

## Features

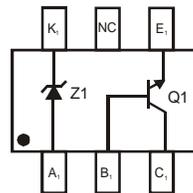
- Epitaxial Planar Die Construction
- Ideally Suited for Automated Assembly Processes
- **Lead Free/RoHS Compliant Version (Notes 2 & 3)**
- **“Green” Device (Note 3)**

## Mechanical Data

- Case: SOT-26
- Case Material: Molded Plastic, “Green” Molding Compound (Note 3) UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Matte Tin Finish annealed over Copper leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208
- Marking Information: See Page 4
- Ordering Information: See Page 4
- Weight: 0.008 grams (approximate)



Top View



Device Schematic

### Maximum Ratings, NPN Transistor Element (Q1) @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	60	V
Collector-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6.0	V
Collector Current - Continuous (Note 1)	$I_C$	600	mA

### Maximum Ratings, Zener Element (Z1) @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Forward Voltage @ $I_F = 10\text{mA}$	$V_F$	0.9	V

## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 1)	$P_D$	300	mW
Thermal Resistance, Junction to Ambient (Note 1)	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- Notes:
1. Part mounted on FR-4 board with recommended pad layout, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.
  2. No purposefully added lead.
  3. Product manufactured with date code WN (Week 45, 2009) and newer are built with Green Molding Compound and Lead-free plating. Product manufactured prior to date code WO are built with Tin-Lead plating, Non-Green Molding Compound and may contain Halogens or  $\text{Sb}_2\text{O}_3$  Fire Retardants.

**Electrical Characteristics, NPN Transistor Element (Q1) @ $T_A = 25^\circ\text{C}$  unless otherwise specified**

Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 4)</b>					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	60	—	V	$I_C = 100\mu\text{A}, I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	$I_C = 1.0\text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6.0	—	V	$I_E = 100\mu\text{A}, I_C = 0$
Collector Cutoff Current	$I_{CEX}$	—	100	nA	$V_{CE} = 35\text{V}, V_{EB(OFF)} = 0.4\text{V}$
Base Cutoff Current	$I_{BL}$	—	100	nA	$V_{CE} = 35\text{V}, V_{EB(OFF)} = 0.4\text{V}$
<b>ON CHARACTERISTICS (Note 4)</b>					
DC Current Gain	$h_{FE}$	20	—	—	$I_C = 100\mu\text{A}, V_{CE} = 1.0\text{V}$
		40	—		$I_C = 1.0\text{mA}, V_{CE} = 1.0\text{V}$
		80	—		$I_C = 10\text{mA}, V_{CE} = 1.0\text{V}$
		100	300		$I_C = 150\text{mA}, V_{CE} = 1.0\text{V}$
		40	—		$I_C = 500\text{mA}, V_{CE} = 2.0\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.40 0.75	V	$I_C = 150\text{mA}, I_B = 15\text{mA}$ $I_C = 500\text{mA}, I_B = 50\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	0.75	0.95 1.2	V	$I_C = 150\text{mA}, I_B = 15\text{mA}$ $I_C = 500\text{mA}, I_B = 50\text{mA}$
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	$C_{cb}$	—	6.5	pF	$V_{CB} = 5.0\text{V}, f = 1.0\text{MHz}, I_E = 0$
Input Capacitance	$C_{eb}$	—	30	pF	$V_{EB} = 0.5\text{V}, f = 1.0\text{MHz}, I_C = 0$
Input Impedance	$h_{ie}$	1.0	15	k $\Omega$	$V_{CE} = 10\text{V}, I_C = 1.0\text{mA}, f = 1.0\text{kHz}$
Voltage Feedback Ratio	$h_{re}$	0.1	8.0	$\times 10^{-4}$	
Small Signal Current Gain	$h_{fe}$	40	500	—	
Output Admittance	$h_{oe}$	1.0	30	$\mu\text{S}$	
Current Gain-Bandwidth Product	$f_T$	250	—	MHz	
<b>SWITCHING CHARACTERISTICS</b>					
Delay Time	$t_d$	—	15	ns	$V_{CC} = 30\text{V}, I_C = 150\text{mA},$ $V_{BE(off)} = 2.0\text{V}, I_{B1} = 15\text{mA}$
Rise Time	$t_r$	—	20	ns	
Storage Time	$t_s$	—	225	ns	$V_{CC} = 30\text{V}, I_C = 150\text{mA},$ $I_{B1} = I_{B2} = 15\text{mA}$
Fall Time	$t_f$	—	30	ns	

