

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ max	$I_D$ $T_c = +25^\circ C$
60V	40m $\Omega$ @ $V_{GS} = 10V$	20A
	50m $\Omega$ @ $V_{GS} = 4.5V$	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

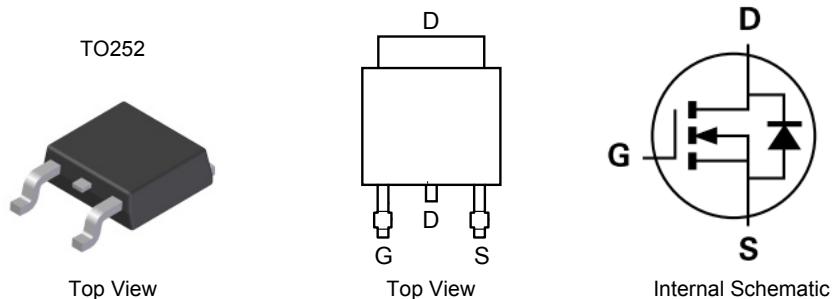
- DC-DC Converters
- Power Management Functions
- Backlighting

## 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)



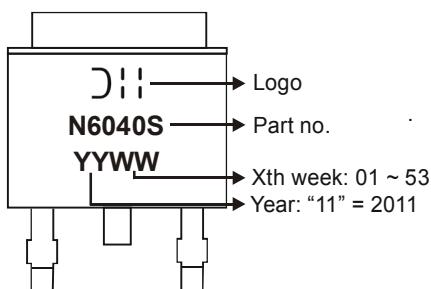
## Ordering Information (Note 4)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	60	V
Gate-Source Voltage			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$	Steady State	$T_C = +25^\circ\text{C}$ $T_C = +100^\circ\text{C}$	$I_D$	20 13	A
Maximum Body Diode Forward Current (Note 5)			$I_S$	4	A
Pulsed Drain Current (10 $\mu\text{s}$ 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** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

