

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on) \text{ max}}$ | I_D $T_C = +25^\circ\text{C}$ |
|---------------|---------------------------------------|------------------------------------|
| 60V | 40m Ω @ $V_{GS} = 10\text{V}$ | 20A |
| | 50m Ω @ $V_{GS} = 4.5\text{V}$ | 16A |

Description

This new generation 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.

Applications

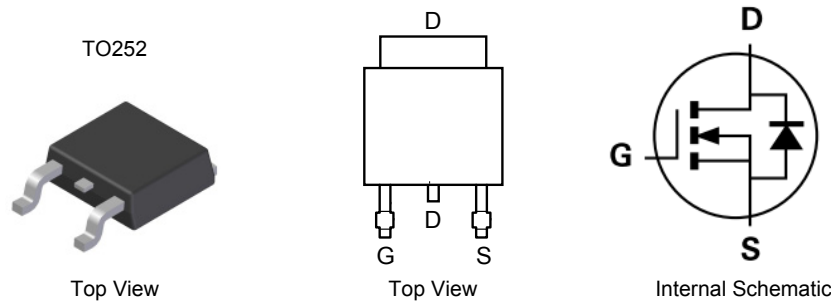
- DC-DC Converters
- Power Management Functions
- Backlighting

Features

- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **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: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.33 grams (approximate)

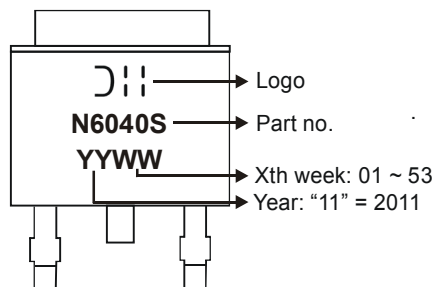


Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|-------|-------------------|
| DMN6040SK3-13 | TO252 | 2,500/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 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



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

| Characteristic | | | Symbol | Value | Units |
|--|--------------|-------------------------|------------------|-------|-------|
| Drain-Source Voltage | | | V _{DSS} | 60 | V |
| Gate-Source Voltage | | | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 5) V _{GS} = -10V | Steady State | T _C = +25°C | I _D | 20 | A |
| | | T _C = +100°C | | 13 | |
| Maximum Body Diode Forward Current (Note 5) | | | I _S | 4 | A |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | I _{DM} | 30 | A |
| Avalanche Current (Note 6) | | | I _{AR} | 14.2 | A |
| Avalanche Energy (Note 6) | | | E _{AR} | 10 | mJ |

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

| Characteristic | | Symbol | Value | Units |
|--|-------------------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5) | T _C = +25°C | P _D | 42 | W |
| | T _C = +100°C | | 17 | |
| Thermal Resistance, Junction to Ambient (Note 5) | | R _{θJA} | 44 | °C/W |
| Thermal Resistance, Junction to Case (Note 5) | | R _{θJC} | 3 | |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +150 | °C |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|------|------|------|---|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 60 | — | — | V | V _{GS} = 0V, I _D = 250µA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | 1 | µA | V _{DS} = 60V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 1 | — | 3 | V | V _{DS} = V _{GS} , I _D = 250µA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | 30 | 40 | mΩ | V _{GS} = 10V, I _D = 20A |
| | | — | 35 | 50 | | V _{GS} = 4.5V, I _D = 12A |
| Diode Forward Voltage | V _{SD} | — | 0.7 | 1.2 | V | V _{GS} = 0V, I _S = 1A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iss} | — | 1287 | — | pF | V _{DS} = 25V, V _{GS} = 0V f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 57 | — | | |
| Reverse Transfer Capacitance | C _{rss} | — | 44 | — | | |
| Gate Resistance | R _G | — | 1.2 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 22.4 | — | nC | V _{DS} = 30V, I _D = 4.3A |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 10.4 | — | | |
| Gate-Source Charge | Q _{gs} | — | 4.9 | — | | |
| Gate-Drain Charge | Q _{gd} | — | 3.0 | — | | |
| Turn-On Delay Time | t _{D(on)} | — | 6.6 | — | nS | V _{GS} = 10V, V _{DD} = 30V, R _G = 6Ω, I _D = 4.3A |
| Turn-On Rise Time | t _r | — | 8.1 | — | | |
| Turn-Off Delay Time | t _{D(off)} | — | 20.1 | — | | |
| Turn-Off Fall Time | t _f | — | 4.0 | — | | |
| Body Diode Reverse Recovery Time | t _{rr} | — | 18 | — | nS | I _S = 4.3A, dI/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Q _{rr} | — | 11.9 | — | nC | I _S = 4.3A, dI/dt = 100A/µs |

