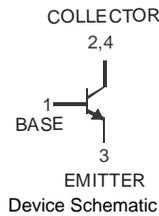


## Features

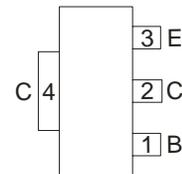
- Complementary PNP Type Available (DSS5540X)
- Ultra Low Collector-Emitter Saturation Voltage
- Ideally Suited for Automated Assembly Processes
- Ideal for Medium Power Switching or Amplification Applications
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**



Top View



Device Schematic



Pin Out Configuration

## Mechanical Data

- Case: SOT89-3L
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals: Finish — Matte Tin 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: 0.072 grams (approximate)

## Maximum Ratings @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	40	V
Collector-Emitter Voltage	$V_{CE0}$	40	V
Emitter-Base Voltage	$V_{EB0}$	6	V
Continuous Collector Current	$I_C$	4	A
Repetitive Collector Current (Note 3)	$I_{CRM}$	5	A
Peak Pulse Collector Current	$I_{CM}$	10	A
Continuous Base Current	$I_B$	1	A
Peak Pulse Base Current	$I_{BM}$	2	A

## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 4) @ $T_A = 25^\circ\text{C}$	$P_D$	0.9	W
Thermal Resistance, Junction to Ambient Air (Note 4) @ $T_A = 25^\circ\text{C}$	$R_{\theta JA}$	139	$^\circ\text{C/W}$
Power Dissipation (Note 5) @ $T_A = 25^\circ\text{C}$	$P_D$	2	W
Thermal Resistance, Junction to Ambient Air (Note 5) @ $T_A = 25^\circ\text{C}$	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- 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. Operated under pulsed conditions: pulse width  $\leq 10\text{ms}$ ; duty cycle  $\leq 0.2$ .
  4. Device mounted on FR-4 PCB with minimum recommended pad layout.
  5. Device mounted on FR-4 PCB with 1 inch<sup>2</sup> copper pad layout.

**Electrical Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Conditions
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	40	—	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 6)	$V_{(BR)CEO}$	40	—	—	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6	—	—	V	$I_E = 100\mu\text{A}$
Collector-Base Cutoff Current	$I_{CBO}$	—	—	100	nA	$V_{CB} = 30\text{V}, I_E = 0$
		—	—	50	$\mu\text{A}$	$V_{CB} = 30\text{V}, I_E = 0, T_A = 150^\circ\text{C}$
Collector-Emitter Cut-Off Current	$I_{CES}$	—	—	100	nA	$V_{CE} = 30\text{V}, V_{BE} = 0\text{V}$
Emitter-Base Cutoff Current	$I_{EBO}$	—	—	100	nA	$V_{EB} = 5\text{V}, I_C = 0$
<b>ON CHARACTERISTICS (Note 6)</b>						
DC Current Gain	$h_{FE}$	300	—	—	—	$V_{CE} = 2\text{V}, I_C = 0.5\text{A}$
		300	—	—		$V_{CE} = 2\text{V}, I_C = 1\text{A}$
		250	—	—		$V_{CE} = 2\text{V}, I_C = 2\text{A}$
		100	—	—		$V_{CE} = 2\text{V}, I_C = 5\text{A}$
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	—	90	mV	$I_C = 0.5\text{A}, I_B = 5\text{mA}$
		—	—	120		$I_C = 1\text{A}, I_B = 10\text{mA}$
		—	80	150		$I_C = 2\text{A}, I_B = 200\text{mA}$
		—	160	290		$I_C = 4\text{A}, I_B = 200\text{mA}$
		—	185	355		$I_C = 5\text{A}, I_B = 500\text{mA}$
Equivalent On-Resistance	$R_{CE(SAT)}$	—	37	71	m $\Omega$	$I_C = 5\text{A}, I_B = 500\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	—	—	1.1	V	$I_C = 4\text{A}, I_B = 200\text{mA}$
		—	—	1.2		$I_C = 5\text{A}, I_B = 500\text{mA}$
Base-Emitter Turn-on Voltage	$V_{BE(ON)}$	—	—	1.1	V	$V_{CE} = 2\text{V}, I_C = 2\text{A}$
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Transition Frequency	$f_T$	70	—	—	MHz	$V_{CE} = 10\text{V}, I_C = 0.1\text{A}, f = 100\text{MHz}$
Collector Capacitance	$C_C$	—	—	75	pF	$V_{CB} = 10\text{V}, I_E = 0\text{A}, f = 1\text{MHz}$
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Time	$t_{on}$	—	135	—	ns	$V_{CC} = 10\text{V}, I_C = 2\text{A}, I_{B1} = 40\text{mA}$
Delay Time	$t_d$	—	60	—	ns	
Rise Time	$t_r$	—	75	—	ns	
Turn-Off Time	$t_{off}$	—	670	—	ns	$V_{CC} = 10\text{V}, I_C = 2\text{A}, I_{B1} = I_{B2} = 40\text{mA}$
Storage Time	$t_s$	—	570	—	ns	
Fall Time	$t_f$	—	100	—	ns	

