

## 60V LOW $V_{CE(sat)}$ NPN SURFACE MOUNT TRANSISTOR

### Features

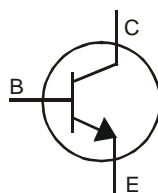
- Epitaxial Planar Die Construction
- Ideal for Medium Power Amplification and Switching
- "Lead Free", RoHS Compliant (Note 1)
- Halogen and Antimony Free. "Green" Device (Note 2)
- Qualified to AEC-Q101 Standards for High Reliability

### Mechanical Data

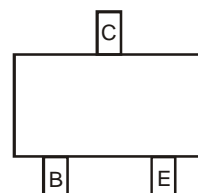
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (approximate)



Top View



Device Symbol



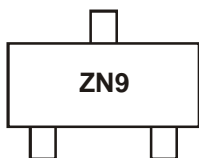
Pin-Out Top

### Ordering Information (Note 3)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DSS4160T-7	ZN9	7	8	3,000

- Notes:
1. No purposefully added lead.
  2. Diodes Inc's "Green" Policy can be found on our website at <http://www.diodes.com>
  3. For packaging details, go to our website at <http://www.diodes.com>

### Marking Information



ZN9 = Product Type Marking Code

**Maximum Ratings** @T<sub>A</sub> = 25°C unless otherwise specified

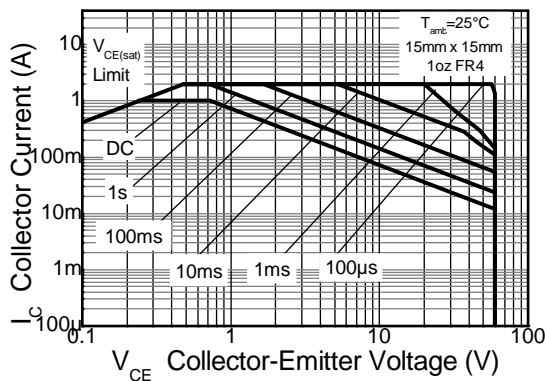
Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CE0</sub>	80	V
Collector-Emitter Voltage	V <sub>CEO</sub>	60	V
Emitter-Base Voltage	V <sub>EBO</sub>	5	V
Continuous Collector Current	I <sub>C</sub>	1	A
Peak Pulse Collector Current	I <sub>CM</sub>	2	A
Base Current (DC)	I <sub>B</sub>	300	mA
Peak Base Current	I <sub>BM</sub>	1	A

**Thermal Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

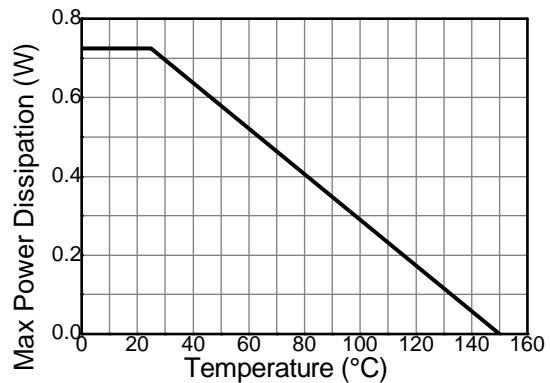
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P <sub>D</sub>	725	mW
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	172	°C/W
Thermal Resistance, Junction to Ambient Air (Note 4)	R <sub>θJA</sub>	79	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

Notes: 4. Operated under pulsed conditions: pulse width ≤100ms, duty cycle ≤ 0.25.  
5. Device mounted on 15mm x 15mm x1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.