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.
 6. UIS in production with L = 0.1mH, T_J = +25°C.
 7. Short duration pulse test used to minimize self-heating effect.
 8. Guaranteed by design. Not subject to product testing.

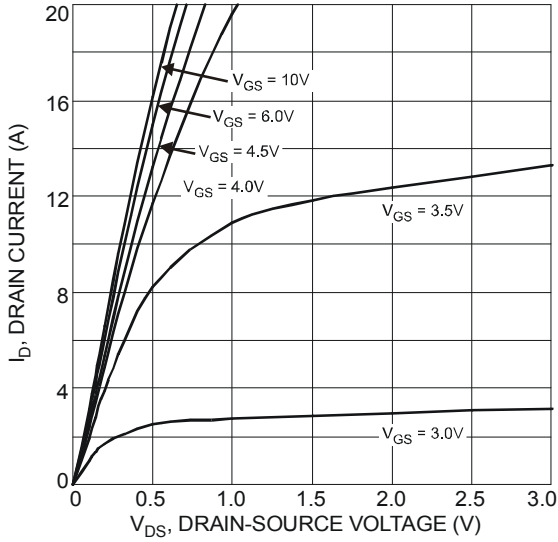


Fig. 1 Typical Output Characteristic

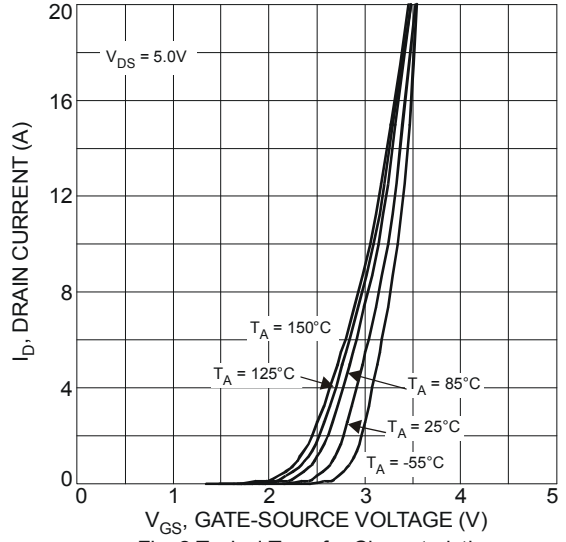


Fig. 2 Typical Transfer Characteristics

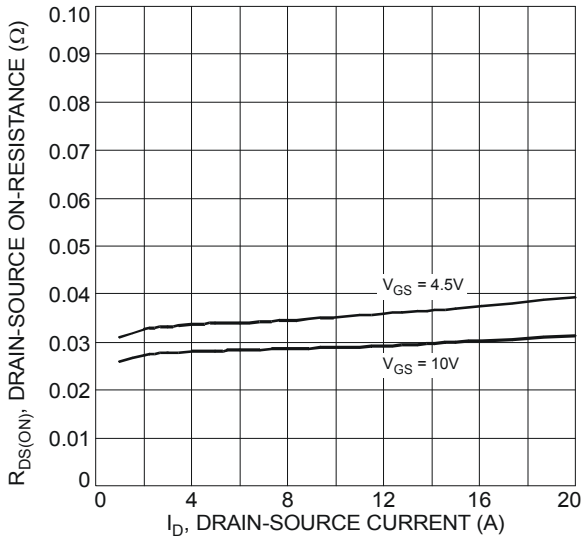


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

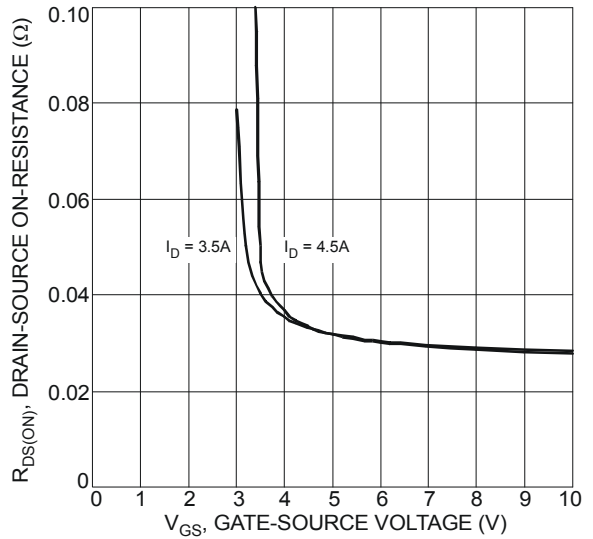