**Electrical Characteristics, Zener Element (Z1) @ $T_A = 25^\circ\text{C}$  unless otherwise specified**

Zener Voltage Range (Note 4)				Maximum Zener Impedance		Maximum Reverse Leakage Current (Note 4)	
$V_Z @ I_{ZT}$		$I_{ZT}$	$Z_{ZT} @ I_{ZT}$	$Z_{ZK} @ I_{ZK} = 0.5\text{mA}$		$I_R$	@ $V_R$
Nom (V)	Min (V)	Max (V)		$\Omega$		$\mu\text{A}$	V
5.6	5.49	5.73	5	60	200	1.0	2.5

Notes: 4. Short duration pulse test used to minimize self-heating effect.

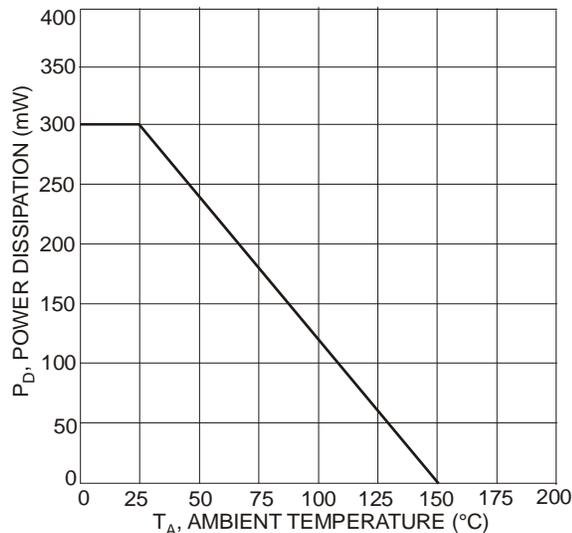
**NPN Transistor Section (Q1)**


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

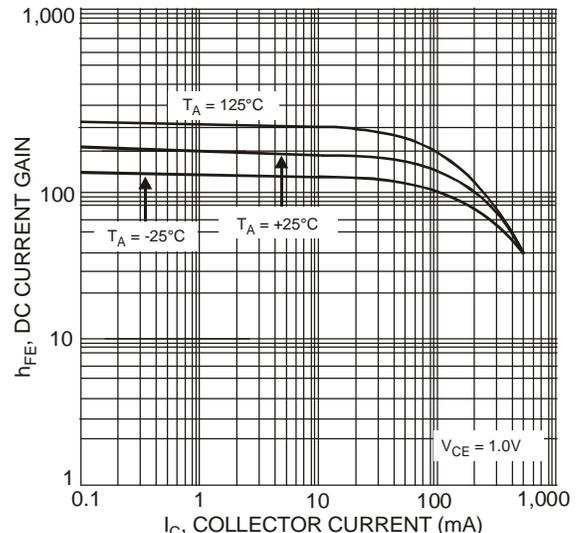


Fig. 2 Typical DC Current Gain vs. Collector Current

**NPN Transistor Section (Q1)**

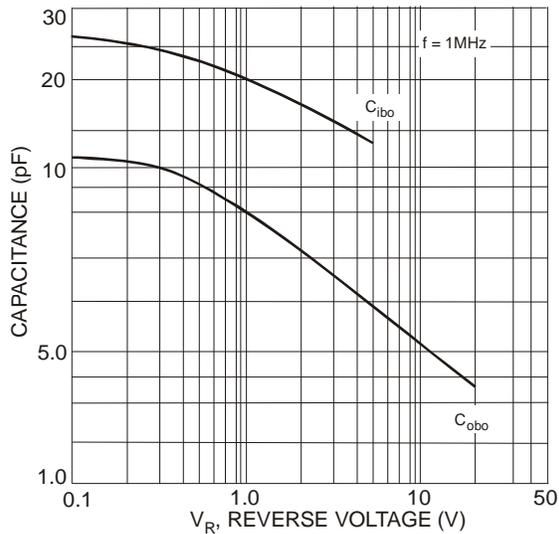