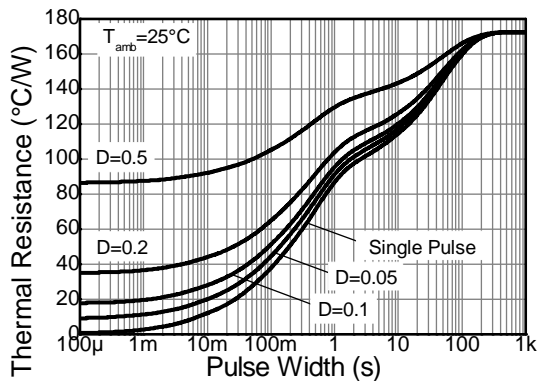
**Thermal Characteristics**



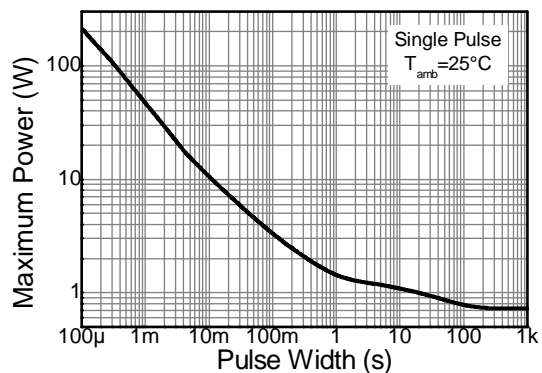
**Safe operating Area**



**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

**Electrical Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector-Base Breakdown Voltage	BV <sub>CB0</sub>	80	—	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage (Note 6)	BV <sub>CEO</sub>	60	—	—	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	5	—	—	V	I <sub>E</sub> = 100μA
Collector-Base Cutoff Current	I <sub>CB0</sub>	—	—	100	nA	V <sub>CB</sub> = 60V, I <sub>E</sub> = 0
		—	—	50	μA	V <sub>CB</sub> = 60V, I <sub>E</sub> = 0, T <sub>A</sub> = 150°C
Collector Cutoff Current	I <sub>CES</sub>	—	—	100	nA	V <sub>EB</sub> = 60V, I <sub>BE</sub> = 0
Emitter-Base Cutoff Current	I <sub>EBO</sub>	—	—	100	nA	V <sub>EB</sub> = 5V, I <sub>C</sub> = 0
DC Current Gain (Note 6)	h <sub>FE</sub>	250	—	—	—	V <sub>CE</sub> = 5V, I <sub>C</sub> = 1mA
		200	—	—	—	V <sub>CE</sub> = 5V, I <sub>C</sub> = 500mA
		100	—	—	—	V <sub>CE</sub> = 5V, I <sub>C</sub> = 1A
Collector-Emitter Saturation Voltage (Note 6)	V <sub>CE(sat)</sub>	—	—	115	mV	I <sub>C</sub> = 100mA, I <sub>B</sub> = 1mA
		—	—	150		I <sub>C</sub> = 500mA, I <sub>B</sub> = 50mA
		—	—	280		I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA
Equivalent On-Resistance	R <sub>CE(sat)</sub>	—	—	280	mΩ	I <sub>E</sub> = 1A, I <sub>B</sub> = 100mA
Base-Emitter Saturation Voltage	V <sub>BE(sat)</sub>	—	—	1.1	V	I <sub>C</sub> = 1A, I <sub>B</sub> = 50mA
Base-Emitter Turn-on Voltage	V <sub>BE(on)</sub>	—	—	0.9	V	V <sub>CE</sub> = 5V, I <sub>C</sub> = 1A
Transition Frequency	f <sub>T</sub>	150	—	—	MHz	V <sub>CE</sub> = 10V, I <sub>C</sub> = 50mA, f = 100MHz
Output Capacitance	C <sub>obo</sub>	—	—	10	pF	V <sub>CB</sub> = 10V, f = 1MHz
Turn-On Time	t <sub>on</sub>	—	63	—	ns	V <sub>CC</sub> = 10V, I <sub>C</sub> = 0.5A, I <sub>B1</sub> = I <sub>B2</sub> = 25mA
Delay Time	t <sub>d</sub>	—	33	—	ns	
Rise Time	t <sub>r</sub>	—	30	—	ns	
Turn-Off Time	t <sub>off</sub>	—	420	—	ns	
Storage Time	t <sub>s</sub>	—	380	—	ns	
Fall Time	t <sub>f</sub>	—	40	—	ns	

Notes: 6. Measured under pulsed conditions. Pulse width = 300μs. Duty cycle ≤2%.

