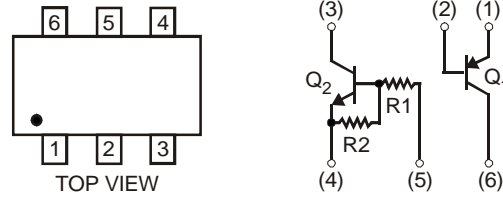
- Epitaxial Planar Die Construction
- One PNP Bipolar Transistor and One NPN Pre-Biased Transistor
- Ultra-Small Surface Mount Package
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**



SOT-563

**Mechanical Data**

- Case: SOT-563
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed Over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Marking Information: See Page 4
- Ordering Information: See Page 4
- Weight: 0.003 grams (approximate)



Schematic and Pin Configuration

**Maximum Ratings, Total Device** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 3)	$P_D$	300	mW
Thermal Resistance, Junction to Ambient Air (Note 3)	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

**Maximum Ratings, PNP Transistor, Q<sub>1</sub>** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	-15	V
Collector-Emitter Voltage	$V_{CEO}$	-12	V
Emitter-Base Voltage	$V_{EBO}$	-6	V
Continuous Collector Current	$I_C$	-500	mA
Peak Pulsed Collector Current	$I_{CP}$	-1.0	A

**Maximum Ratings, Pre-Biased NPN Transistor, Q<sub>2</sub>** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	50	V
Input Voltage	$V_{IN}$	-10 to +40	V
Collector Current	$I_C$	100	mA
Output Current	$I_O$	50	mA

- Notes:
1. No purposefully added lead.
  2. Diodes Inc.'s "Green" policy can be found on our website at [http://www.diodes.com/products/lead\\_free/index.php](http://www.diodes.com/products/lead_free/index.php).
  3. Device mounted on FR-4 PCB; 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>.

## Electrical Characteristics, PNP Transistor, Q<sub>1</sub> @ T<sub>A</sub> = 25°C unless otherwise specified

Characteristic (Note 4)	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	V <sub>(BR)CBO</sub>	-15	—	—	V	I <sub>C</sub> = -10μA, I <sub>E</sub> = 0
Collector-Emitter Breakdown Voltage	V <sub>(BR)CEO</sub>	-12	—	—	V	I <sub>C</sub> = -1.0mA, I <sub>B</sub> = 0
Emitter-Base Breakdown Voltage	V <sub>(BR)EBO</sub>	-6	—	—	V	I <sub>E</sub> = -10μA, I <sub>C</sub> = 0
Collector Cutoff Current	I <sub>CBO</sub>	—	—	-100	nA	V <sub>CB</sub> = -15V, I <sub>E</sub> = 0
Collector Cutoff Current	I <sub>EBO</sub>	—	—	-100	nA	V <sub>EB</sub> = -6V, I <sub>C</sub> = 0
DC Current Gain	h <sub>FE</sub>	270	—	680	—	V <sub>CE</sub> = -2.0V, I <sub>C</sub> = -10mA
Collector-Emitter Saturation Voltage	V <sub>CE(SAT)</sub>	—	-100	-250	mV	I <sub>C</sub> = -200mA, I <sub>B</sub> = -10mA
Gain-Bandwidth Product	f <sub>T</sub>	—	280	—	MHz	V <sub>CE</sub> = -2.0V, I <sub>E</sub> = 10mA, f = 100MHz
Collector Output Capacitance	C <sub>obo</sub>	—	5	—	pF	V <sub>CB</sub> = -10V, I <sub>E</sub> = 0, f = 1MHz