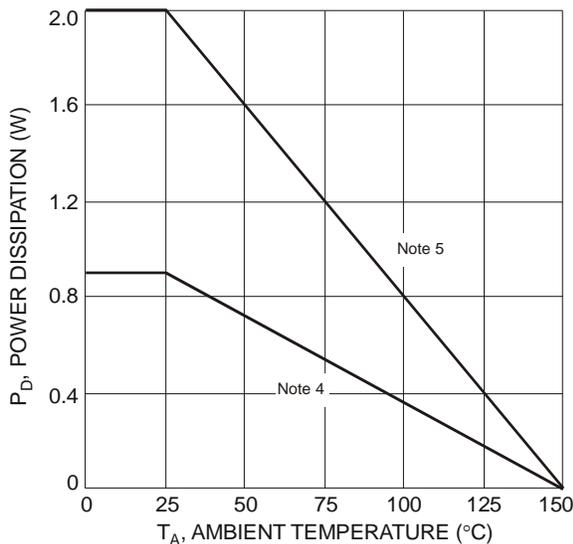
 Notes: 6. Measured under pulsed conditions. Pulse width = 300 $\mu\text{s}$ . Duty cycle  $\leq 2\%$ .


Fig. 1 Power Dissipation vs. Ambient Temperature

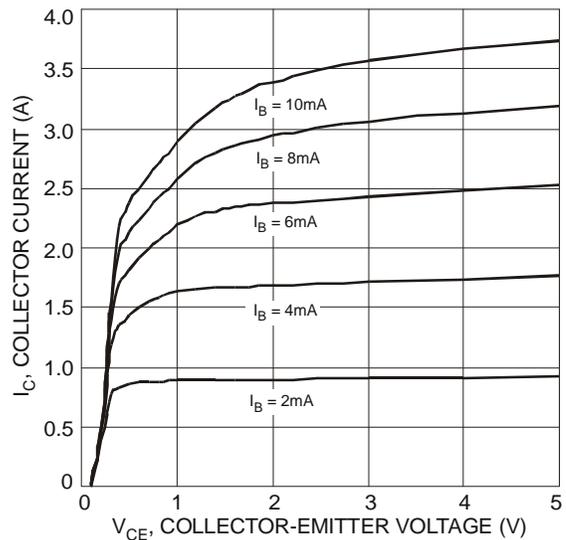


Fig. 2 Typical Collector Current vs. Collector-Emitter Voltage

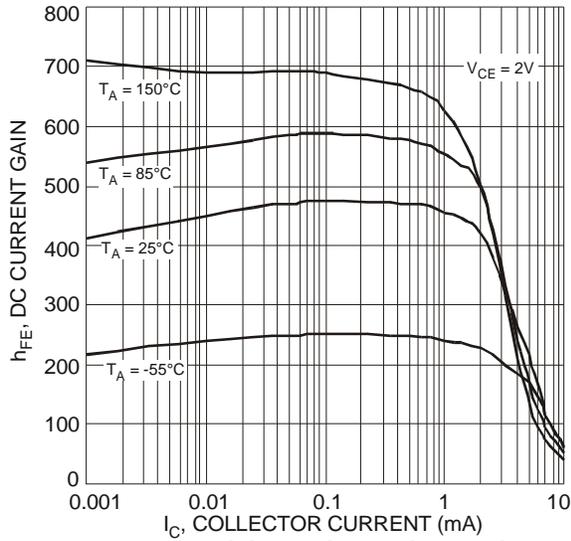


Fig. 3 Typical DC Current Gain vs. Collector Current

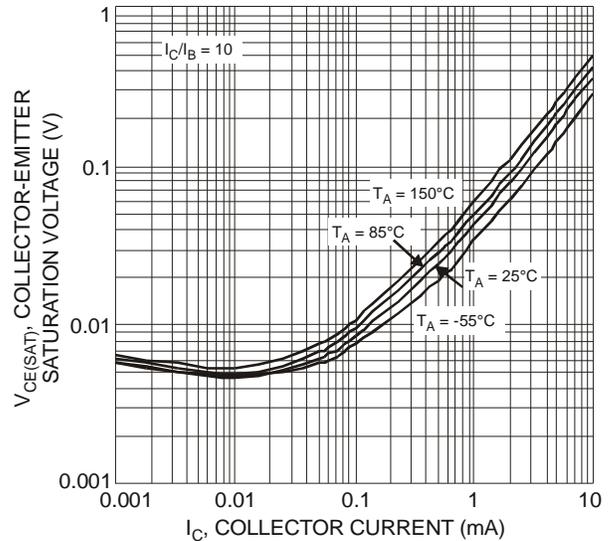


Fig. 4 Typical Collector-Emitter Saturation Voltage vs. Collector Current

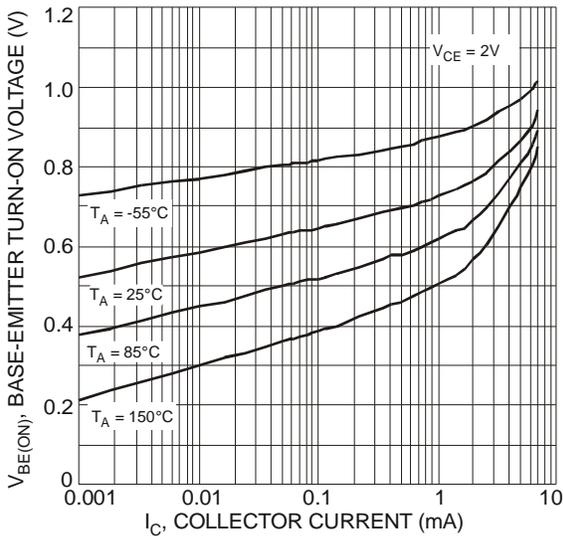


Fig. 5 Typical Base-Emitter Turn-On Voltage vs. Collector Current

