# 40V PNP LOW $V_{CE(sat)}$ TRANSISTOR

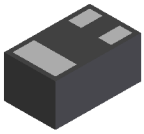
## Features

- $BV_{CEO}$ > -40V
- $I_C$ = -500mA High Collector Current
- $I_{CM}$ = -1A Peak Pulse Current
- $P_D$ = 1000mW Power Dissipation
- Low Collector-Emitter Saturation Voltage, $V_{CE(sat)}$
- 0.60mm$^2$ Package Footprint, 13 times Smaller than SOT23
- 0.5mm Height Package Minimizing Off-Board Profile
- Complementary NPN Type DSS2540M
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

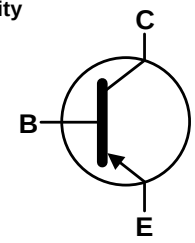
## Mechanical Data

- Case: X1-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — NiPdAu e4 Solderable per MIL-STD-202, Method 208
- Weight: 0.0009 grams (Approximate)

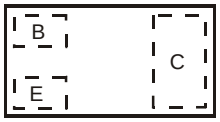
X1-DFN1006-3



Bottom View




Device Symbol




Top View
Device Schematic

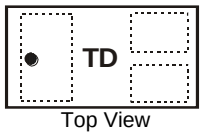
## Ordering Information (Note 4)

| Product | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|
| DSS3540M-7 | TD | 7 | 8 | 3,000 |
| DSS3540M-7B | TD | 7 | 8 | 10,000 |

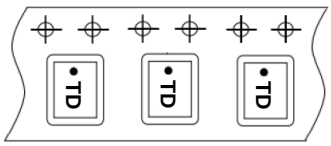
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at http://www.diodes.com.

## Marking Information

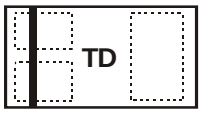
**DSS3540M-7**



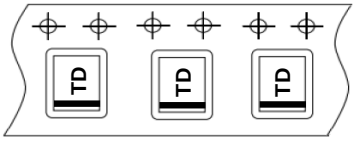

Top View
Dot Denotes Collector Side



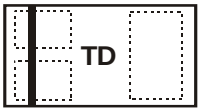

From date code 1527 (YYWW), this changes to:



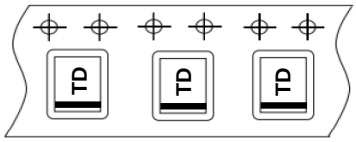

Top View
Bar Denotes Base and Emitter Side




**DSS3540M-7B**




Top View
Bar Denotes Base and Emitter Side




TD = Product Type Marking Code

## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -40 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -40 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -6 | V |
| Collector Current - Continuous | $I_C$ | -500 | mA |
| Peak Pulse Collector Current | $I_{CM}$ | -1 | A |
| Peak Base Current | $I_{BM}$ | -100 | mA |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 5) | $P_D$ | 400 | mW |
| | (Note 6) | | 1,000 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 310 | °C/W |
| | (Note 6) | | 120 | |
| Thermal Resistance, Junction to Lead | (Note 7) | $R_{\theta JL}$ | 120 | °C/W |
| Operating and Storage and Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 8)

| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | B |

Notes:
5. For the device mounted on minimum recommended pad layout 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady state condition. The entire exposed collector pad is attached to the heatsink.
6. Same as Note 5, except the exposed collector pad is mounted on 25mm x 25mm 2oz copper.
7. Thermal resistance from junction to solder-point (on the exposed collector pad).
8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics

