



**THE DATASHEET OF  
DMN53D0L-13**



## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$           | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|------------------------|------------------------------|
| 50V           | 1.6Ω @ $V_{GS} = 10V$  | 500 mA                       |
|               | 2.5Ω @ $V_{GS} = 4.5V$ | 200 mA                       |

## Features and Benefits

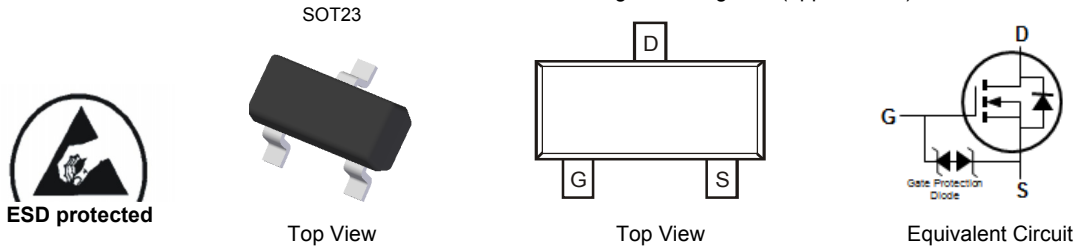
- N-Channel MOSFET
- Low On-Resistance
- Very Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- ESD Protected to 2KV
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Description and Applications

This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## 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: Matte Tin Finish annealed over Alloy 42 leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 <sup>(e3)</sup>
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)

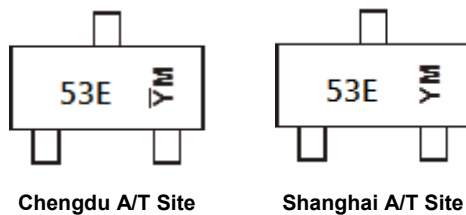


## Ordering Information (Note 4)

| Part Number | Case  | Packaging         |
|-------------|-------|-------------------|
| DMN53D0L-7  | SOT23 | 3000/Tape & Reel  |
| DMN53D0L-13 | SOT23 | 10000/Tape & Reel |

- 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](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/products/packages.html>.

## Marking Information



53E = Product Type Marking Code  
 YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)  
 YM = Date Code Marking for CAT (Chengdu Assembly/ Test site)  
 Y or  $\bar{Y}$  = Year (ex: B = 2014)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|------|------|------|------|------|------|------|------|
| Code | B    | C    | D    | E    | F    | G    | H    |

| 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   |

**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic         | Symbol    | Value    | Unit |
|------------------------|-----------|----------|------|
| Drain Source Voltage   | $V_{DSS}$ | 50       | V    |
| Gate-Source Voltage    | $V_{GSS}$ | $\pm 20$ | V    |
| Drain Current (Note 6) | $I_D$     | 500      | mA   |

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                                   | Symbol          | Value       | Unit               |
|--|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 5)                 | $P_D$           | 370         | mW                 |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 344         | $^\circ\text{C/W}$ |
| Total Power Dissipation (Note 6)                 | $P_D$           | 540         | mW                 |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 236         | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$   |

