N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D $T_A = 25°C$
20V	0.55Ω @ V_{GS} = 4.5V	630mA
	0.9Ω @ V_{GS} = 1.8V	410mA

Description and Applications

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.

- DC-DC Converters
- Power management functions

Features and Benefits

- Low On-Resistance: $R_{DS(ON)}$ = $550_{(max)}$mΩ @ V_{GS} = 4.5V
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **ESD Protected up to 2KV**
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 standards for High Reliability**

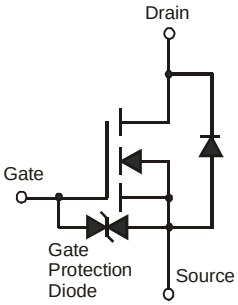
Mechanical Data

- Case: SOT-23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin annealed over Alloy 42 leadframe. Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)

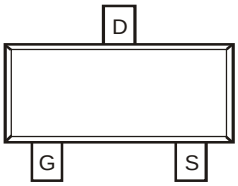
ESD PROTECTED TO 2kV

SOT-23

Top View



Equivalent Circuit



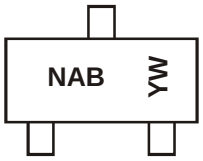
Top View

Ordering Information (Note 3)

Part Number	Case	Packaging
DMN2004K-7	SOT-23	3000/Tape & Reel

Notes: 1. No purposefully added lead.
2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com.
3. For packaging details, go to our website at http://www.diodes.com.

Marking Information



NAB = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: T = 2006)
M = Month (ex: 9 = September)

Date Code Key

Year	2006	2007	2008	2009	2010	2011	2012
Code	T	U	V	W	X	Y	Z

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°C unless otherwise specified

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±8	V
Drain Current (Note 4) V_{GS} = 4.5V	Steady State	T_A = 25°C T_A = 85°C	I_D	630 450	mA
Drain Current (Note 4) V_{GS} = 1.8V	Steady State	T_A = 25°C T_A = 85°C	I_D	410 300	mA
Pulsed Drain Current (Note 5)			I_{DM}	1.5	A

Thermal Characteristics @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 4)	P_D	350	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	357	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-65 to +150	°C

Electrical Characteristics @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	V_{GS} = 0V, I_D = 10μA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	V_{DS} = 16V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±1	μA	V_{GS} = ±4.5V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	0.5	—	1.0	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	—	0.4 0.5 0.7	0.55 0.70 0.9	Ω	V_{GS} = 4.5V, I_D = 540mA V_{GS} = 2.5V, I_D = 500mA V_{GS} = 1.8V, I_D = 350mA
Forward Transfer Admittance	$\|Y_{fs}\|$	200	—	—	ms	V_{DS} =10V, I_D = 0.2A
Source Current	I_S	—	—	0.5	A	—
Diode Forward Voltage (Note 6)	V_{SD}	0.6	—	1	V	V_{GS} = 0V, I_S = 500mA
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{iss}	—	—	150	pF	V_{DS} = 16V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	—	25	pF	
Reverse Transfer Capacitance	C_{rss}	—	—	20	pF	
Gate Resistance	R_g	—	292	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge	Q_g	—	0.9	—	nC	V_{DS} = 15V, V_{GS} = 4.5V, I_D = 0.5A
Gate-Source Charge	Q_{gs}	—	0.2	—		
Gate-Drain Charge	Q_{gd}	—	0.2	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.7	—	ns	V_{GS} = 8V, V_{DS} = 15V, R_G = 6Ω, R_L = 30Ω
Turn-On Rise Time	t_r	—	8.4	—		
Turn-Off Delay Time	$t_{D(off)}$	—	59.4	—		
Turn-Off Fall Time	t_f	—	37.6	—		
Body Diode Reverse Recovery Time	t_{rr}	—	5.5	—	ns	I_S = 0.5A, dI/dt = -100A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	—	0.85	—	nC	I_S = 0.5A, dI/dt = -100A/μs

Notes: 4. Device mounted on FR-4 PCB, with minimum recommended pad layout, single sided.
5. Pulse width ≤10μS, Duty Cycle ≤1%.
6. Short duration pulse test used to minimize self-heating effect.

