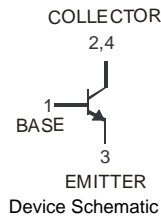


Features

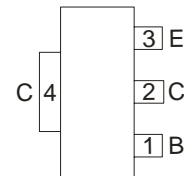
- Complementary PNP Type Available (DSS5540X)
- Ultra Low Collector-Emitter Saturation Voltage
- Ideally Suited for Automated Assembly Processes
- Ideal for Medium Power Switching or Amplification Applications
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**



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.
 3. Operated under pulsed conditions: pulse width $\leq 10\text{ms}$; duty cycle ≤ 0.2 .
 4. Device mounted on FR-4 PCB with minimum recommended pad layout.
 5. Device mounted on FR-4 PCB with 1 inch² copper pad layout.

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Conditions |
|--|---------------|-----|-----|-----|------------|---|
| OFF CHARACTERISTICS | | | | | | |
| 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 | $V_{CB} = 30\text{V}, I_E = 0$ |
| 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 | $V_{EB} = 5\text{V}, I_C = 0$ |
| ON CHARACTERISTICS (Note 6) | | | | | | |
| 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 Ω | $I_C = 5\text{A}, I_B = 500\text{mA}$ |
| 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 | $V_{CE} = 2\text{V}, I_C = 2\text{A}$ |
| SMALL SIGNAL CHARACTERISTICS | | | | | | |
| 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 | $V_{CB} = 10\text{V}, I_E = 0\text{A}, f = 1\text{MHz}$ |
| SWITCHING CHARACTERISTICS | | | | | | |
| 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 μs . Duty cycle $\leq 2\%$.