## Electrical Characteristics, Pre-Biased NPN Transistor, Q<sub>2</sub> @ T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Input Voltage	V <sub>I(off)</sub>	—	—	0.5	V	V <sub>CC</sub> = 5V, I <sub>O</sub> = 100μA
	V <sub>I(on)</sub>	3	—	—	V	V <sub>O</sub> = 0.3V, I <sub>O</sub> = 10mA
Output Voltage	V <sub>O(on)</sub>	—	0.1	0.3	V	I <sub>O</sub> /I <sub>I</sub> = 10mA/0.5 mA
Input Current	I <sub>I</sub>	—	—	0.88	mA	V <sub>I</sub> = 5V
Output Current	I <sub>O(off)</sub>	—	—	0.5	μA	V <sub>CC</sub> = 50V, V <sub>I</sub> = 0V
DC Current Gain	G <sub>I</sub>	30	—	—	—	V <sub>O</sub> = 5V, I <sub>O</sub> = 5mA
Gain-Bandwidth Product (Note 5)	f <sub>T</sub>	—	250	—	MHz	V <sub>CE</sub> = 10V, I <sub>E</sub> = -5mA, f = 100MHz
Input Resistance	R <sub>1</sub>	7	10	13	kΩ	—
Resistance Ratio	R <sub>2</sub> /R <sub>1</sub>	0.8	1	1.2	—	—

- Notes:
- Short duration pulse test used to minimize self-heating effect.
  - Characteristics of the transistor. For reference only.

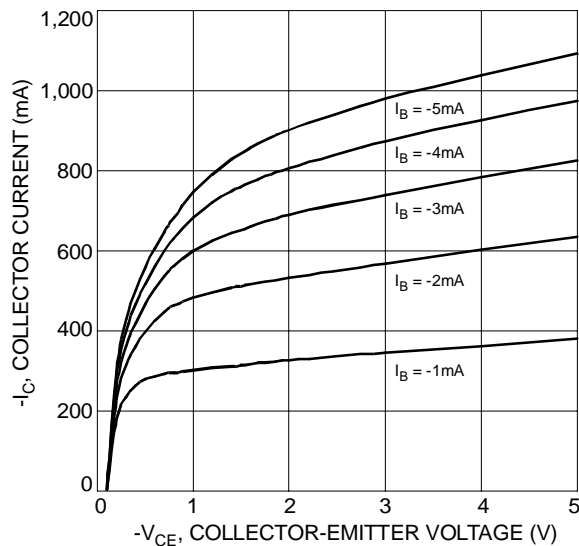


Fig. 1 Typical Collector Current vs. Collector-Emitter Voltage (Q<sub>1</sub>, PNP)

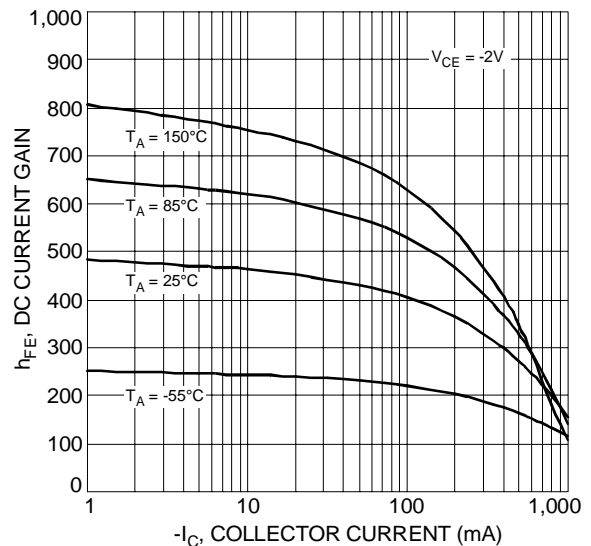


Fig. 2 Typical DC Current Gain vs. Collector Current (Q<sub>1</sub>, PNP)

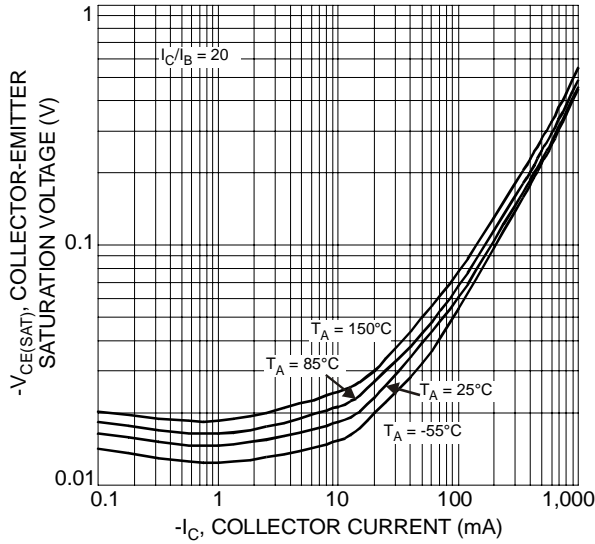


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current (Q1, PNP)