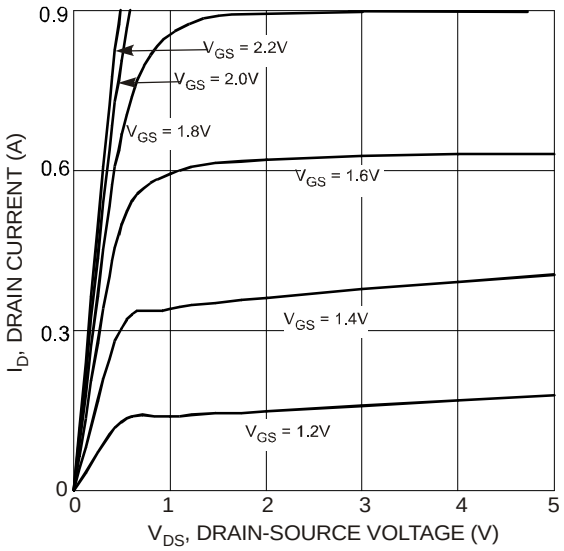


Fig. 1 Typical Output Characteristics

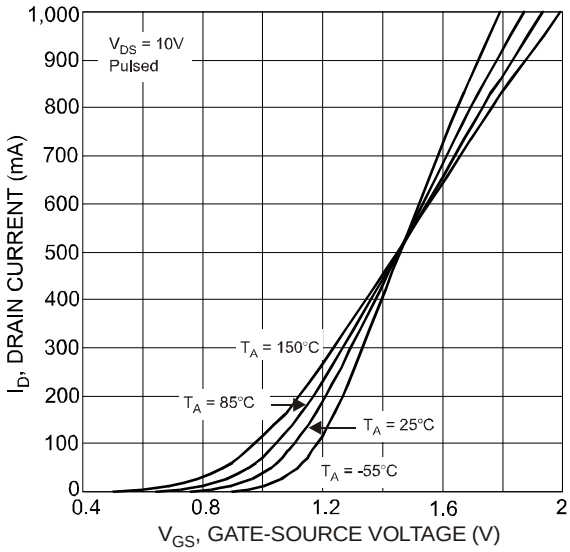


Fig. 2 Reverse Drain Current vs. Source-Drain Voltage

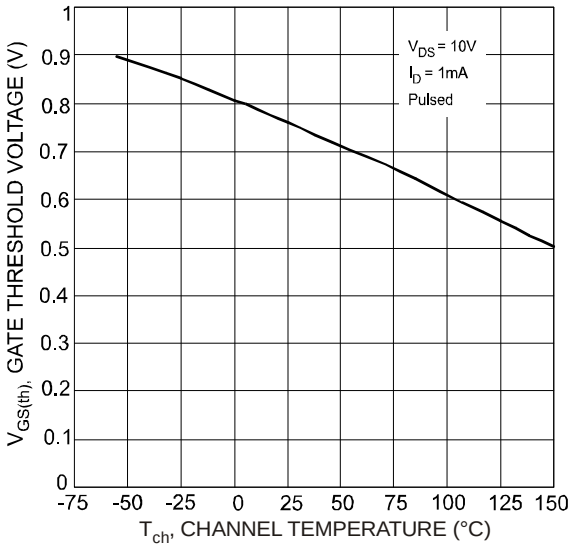


Fig. 3 Gate Threshold Voltage vs. Channel Temperature

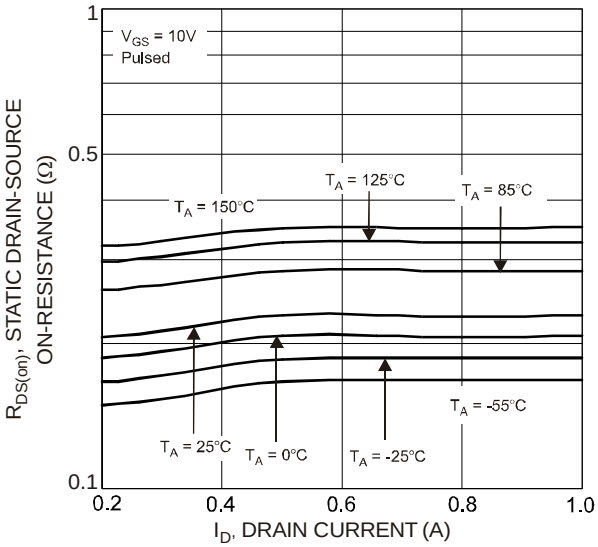


Fig. 4 Static Drain-Source On-Resistance vs. Drain Current