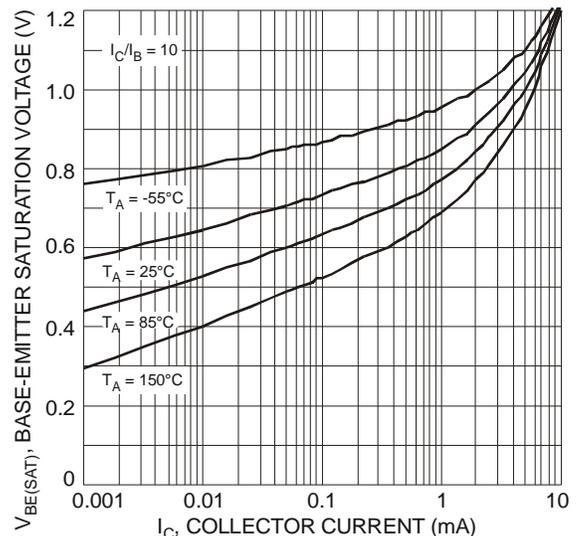


Fig. 6 Typical Base-Emitter Saturation Voltage vs. Collector Current

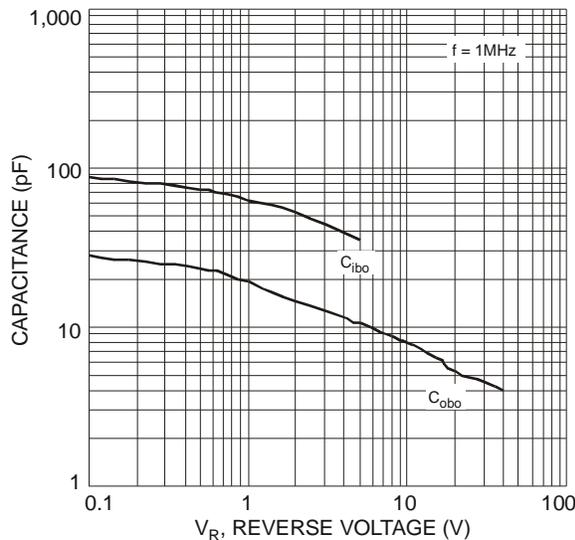


Fig. 7 Typical Capacitance Characteristics

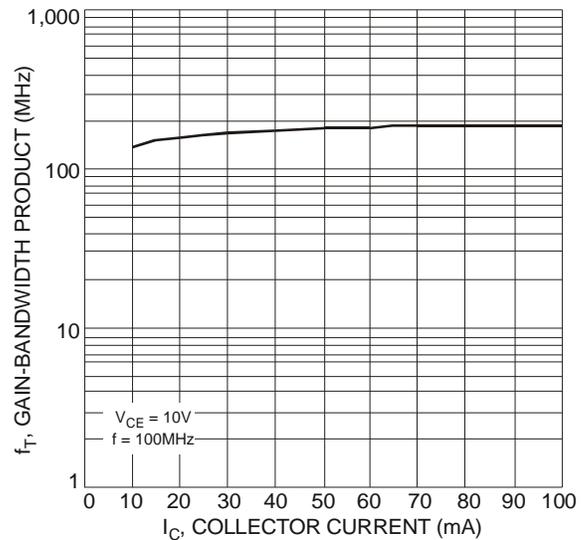
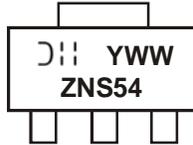


Fig. 8 Typical Gain-Bandwidth Product vs. Collector Current

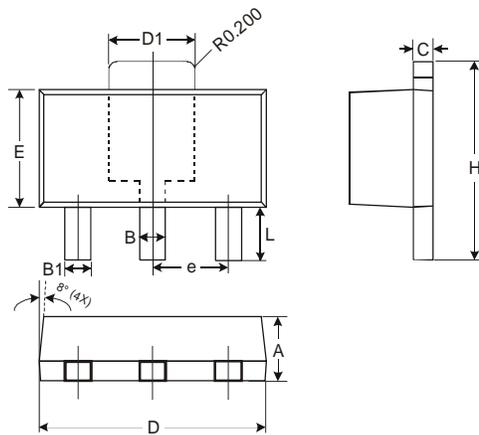
**Ordering Information** (Note 7)

Part Number	Case	Packaging
DSS4540X-13	SOT89-3L	2500/Tape & Reel

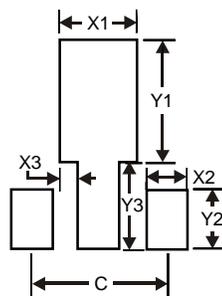
Notes: 7. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

**Marking Information**


ZNS54 = Product Type Marking Code  
 ⏏ = Manufacturer's Code Marking  
 YWW = Date Code Marking  
 Y = Last digit of year (ex: 8 = 2008)  
 WW = Week code 01 - 52

**Package Outline Dimensions**


SOT89-3L			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
B	0.45	0.55	0.50
B1	0.37	0.47	0.42
C	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.50	1.70	1.60
E	2.40	2.60	2.50
e	—	—	1.50
H	3.95	4.25	4.10
L	0.90	1.20	1.05
All Dimensions in mm			

**Suggested Pad Layout**


Dimensions	Value (in mm)
X1	1.7
X2	0.9
X3	0.4
Y1	2.7
Y2	1.3
Y3	1.9
C	3.0

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