Fig. 4 Typical On-Resistance vs. Drain Current and Gate Voltage

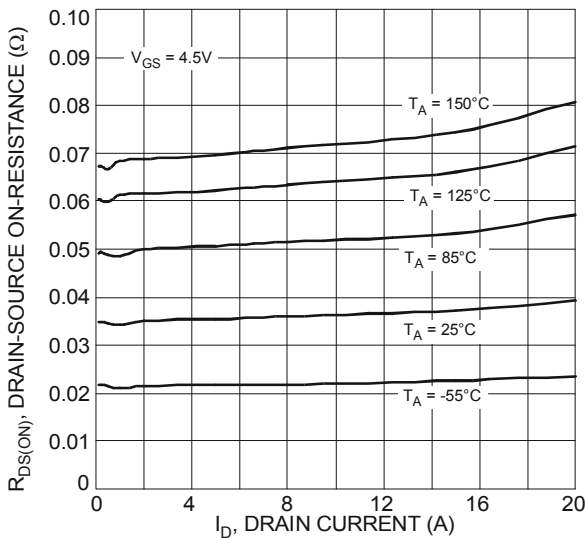


Fig. 5 Typical On-Resistance vs. Drain Current and Temperature

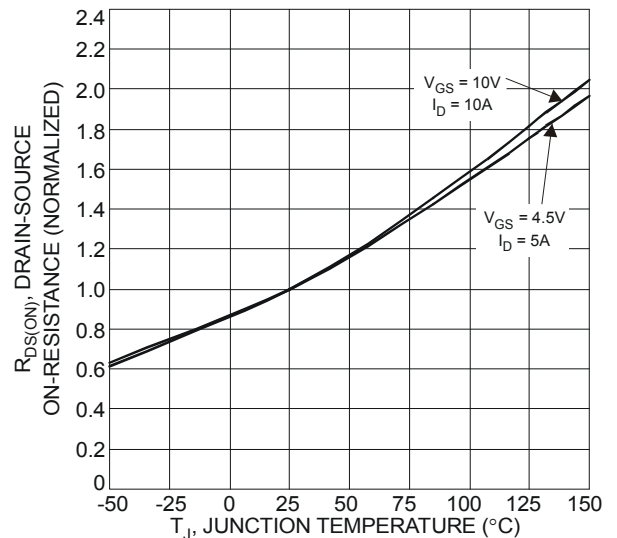


Fig. 6 On-Resistance Variation with Temperature

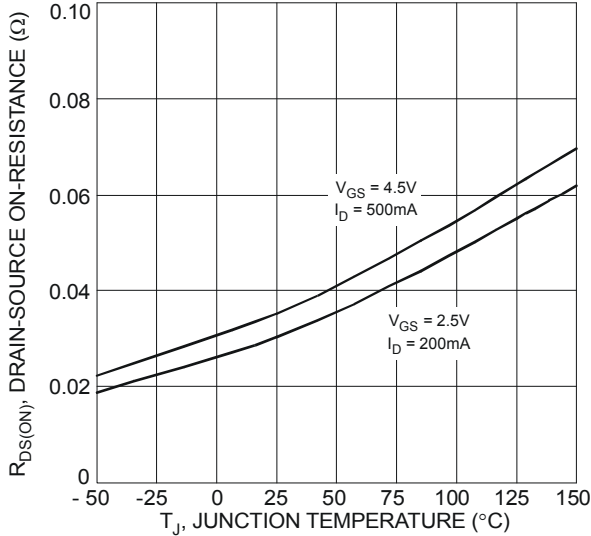


Fig. 7 On-Resistance Variation with Temperature

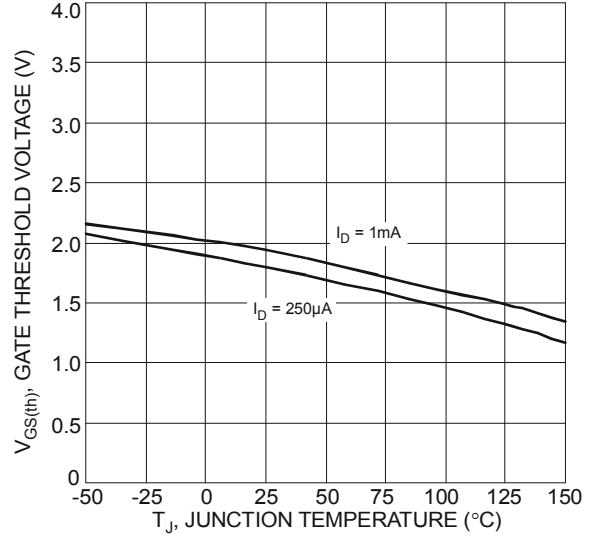


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

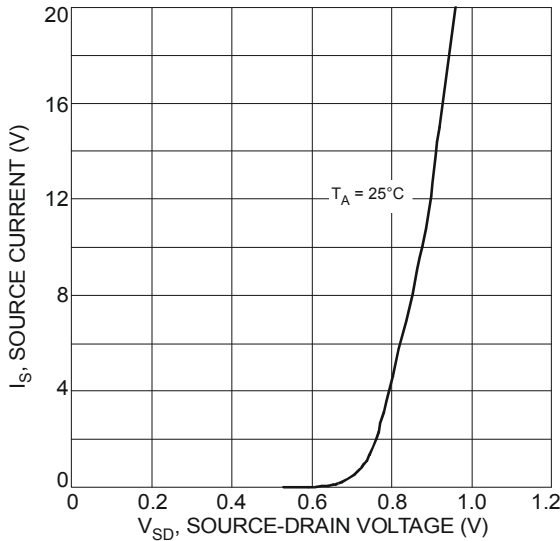


Fig. 9 Diode Forward Voltage vs. Current

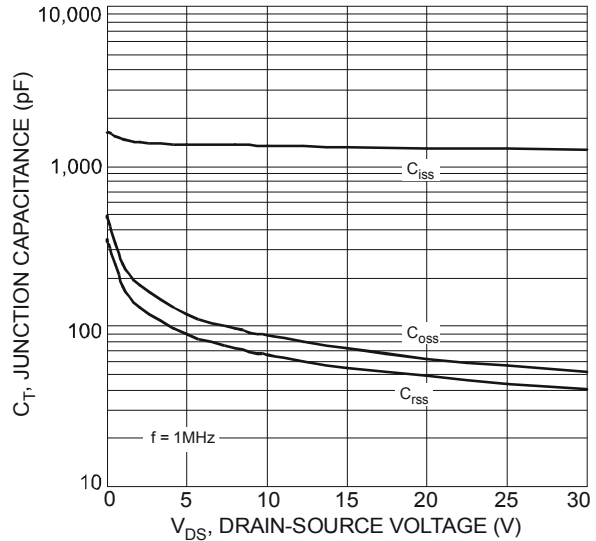