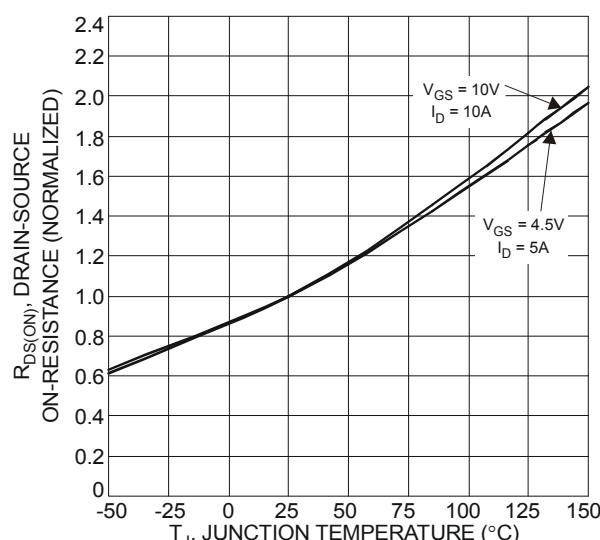
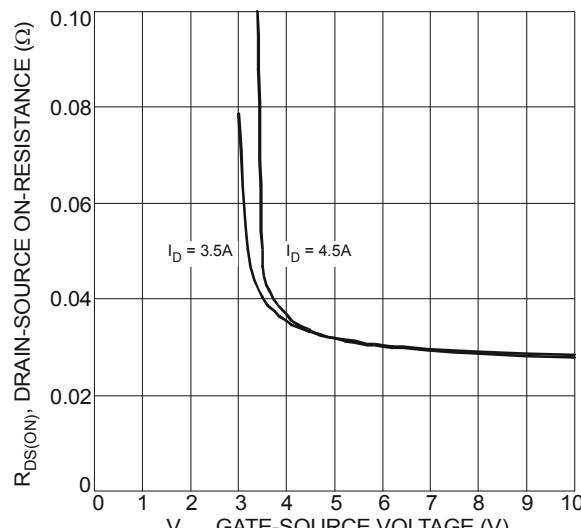
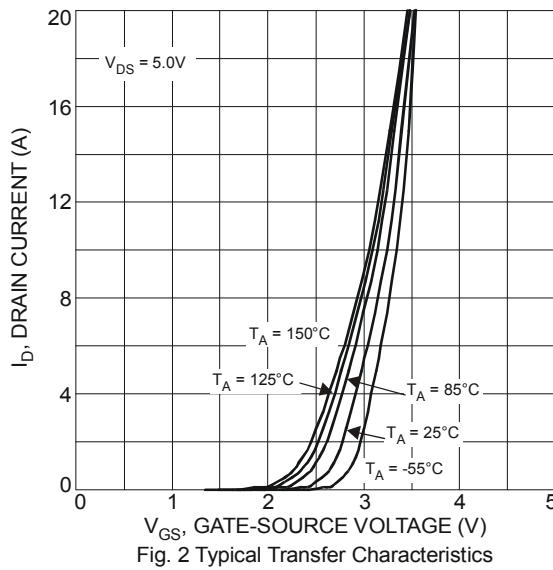
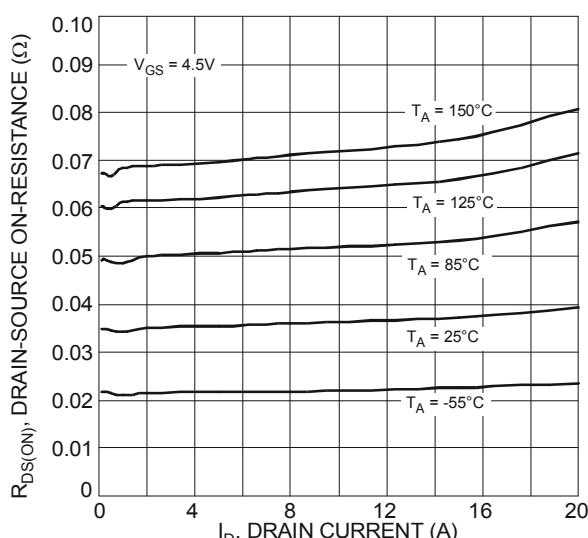
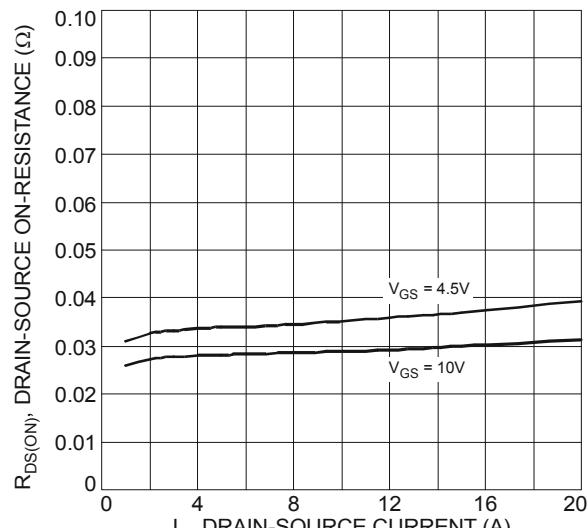
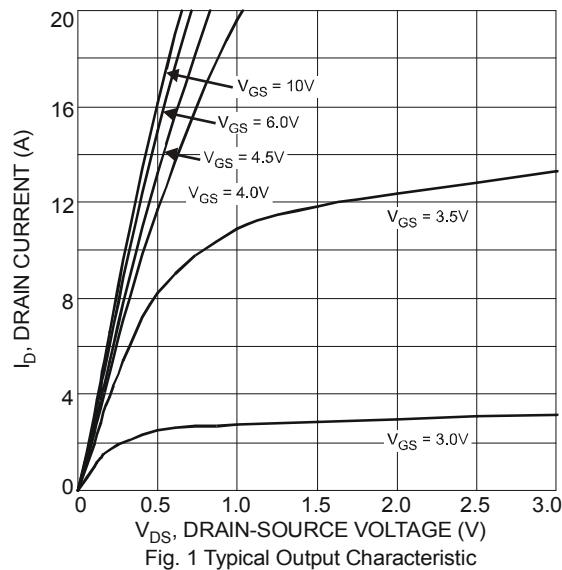
Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	$T_C = +25^\circ\text{C}$	$P_D$	42	W
	$T_C = +100^\circ\text{C}$		17	
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	44	°C/W
Thermal Resistance, Junction to Case (Note 5)		$R_{\theta JC}$	3	
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	°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	$BV_{DSS}$	60	—	—	V	$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(\text{th})}$	1	—	3	V	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(\text{ON})}$	—	30	40	$\text{m}\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 20\text{A}$
		—	35	50		$V_{GS} = 4.5\text{V}$ , $I_D = 12\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0\text{V}$ , $I_S = 1\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	—	1287	—	pF	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	57	—		
Reverse Transfer Capacitance	$C_{rss}$	—	44	—		
Gate Resistance	$R_G$	—	1.2	—	$\Omega$	$V_{DS} = 0\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$
Total Gate Charge ( $V_{GS} = 10\text{V}$ )	$Q_g$	—	22.4	—	nC	$V_{DS} = 30\text{V}$ , $I_D = 4.3\text{A}$
Total Gate Charge ( $V_{GS} = 4.5\text{V}$ )	$Q_g$	—	10.4	—		
Gate-Source Charge	$Q_{gs}$	—	4.9	—		
Gate-Drain Charge	$Q_{gd}$	—	3.0	—		
Turn-On Delay Time	$t_{D(\text{on})}$	—	6.6	—	nS	$V_{GS} = 10\text{V}$ , $V_{DD} = 30\text{V}$ , $R_G = 6\Omega$ , $I_D = 4.3\text{A}$
Turn-On Rise Time	$t_r$	—	8.1	—		
Turn-Off Delay Time	$t_{D(\text{off})}$	—	20.1	—		
Turn-Off Fall Time	$t_f$	—	4.0	—		
Body Diode Reverse Recovery Time	$t_{rr}$	—	18	—	nS	$I_S = 4.3\text{A}$ , $dI/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{rr}$	—	11.9	—	nC	$I_S = 4.3\text{A}$ , $dI/dt = 100\text{A}/\mu\text{s}$