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

| Characteristic                          | Symbol       | Min | Typ | Max | Unit          | Test Condition  |
|---|--------------|-----|-----|-----|---------------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>     |              |     |     |     |               |   |
| Drain-Source Breakdown Voltage          | $BV_{DSS}$   | 50  | —   | —   | V             | $V_{GS} = 0V, I_D = 250\mu\text{A}$                                   |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | —   | —   | 1.0 | $\mu\text{A}$ | $V_{DS} = 50V, V_{GS} = 0V$   |
| Gate-Body Leakage                       | $I_{GSS}$    | —   | —   | 10  | $\mu\text{A}$ | $V_{GS} = \pm 20V, V_{DS} = 0V$                                       |
| <b>ON CHARACTERISTICS (Note 7)</b>      |              |     |     |     |               |   |
| Gate Threshold Voltage                  | $V_{GS(th)}$ | 0.8 | —   | 1.5 | V             | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$                               |
| Static Drain-Source On-Resistance       | $R_{DS(on)}$ | —   | —   | 1.6 | $\Omega$      | $V_{GS} = 10V, I_D = 500\text{mA}$                                    |
|   |              | —   | —   | 2.5 |               | $V_{GS} = 4.5V, I_D = 200\text{mA}$                                   |
|   |              | —   | —   | 4.5 |               | $V_{GS} = 2.5V, I_D = 100\text{mA}$                                   |
| Source-Drain Diode Forward Voltage      | $V_{SD}$     | —   | —   | 1.4 | V             | $V_{GS} = 0V, I_S = 500\text{mA}$                                     |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b> |              |     |     |     |               |   |
| Input Capacitance                       | $C_{iss}$    | —   | 46  | —   | pF            | $V_{DS} = 25V, V_{GS} = 0V$<br>$f = 1.0\text{MHz}$                    |
| Output Capacitance                      | $C_{oss}$    | —   | 5.3 | —   | pF            |   |
| Reverse Transfer Capacitance            | $C_{rss}$    | —   | 4.0 | —   | pF            |   |
| Total Gate Charge                       | $Q_g$        | —   | 0.6 | —   | nC            | $V_{GS} = 4.5V, V_{DS} = 10V,$<br>$I_D = 250\text{mA}$                |
| Gate-Source Charge                      | $Q_{gs}$     | —   | 0.2 | —   | nC            |   |
| Gate-Drain Charge                       | $Q_{gd}$     | —   | 0.1 | —   | nC            |   |
| Turn-On Delay Time                      | $t_{D(on)}$  | —   | 2.7 | —   | ns            | $V_{DD} = 30V, V_{GS} = 10V,$<br>$R_G = 25\Omega, I_D = 200\text{mA}$ |
| Turn-On Rise Time                       | $t_r$        | —   | 2.5 | —   | ns            |   |
| Turn-Off Delay Time                     | $t_{D(off)}$ | —   | 19  | —   | ns            |   |
| Turn-Off Fall Time                      | $t_f$        | —   | 11  | —   | ns            |   |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal vias to bottom layer 1inch square copper plate
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