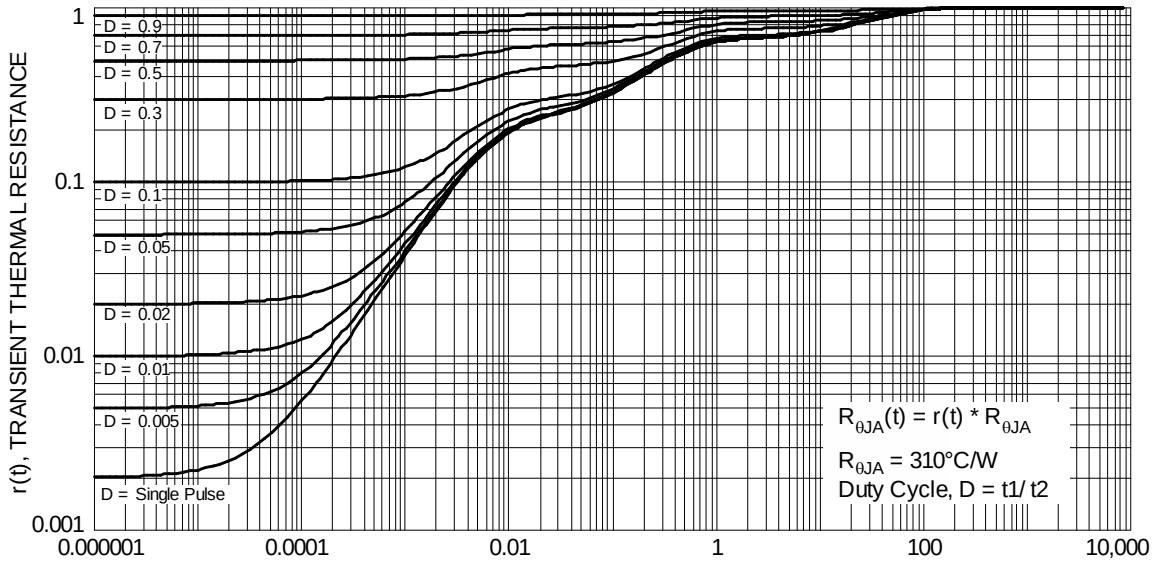



Fig. 1 Transient Thermal Resistance

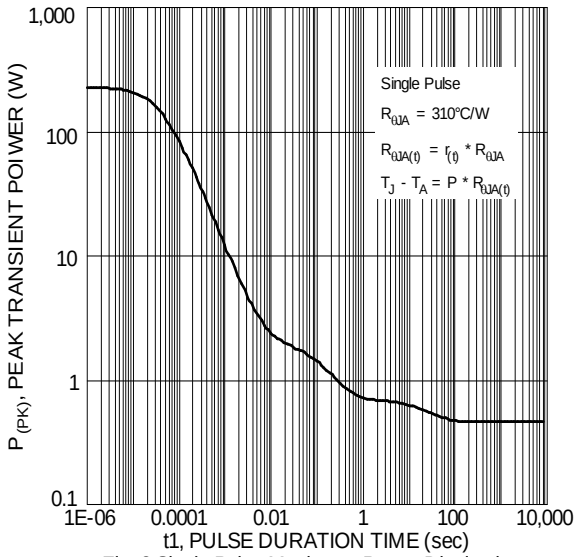



Fig. 2 Single Pulse Maximum Power Dissipation

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -40 | — | — | V | $I_C$ = -100µA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage (Note 9) | $BV_{CEO}$ | -40 | — | — | V | $I_C$ = -10mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -6 | — | — | V | $I_E$ = -100µA, $I_C$ = 0 |
| Collector-Base Cutoff Current | $I_{CBO}$ | — | — | -100<br>-50 | nA<br>µA | $V_{CB}$ = -30V, $I_E$ = 0<br>$V_{CB}$ = -30V, $I_E$ = 0, $T_A$ = +150°C |
| Emitter-Base Cutoff Current | $I_{EBO}$ | — | — | -100 | nA | $V_{EB}$ = -5V, $I_C$ = 0 |
| Collector-Emitter Cutoff Current | $I_{CEX}$ | — | — | -100<br>-100 | nA | $V_{CE}$ = -30V, $V_X$ = ±0.25V<br>$V_{CE}$ = -30V, $V_X$ = 3V |
| Collector-Emitter Cutoff Current | $I_{CES}$ | — | — | -100 | nA | $V_{CE}$ = -30V |
| **ON CHARACTERISTICS (Note 9)** | | | | | | |
| DC Current Gain | $h_{FE}$ | 200<br>150<br>40 | —<br>—<br>— | —<br>—<br>— | — | $V_{CE}$ = -2V, $I_C$ = -10mA<br>$V_{CE}$ = -2V, $I_C$ = -100mA<br>$V_{CE}$ = -2V, $I_C$ = -500mA |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | —<br>—<br>—<br>— | —<br>—<br>—<br>— | -50<br>-130<br>-200<br>-350 | mV | $I_C$ = -10mA, $I_B$ = -0.5mA<br>$I_C$ = -100mA, $I_B$ = -5mA<br>$I_C$ = -200mA, $I_B$ = -10mA<br>$I_C$ = -500mA, $I_B$ = -50mA |
| Collector-Emitter Saturation Resistance | $R_{CE(sat)}$ | — | — | 700 | mΩ | $I_C$ = -500mA, $I_B$ = -50mA |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | — | — | -1.2 | V | $I_C$ = -500mA, $I_B$ = -50mA |
| Base-Emitter Turn On Voltage | $V_{BE(on)}$ | — | — | -1.1 | V | $V_{CE}$ = -2V, $I_C$ = -100mA |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Output Capacitance | $C_{obo}$ | — | — | 10 | pF | $V_{CB}$ = -10V, f = 1.0MHz |
| Current Gain-Bandwidth Product | $f_T$ | 100 | — | — | MHz | $V_{CE}$ = -5V, $I_C$ = -100mA, f = 100MHz |