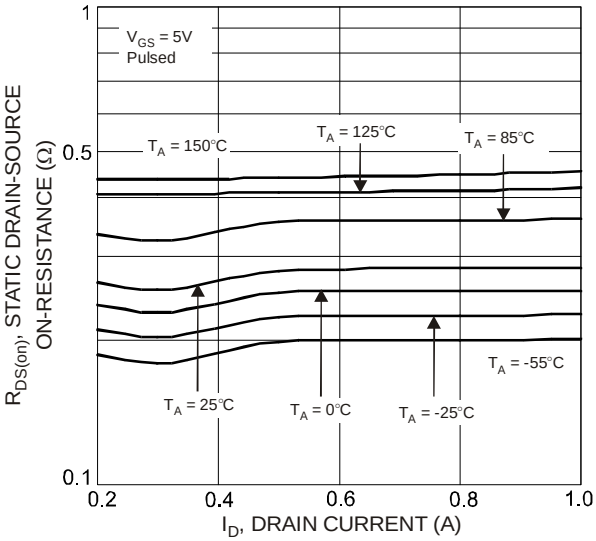


Fig. 5 Static Drain-Source On-Resistance vs. Drain Current

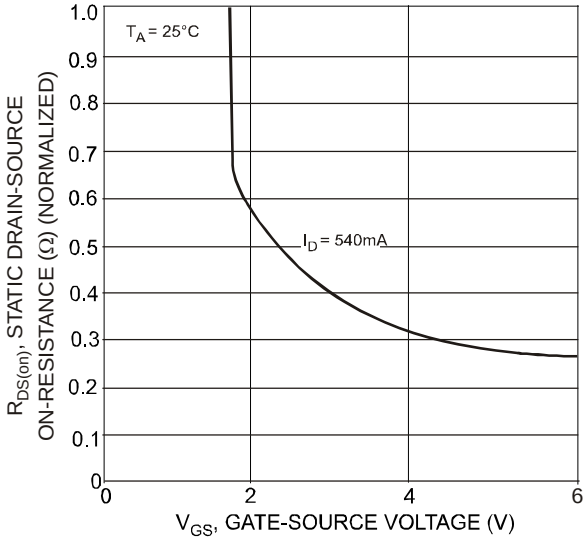


Fig. 6 Static Drain-Source, On-Resistance vs. Gate-Source Voltage

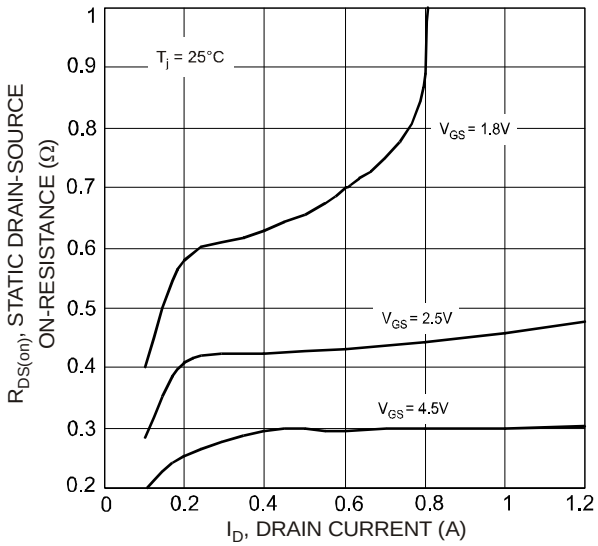


Fig. 7 On-Resistance vs. Drain Current and Gate Voltage

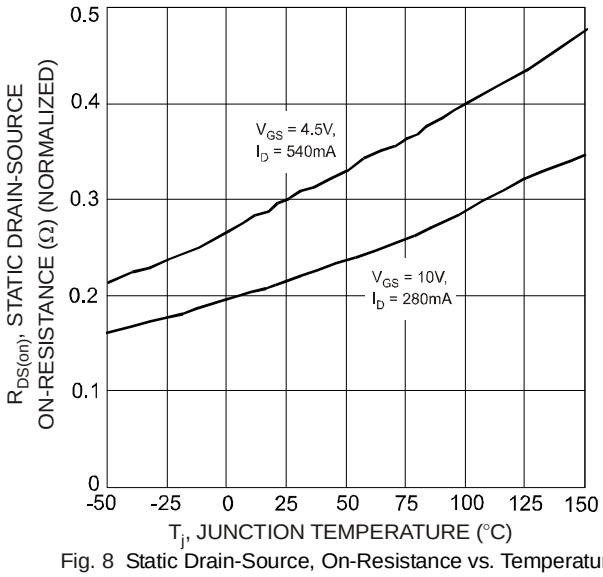


Fig. 8 Static Drain-Source, On-Resistance vs. Temperature