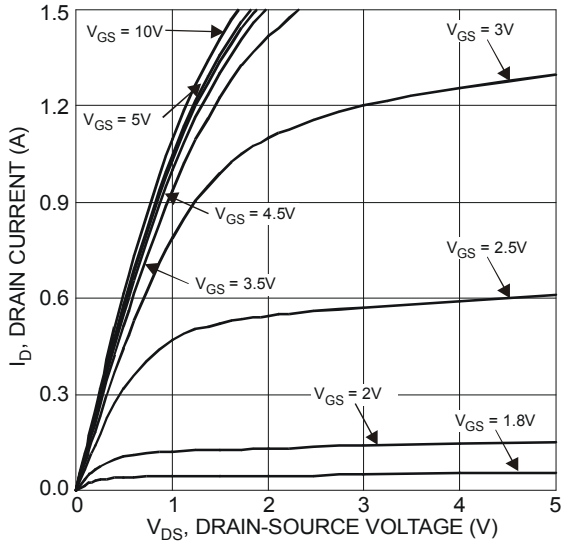


Figure 1 Typical Output Characteristics

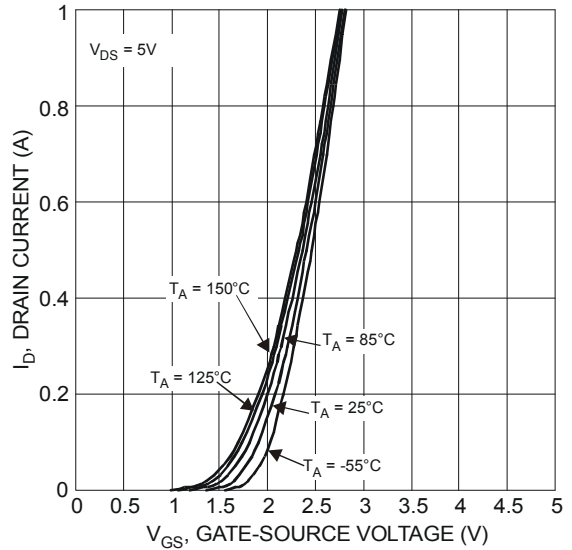


Figure 2 Typical Transfer Characteristics

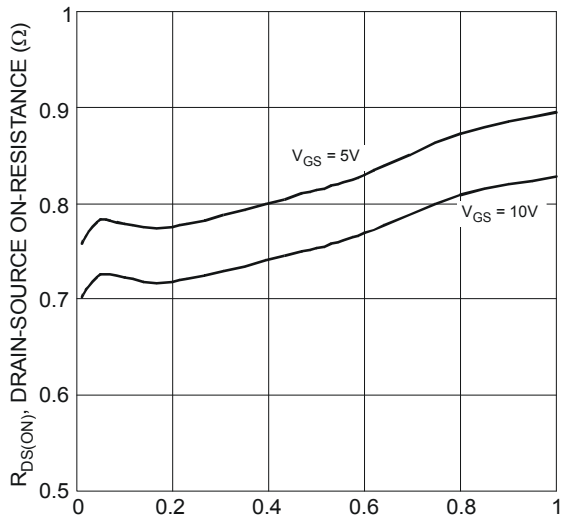


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

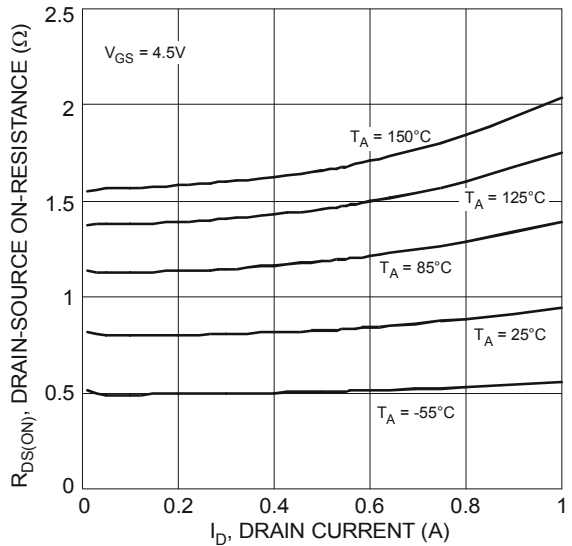


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

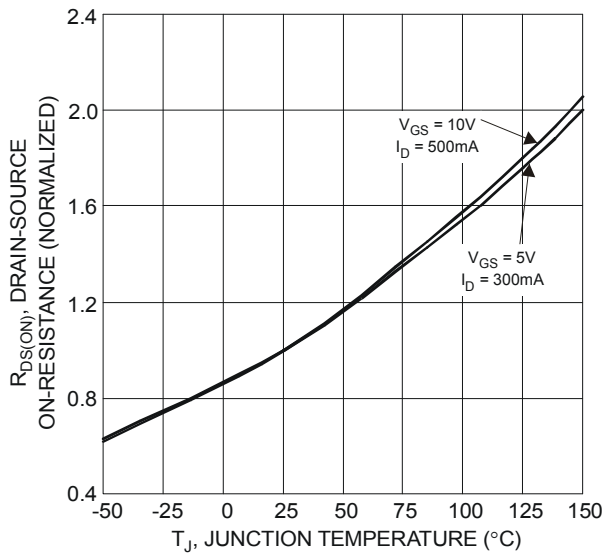


Figure 5 On-Resistance Variation with Temperature

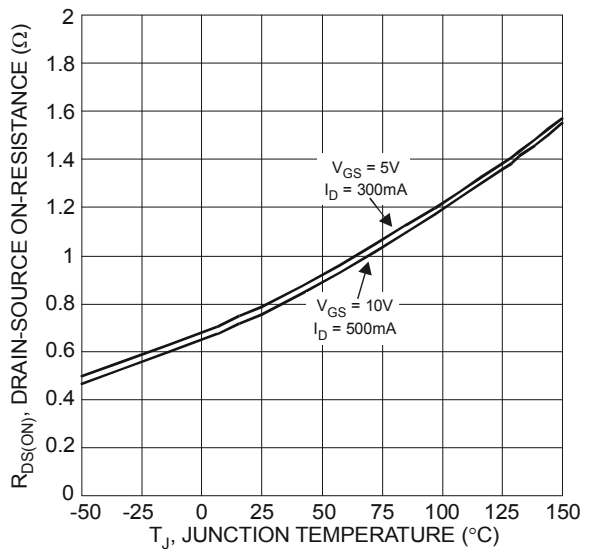


Figure 6 On-Resistance Variation with Temperature