Notes:

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



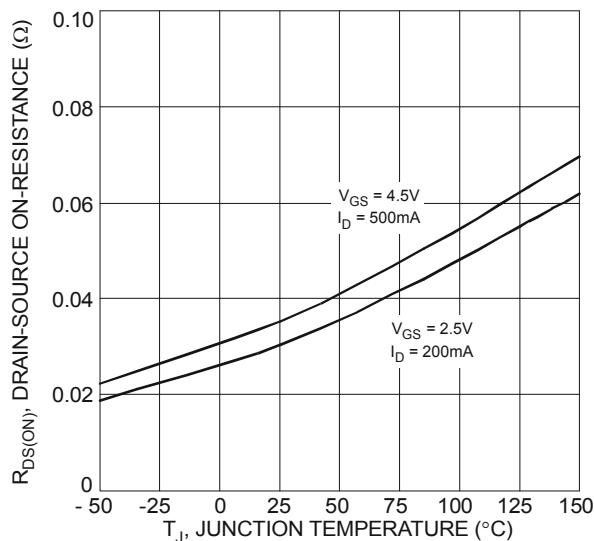


Fig. 7 On-Resistance Variation with Temperature

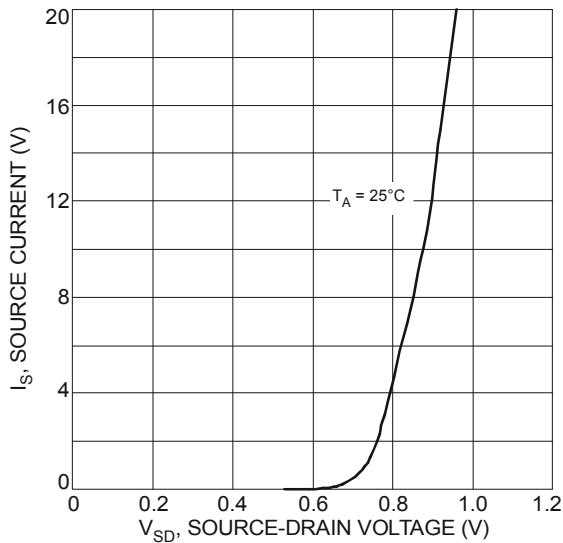


Fig. 9 Diode Forward Voltage vs. Current

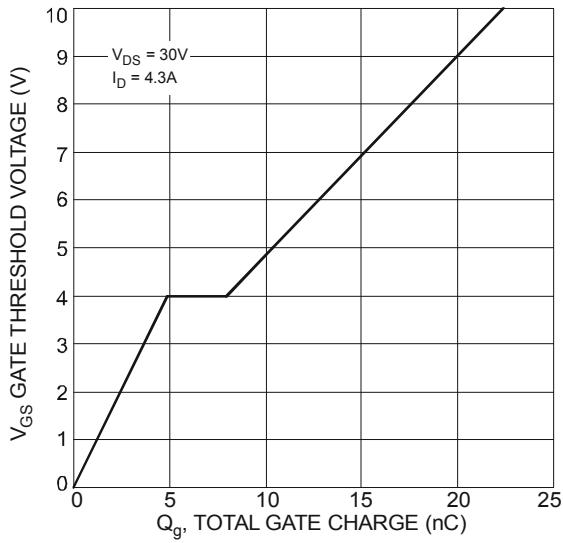


Fig. 11 Gate Charge

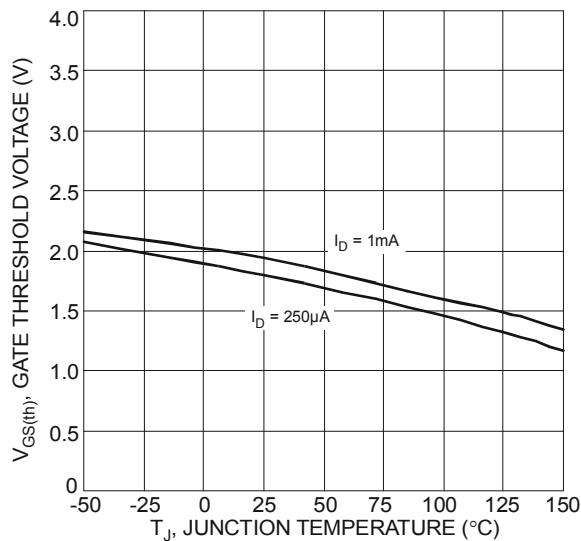


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

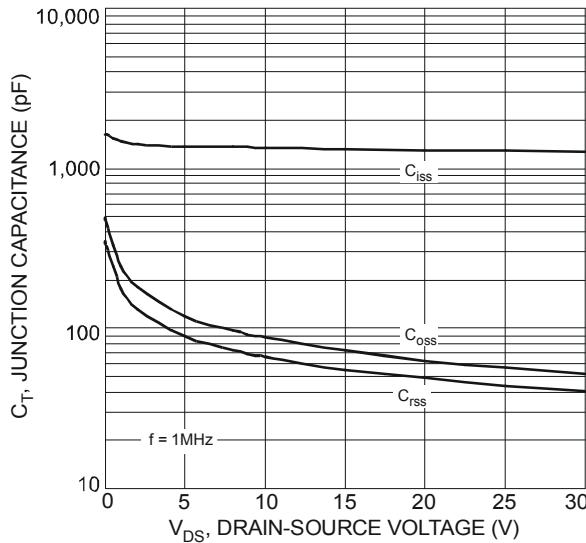


Fig. 10 Typical Junction Capacitance

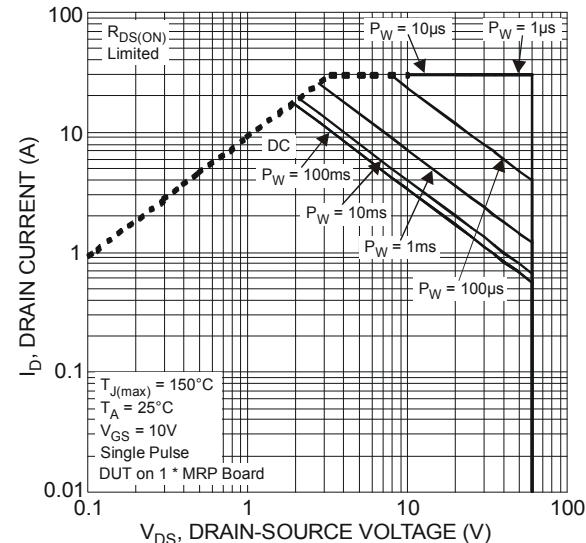
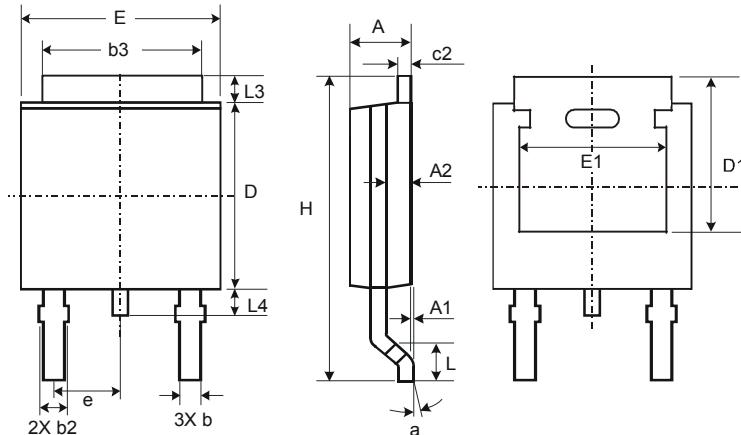


Fig 12 SOA, Safe Operation Area

## Package Outline Dimensions

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

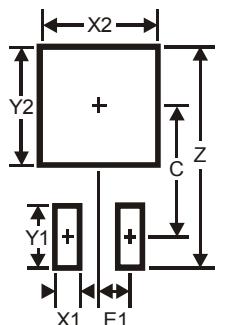


TO252			
Dim	Min	Max	Typ
<b>A</b>	2.19	2.39	2.29
<b>A1</b>	0.00	0.13	0.08
<b>A2</b>	0.97	1.17	1.07
<b>b</b>	0.64	0.88	0.783
<b>b2</b>	0.76	1.14	0.95
<b>b3</b>	5.21	5.46	5.33
<b>c2</b>	0.45	0.58	0.531
<b>D</b>	6.00	6.20	6.10
<b>D1</b>	5.21	—	—
<b>e</b>	—	—	2.286
<b>E</b>	6.45	6.70	6.58
<b>E1</b>	4.32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

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