Fig. 10 Typical Junction Capacitance

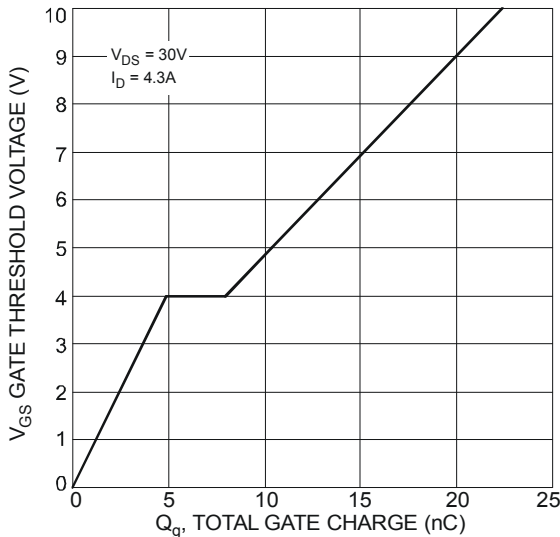


Fig. 11 Gate Charge

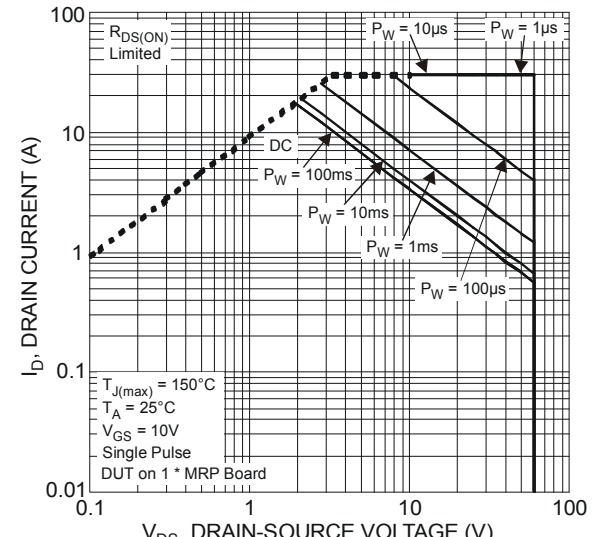
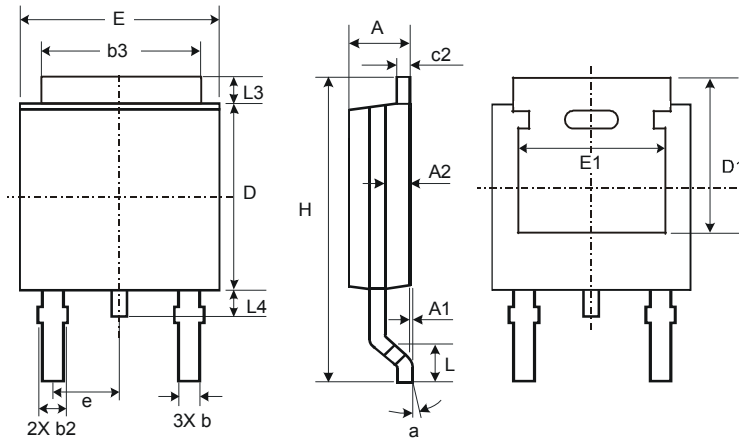


Fig. 12 SOA, Safe Operation Area

Package Outline Dimensions

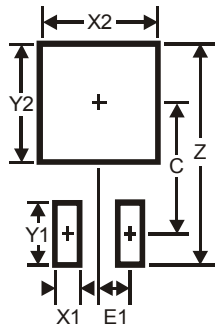
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| TO252 | | | |
|-----------------------------|------|-------|-------|
| Dim | Min | Max | Typ |
| A | 2.19 | 2.39 | 2.29 |
| A1 | 0.00 | 0.13 | 0.08 |
| A2 | 0.97 | 1.17 | 1.07 |
| b | 0.64 | 0.88 | 0.783 |
| b2 | 0.76 | 1.14 | 0.95 |
| b3 | 5.21 | 5.46 | 5.33 |
| c2 | 0.45 | 0.58 | 0.531 |
| D | 6.00 | 6.20 | 6.10 |
| D1 | 5.21 | – | – |
| e | – | – | 2.286 |
| E | 6.45 | 6.70 | 6.58 |
| E1 | 4.32 | – | – |
| H | 9.40 | 10.41 | 9.91 |
| L | 1.40 | 1.78 | 1.59 |
| L3 | 0.88 | 1.27 | 1.08 |
| L4 | 0.64 | 1.02 | 0.83 |
| a | 0° | 10° | – |
| 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) |
|------------|---------------|
| Z | 11.6 |
| X1 | 1.5 |
| X2 | 7.0 |
| Y1 | 2.5 |
| Y2 | 7.0 |
| C | 6.9 |
| E1 | 2.3 |

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