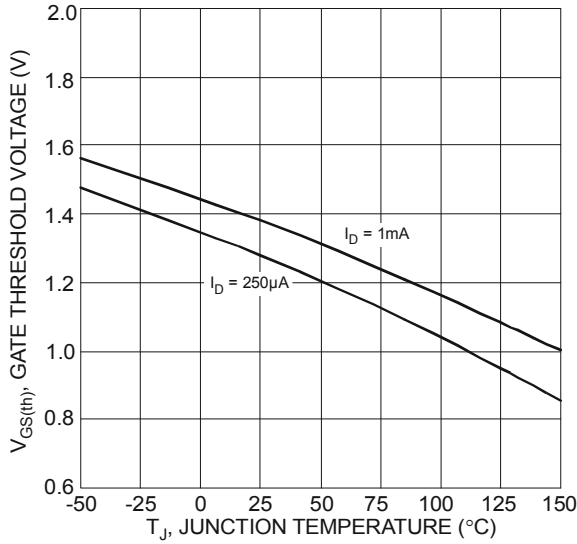


Figure 7 Gate Threshold Variation vs. Ambient Temperature

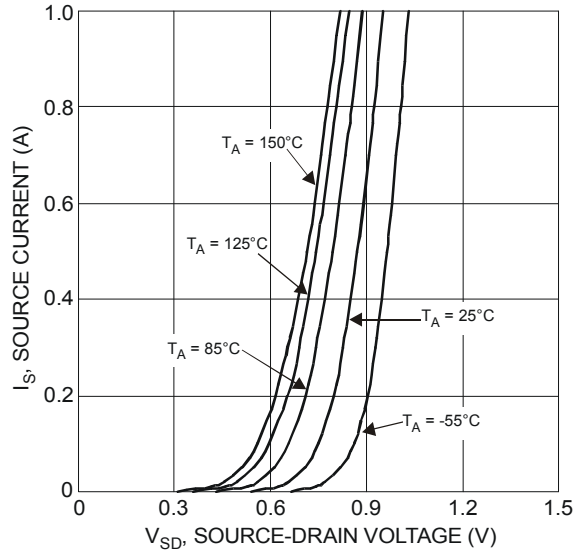


Figure 8 Diode Forward Voltage vs. Current

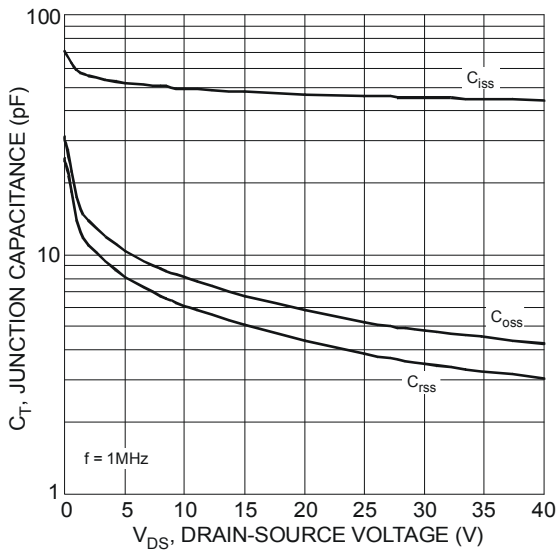


Figure 9 Typical Junction Capacitance

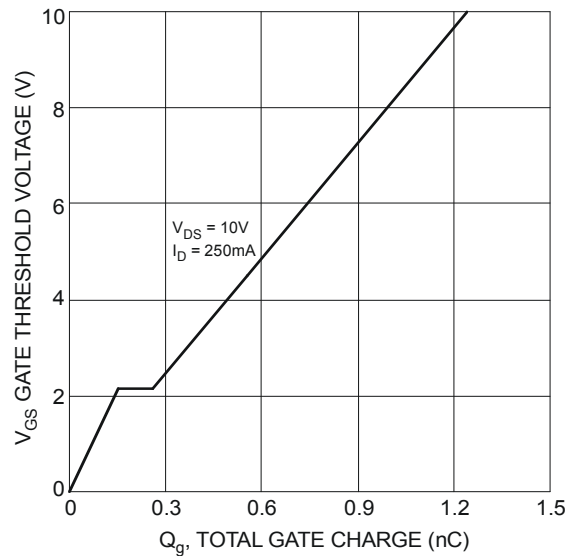
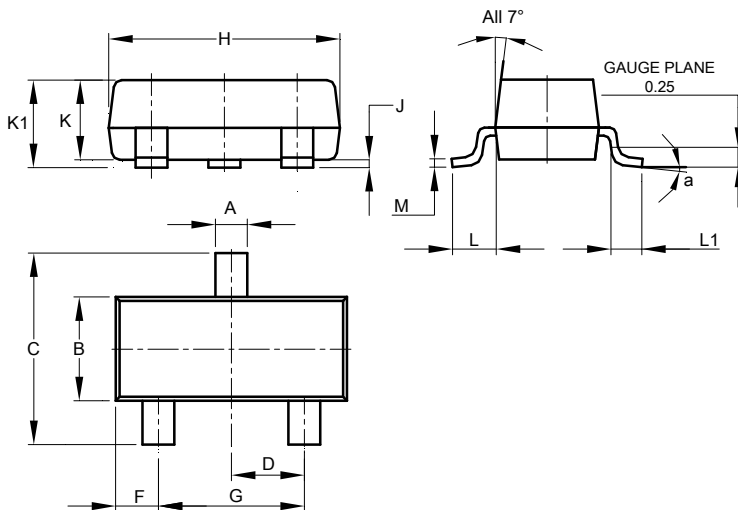


Figure 10 Gate Charge

### Package Outline Dimensions

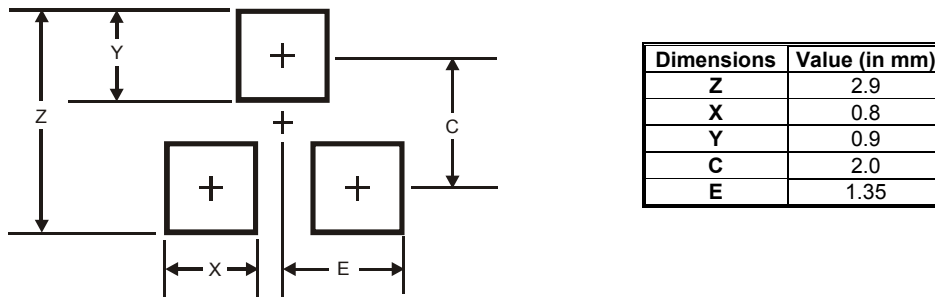
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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                    | 0.890 | 1.00  | 0.975 |
| K1                   | 0.903 | 1.10  | 1.025 |
| L                    | 0.45  | 0.61  | 0.55  |
| L1                   | 0.25  | 0.55  | 0.40  |
| M                    | 0.085 | 0.150 | 0.110 |
| α                    | 8°    |       |       |
| All Dimensions in mm |       |       |       |

## Suggested Pad Layout

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



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