Fig. 3 Typical Capacitance Characteristics

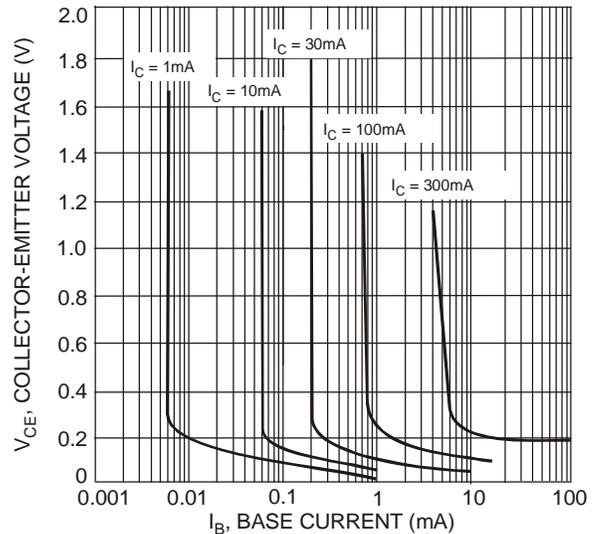


Fig. 4 Typical Collector Saturation Region

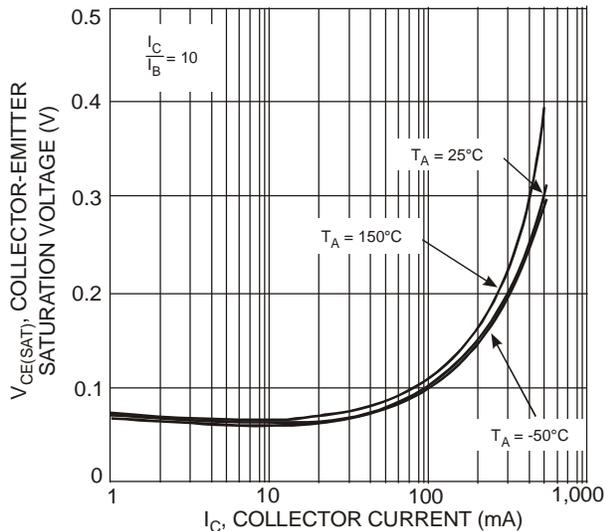


Fig. 5 Typical Collector-Emitter Saturation Voltage vs. Collector Current

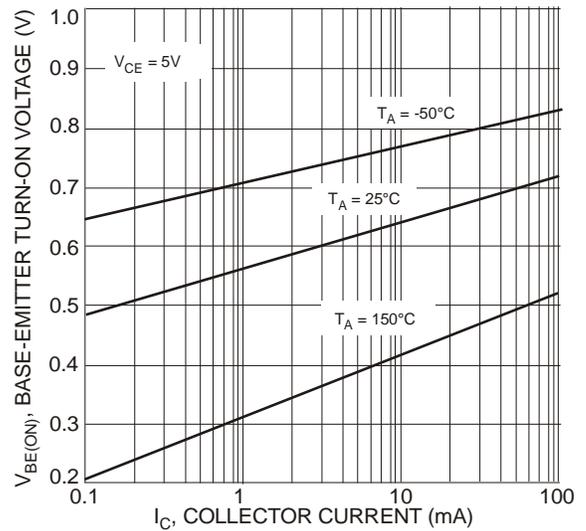


Fig. 6 Typical Base-Emitter Turn-On Voltage vs. Collector Current

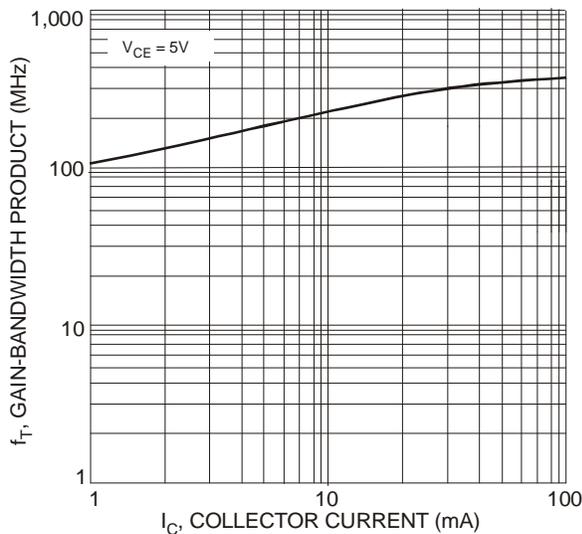


Fig. 7 Typical Gain-Bandwidth Product vs. Collector Current

**Zener Section (Z1)**

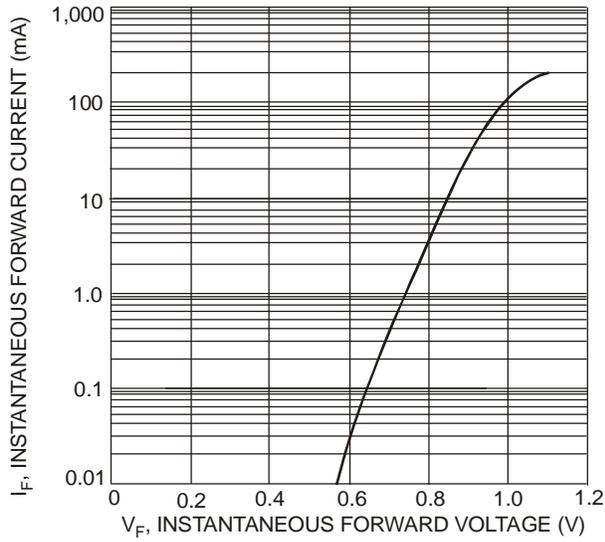


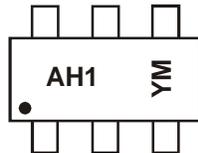
Fig. 8 Typical Forward Characteristics

**Ordering Information** (Note 5)

Part Number	Case	Packaging