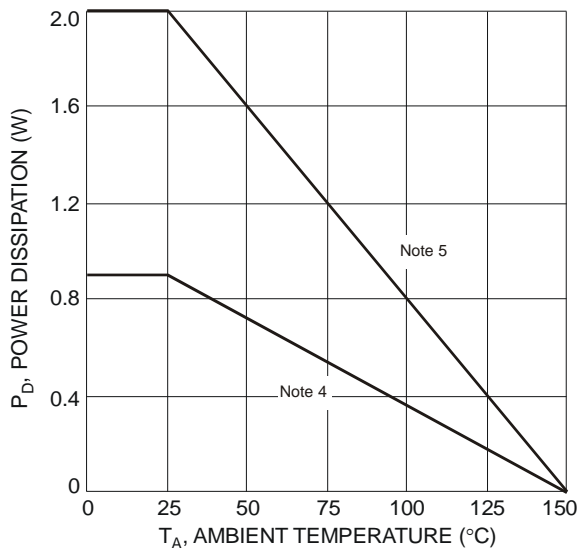


Fig. 1 Power Dissipation vs. Ambient Temperature

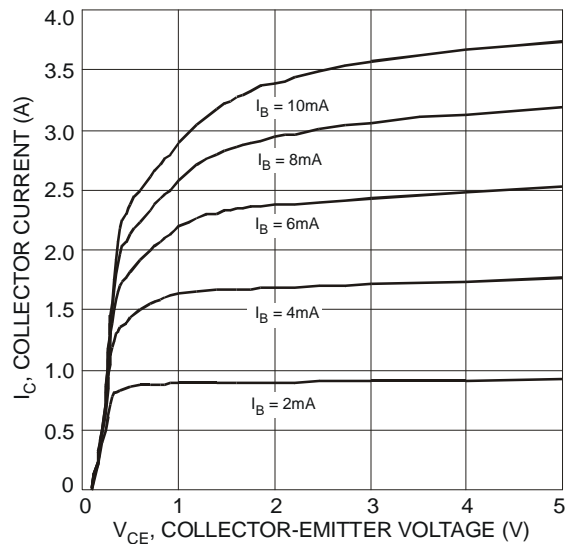


Fig. 2 Typical Collector Current vs. Collector-Emitter Voltage

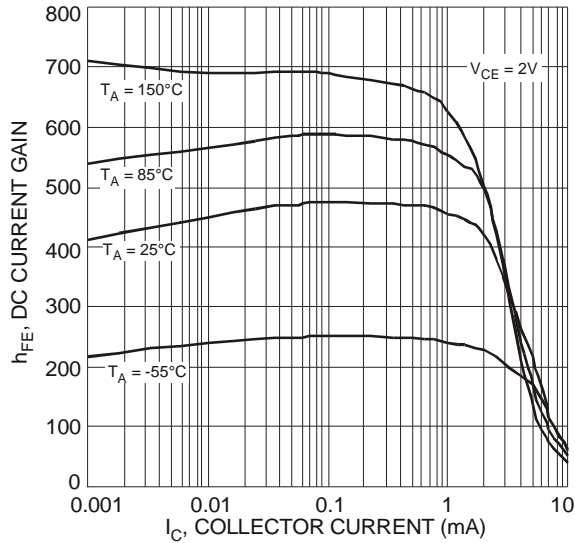


Fig. 3 Typical DC Current Gain vs. Collector Current

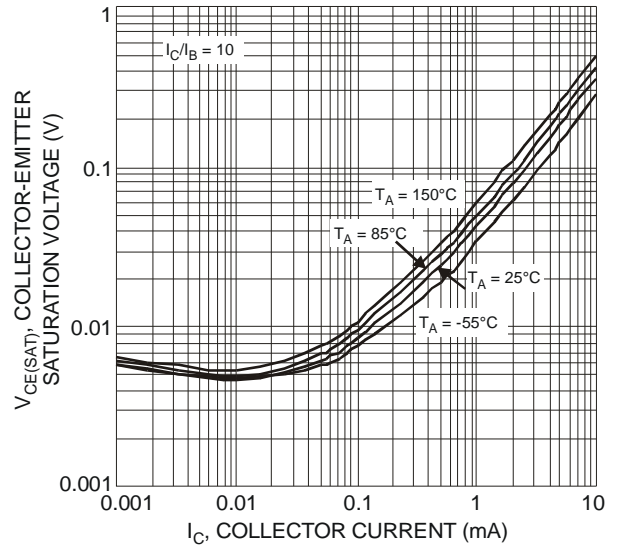


Fig. 4 Typical Collector-Emitter Saturation Voltage vs. Collector Current

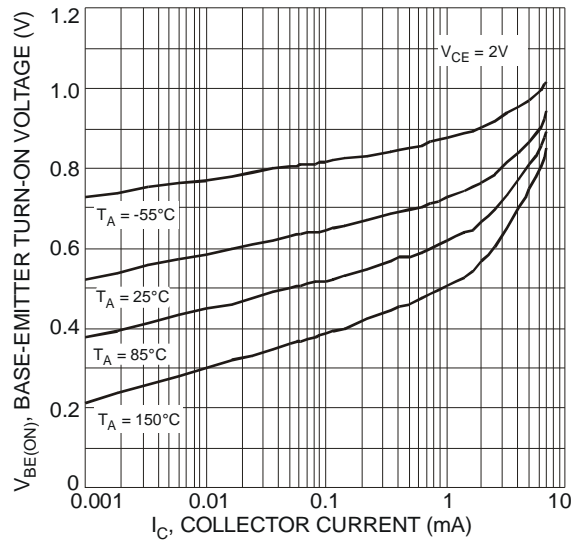


Fig. 5 Typical Base-Emitter Turn-On Voltage vs. Collector Current

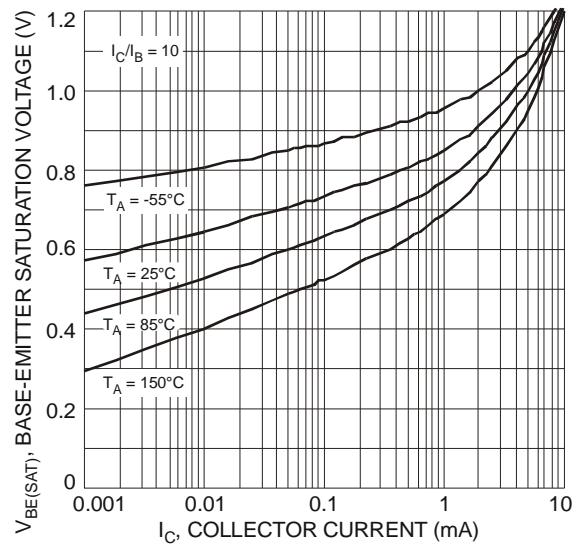


Fig. 6 Typical Base-Emitter Saturation Voltage vs. Collector Current