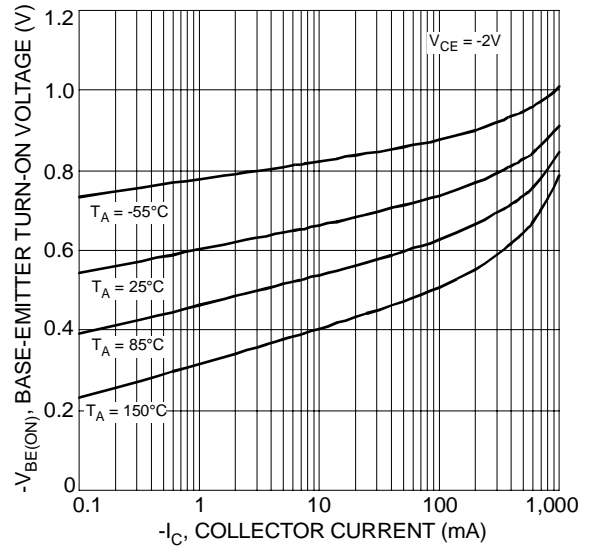


Fig. 4 Typical Base-Emitter Turn-On Voltage vs. Collector Current (Q1, PNP)

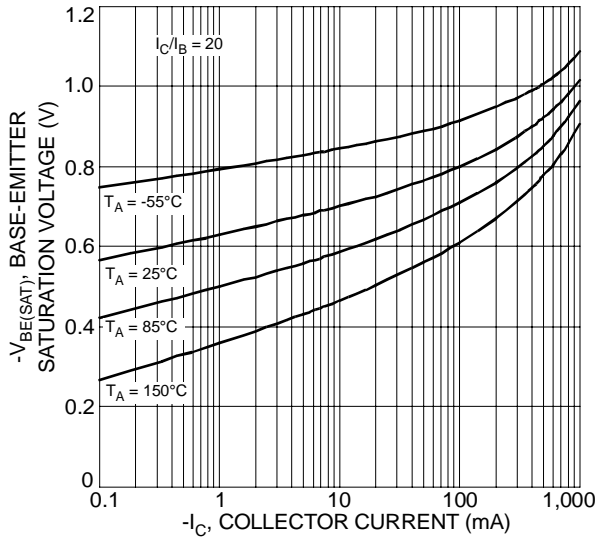


Fig. 5 Typical Base-Emitter Saturation Voltage vs. Collector Current (Q1, PNP)

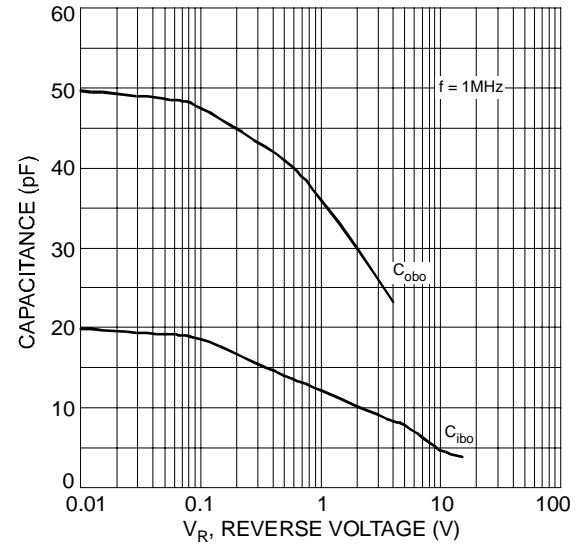


Fig. 6 Typical Capacitance Characteristics (Q1, PNP)