DVRN6056-7-F	SOT-26	3000/Tape & Reel

Notes: 5. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

**Marking Information**



AH1 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: P = 2003)  
 M = Month (ex: 9 = September)

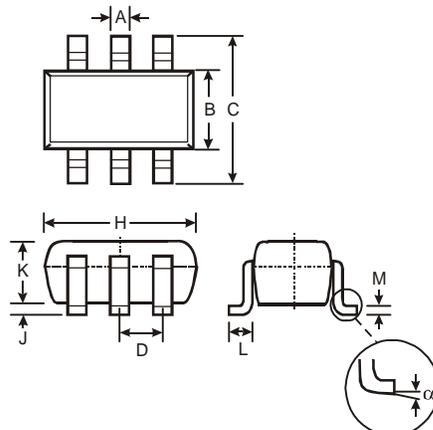
Date Code Key

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Code	P	R	S	T	U	V	W	X	Y	Z	A	B	C

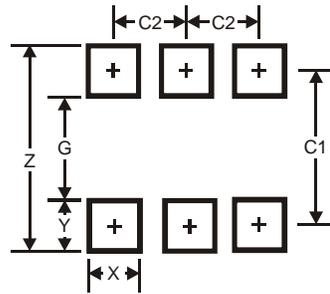
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

**Package Outline Dimensions**



SOT-26			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
α	0°	8°	—
All Dimensions in mm			

## Suggested Pad Layout



Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

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