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

## Typical Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

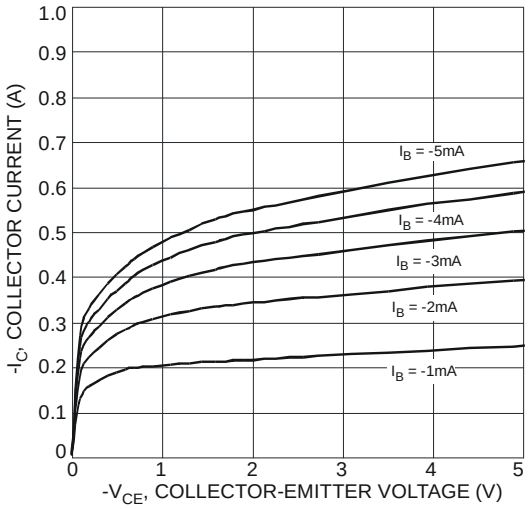



Fig. 4 Typical Collector Current vs. Collector-Emitter Voltage

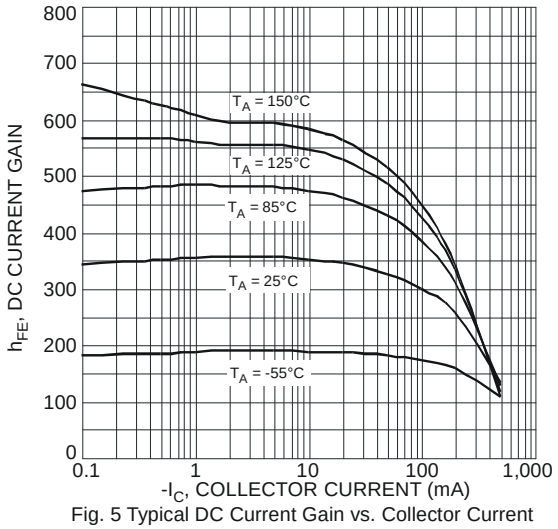



Fig. 5 Typical DC Current Gain vs. Collector Current

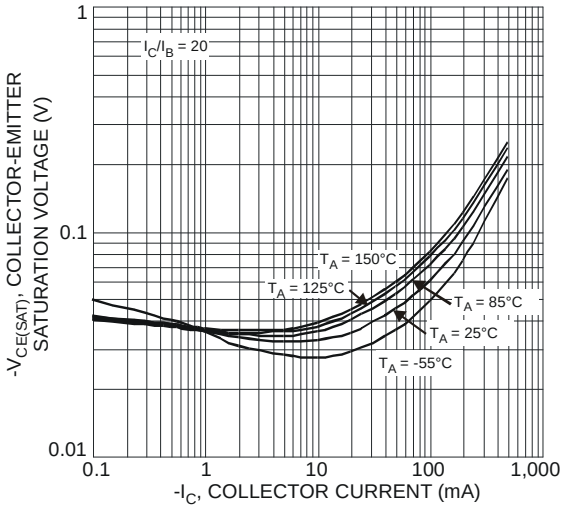



Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

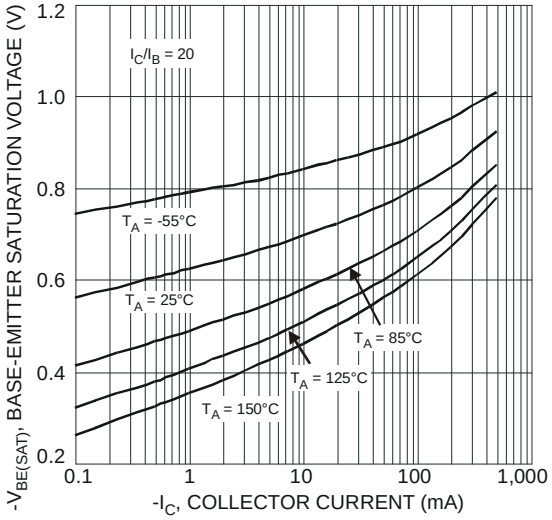



Fig. 7 Typical Base-Emitter Saturation Voltage vs. Collector Current

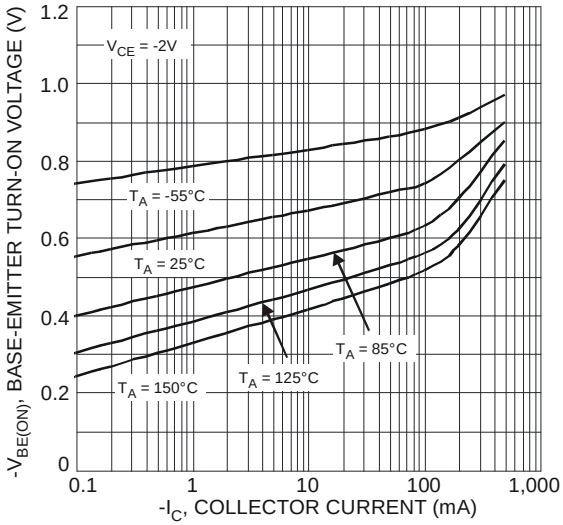



Fig. 8 Typical Base-Emitter Turn-On Voltage vs. Collector Current

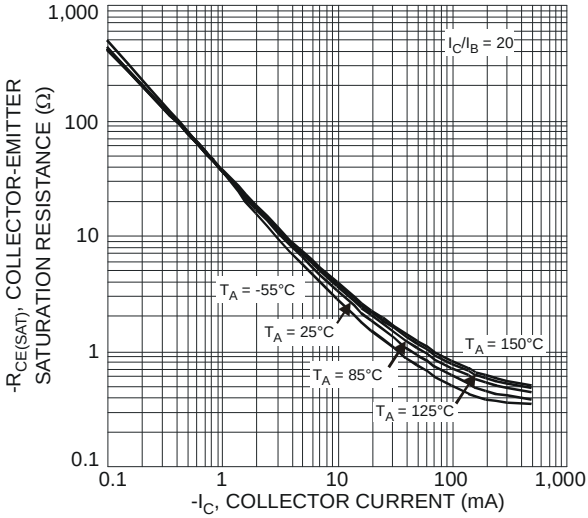
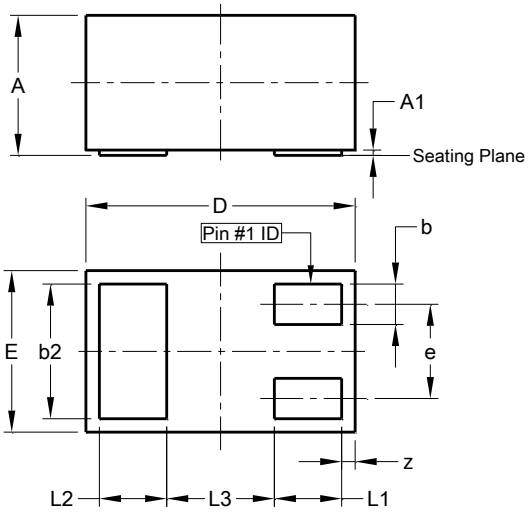



Fig. 9 Typical Collector-Emitter Saturation Resistance vs. Collector Current