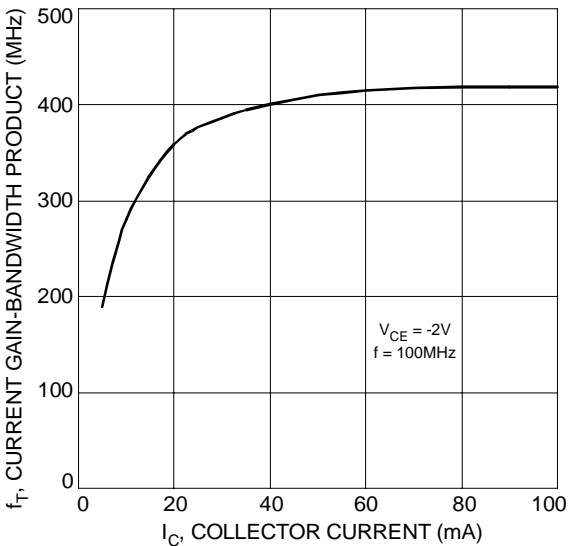


Fig. 7 Typical Gain-Bandwidth Product vs. Emitter Current (Q1, PNP)

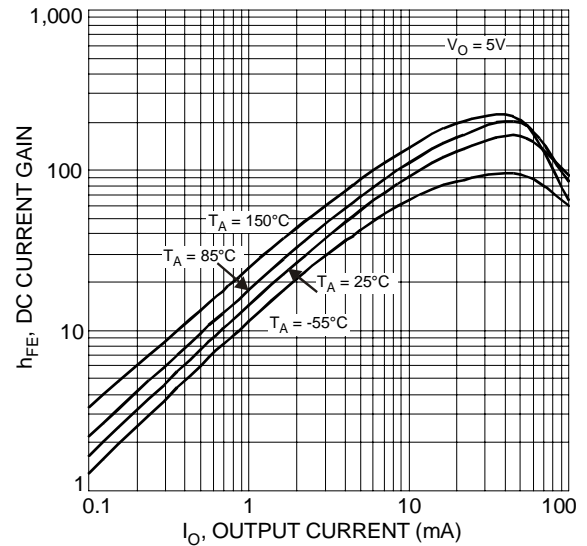


Fig. 8 Typical DC Current Gain vs. Output Current (Q2, NPN PBT)

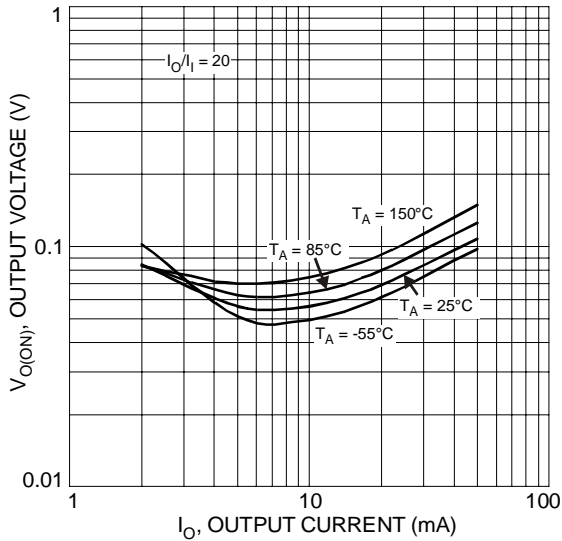


Fig. 9 Typical Output Voltage vs. Output Current (Q2, NPN PBT)

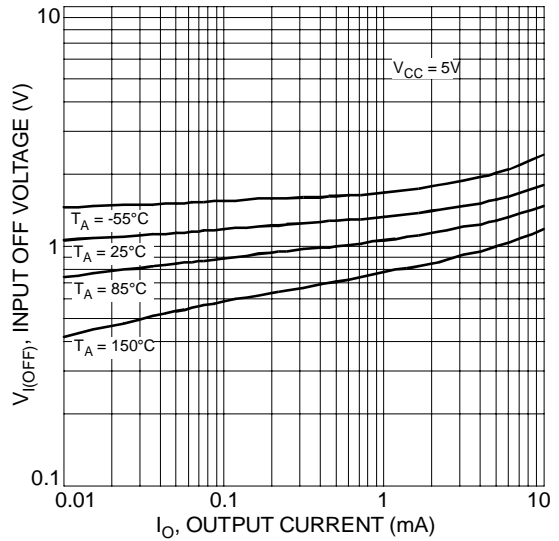


Fig. 10 Typical Input Off Voltage vs. Output Current (Q2, NPN PBT)