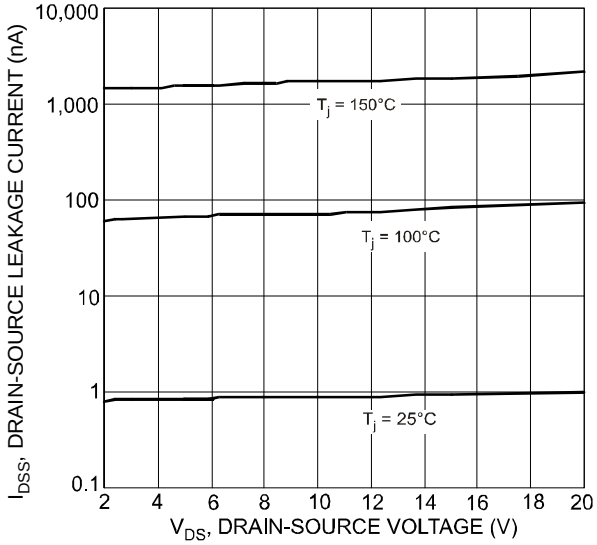


Fig. 9 Drain Source Leakage Current vs. Voltage

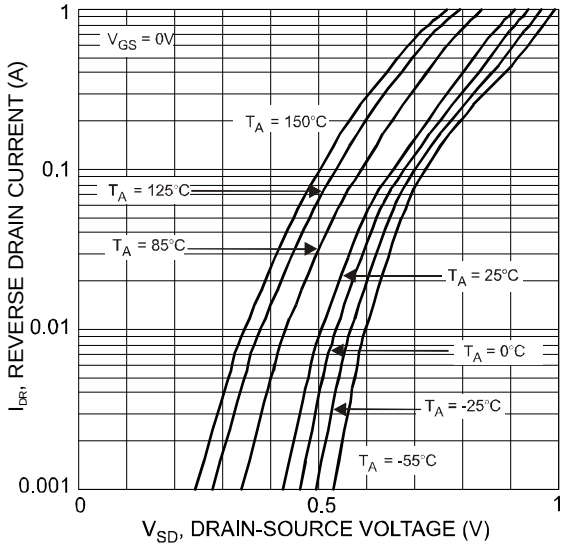


Fig. 10 Reverse Drain Current vs. Source-Drain Voltage

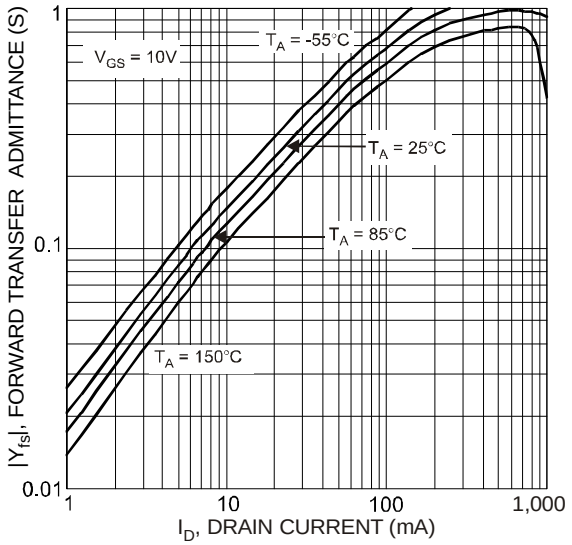


Fig. 11 Forward Transfer Admittance vs. Drain Current

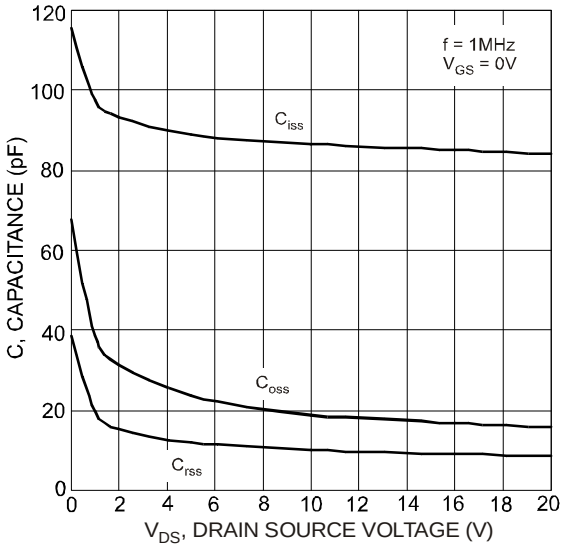


Fig. 12 Capacitance Variation

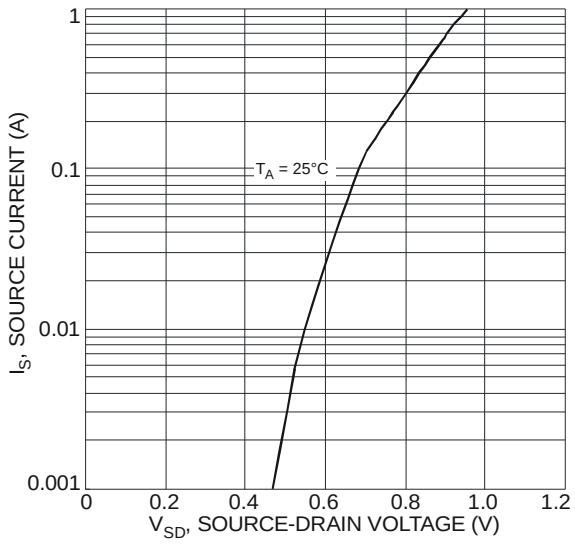