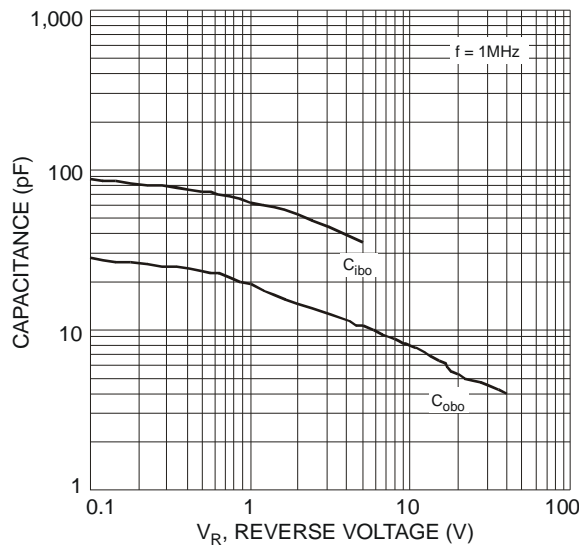


Fig. 7 Typical Capacitance Characteristics

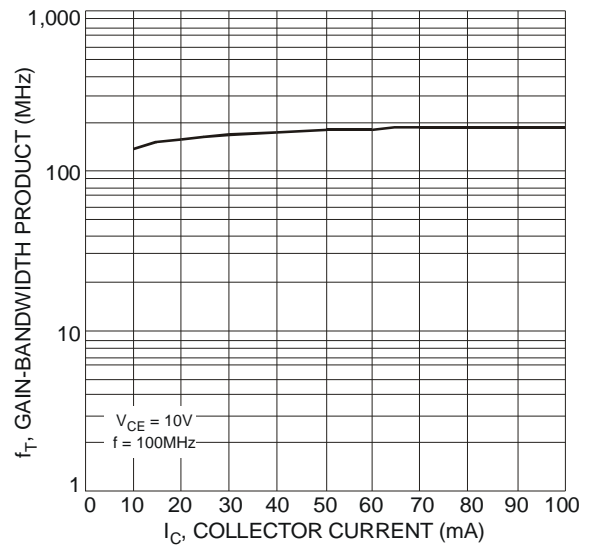
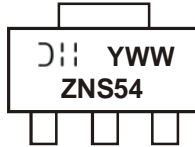


Fig. 8 Typical Gain-Bandwidth Product vs. Collector Current

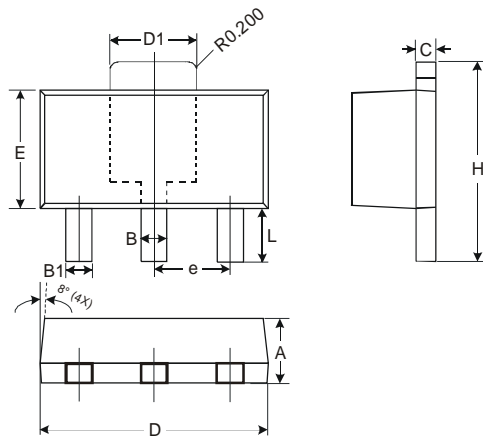
Ordering Information (Note 7)

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

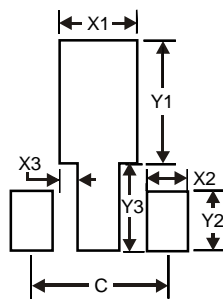
Notes: 7. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

Marking Information


ZNS54 = Product Type Marking Code
 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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