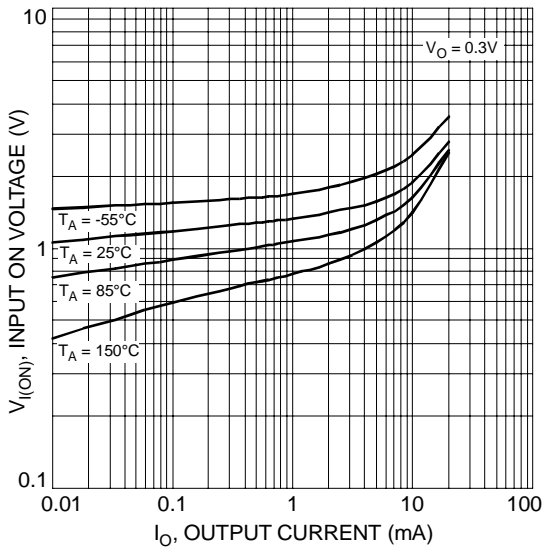


Fig. 11 Typical Input On Voltage vs. Output Current (Q2, NPN PBT)

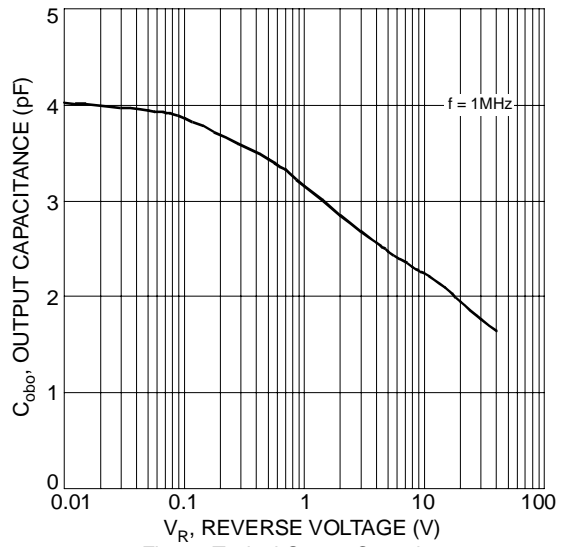


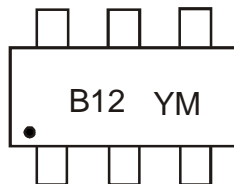
Fig. 12 Typical Output Capacitance Characteristics (Q2, NPN PBT)

## Ordering Information (Note 6)

Device	Packaging	Shipping
EMF21-7	SOT-563	3000/Tape & Reel

Notes: 6. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Marking Information



B12 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: U = 2007  
 M = Month ex: 9 = September

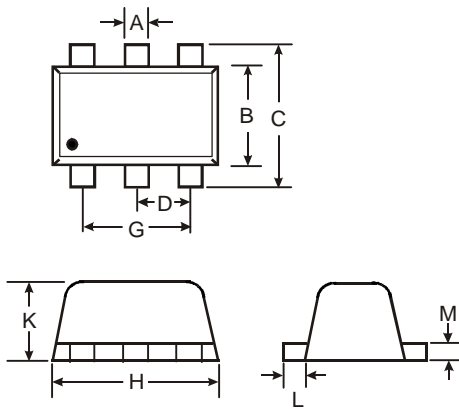
### Date Code Key

Year	2007	2008	2009	2010	2011	2012
Code	U	V	W	X	Y	Z

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-563			
Dim	Min	Max	Typ
A	0.15	0.30	0.25
B	1.10	1.25	1.20
C	1.55	1.70	1.60
D	0.50	-	-
G	0.90	1.10	1.00
H	1.50	1.70	1.60
K	0.56	0.60	0.60
L	0.10	0.30	0.20
M	0.10	0.18	0.11
All Dimensions in mm			

**IMPORTANT NOTICE**

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to any product herein. Diodes Incorporated does not assume any liability arising out of the application or use of any product described herein; neither does it convey any license under its patent rights, nor the rights of others. The user of products in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on our website, harmless against all damages.

**LIFE SUPPORT**

Diodes Incorporated products are not authorized for use as critical components in life support devices or systems without the expressed written approval of the President of Diodes Incorporated.