Fig. 13 Diode Forward Voltage vs. Current

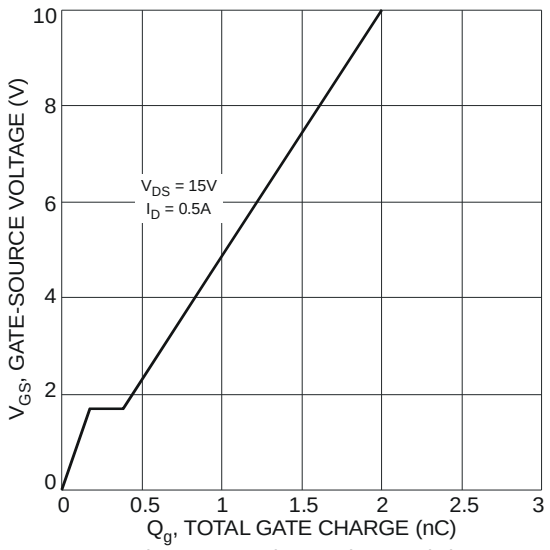
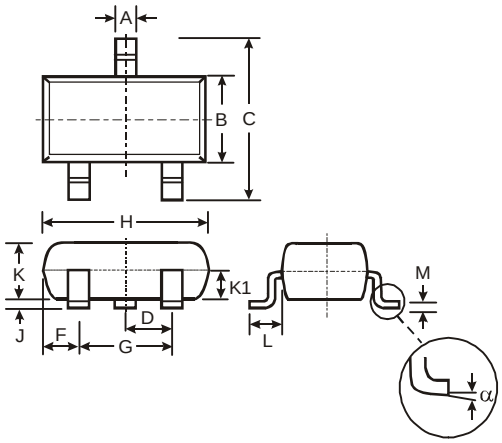


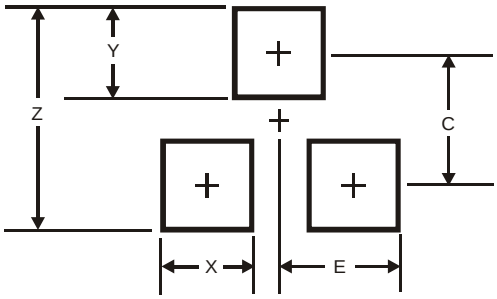
Fig. 14 Gate-Charge Characteristics

Package Outline Dimensions



SOT-23			
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	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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