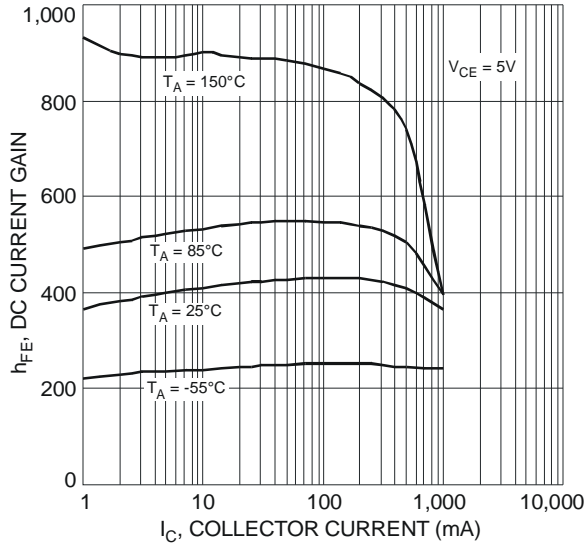


Fig. 5 Typical DC Current Gain vs. Collector Current

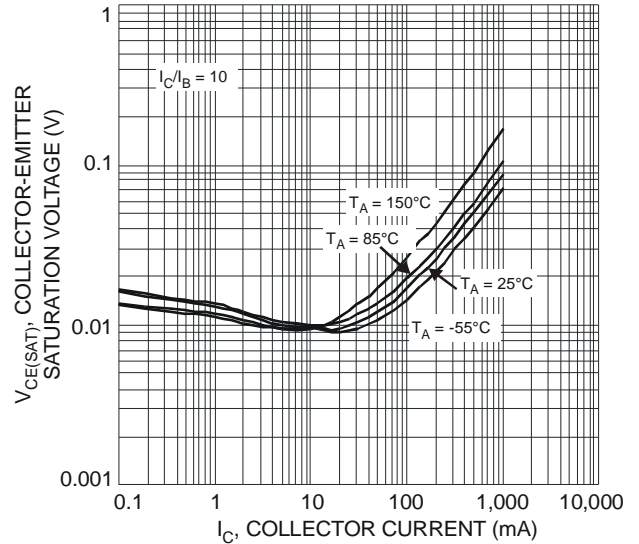


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

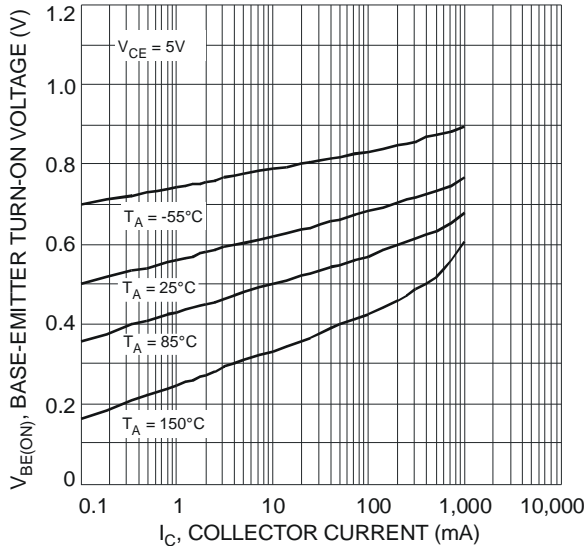


Fig. 7 Typical Base-Emitter Turn-On Voltage vs. Collector Current

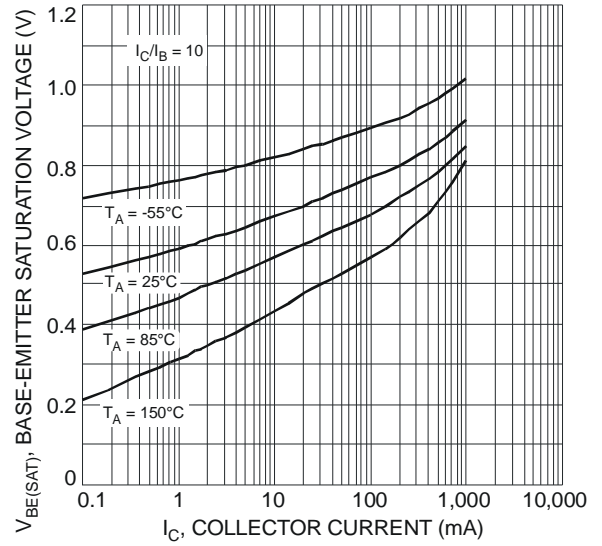


Fig. 8 Typical Base-Emitter Saturation Voltage vs. Collector Current

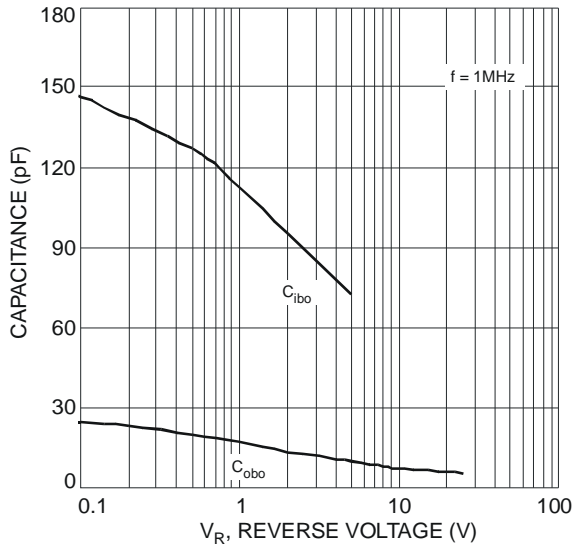
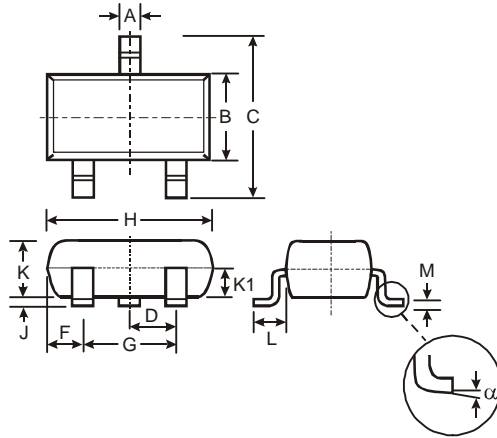


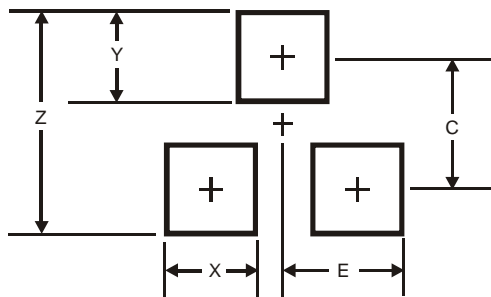
Fig. 9 Typical Capacitance Characteristics

**Package Outline Dimensions**



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
alpha	0°	8°	-
All Dimensions in mm			

**Suggested Pad Layout**



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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