## Package Outline Dimensions

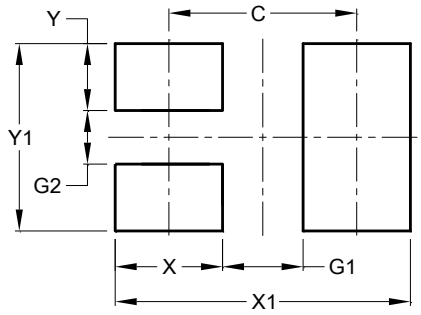
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.




| X1-DFN1006-3 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.47 | 0.53 | 0.50 |
| **A1** | 0.00 | 0.05 | 0.03 |
| **b** | 0.10 | 0.20 | 0.15 |
| **b2** | 0.45 | 0.55 | 0.50 |
| **D** | 0.95 | 1.075 | 1.00 |
| **E** | 0.55 | 0.675 | 0.60 |
| **e** | - | - | 0.35 |
| **L1** | 0.20 | 0.30 | 0.25 |
| **L2** | 0.20 | 0.30 | 0.25 |
| **L3** | - | - | 0.40 |
| **z** | 0.02 | 0.08 | 0.05 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.70 |
| **G1** | 0.30 |
| **G2** | 0.20 |
| **X** | 0.40 |
| **X1** | 1.10 |
| **Y** | 0.25 |
| **Y1** | 0.70 |

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