

DUAL N-CANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max $T_A = +25^\circ\text{C}$
20V	45m Ω @ $V_{GS} = 4.5\text{V}$	4.5A
	55m Ω @ $V_{GS} = 2.5\text{V}$	4.1A

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **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

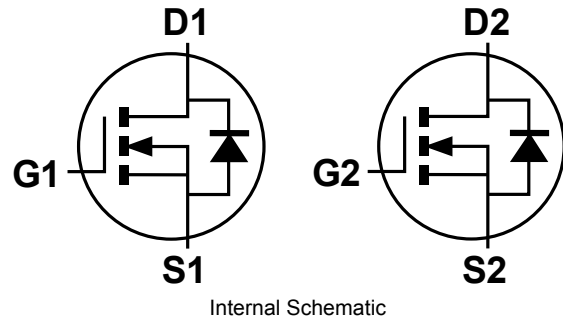
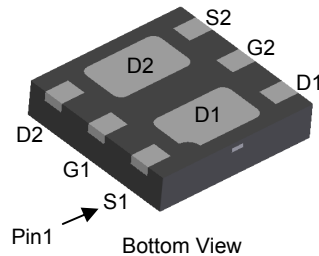
This MOSFET has been designed to minimize the on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

- Battery Charging
- Power Management Functions
- DC-DC Converters
- Portable Power Adaptors

Mechanical Data

- Case: U-DFN2020-6 Type B
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.0065 grams (approximate)

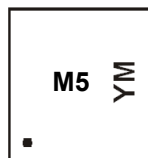


Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2050LFDB -7	DFN2020-6 Type B	3,000/Tape & Reel
DMN2050LFDB -13	DFN2020-6 Type B	10,000/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



M5 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: A = 2013)
 M = Month (ex: 9 = September)

Date Code Key

Year	2009	2010	2011	2012	2013	2014	2015					
Code	W	X	Y	Z	A	B	C					
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}	±12	V
Continuous Drain Current (Note 5) V _{GS} = 4.5V	Steady State	T _A = +25°C	I _D	3.3	A
		T _A = +70°C		2.6	
Continuous Drain Current (Note 6) V _{GS} = 4.5V	Steady State	T _A = +25°C	I _D	4.5	A
		T _A = +70°C		3.6	
Maximum Continuous Body Diode Forward Current (Note 6)			I _S	1	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I _{DM}	25	A
Avalanche Current (Note 7) L = 0.1mH			I _{AR}	9	A
Repetitive Avalanche Energy (Note 7) L = 0.1mH			E _{AR}	4.5	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T _A = +25°C	P _D	0.73	W
	T _A = +70°C		0.46	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R _{θJA}	173	°C/W
	t < 10s		110	
Total Power Dissipation (Note 6)	T _A = +25°C	P _D	1.42	W
	T _A = +70°C		0.90	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R _{θJA}	89	°C/W
	t < 10s		57	
Thermal Resistance, Junction to Case (Note 6)		R _{θJC}	18	
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 8)						
Drain-Source Breakdown Voltage	BV _{DSS}	20	–	–	V	V _{GS} = 0V, I _D = 250μA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	–	–	1.0	μA	V _{DS} = 16V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	–	–	±100	nA	V _{GS} = ±12V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(th)}	0.4	–	1.0	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(on)}	–	28	45	mΩ	V _{GS} = 4.5V, I _D = 5.0A
		–	36	55		V _{GS} = 2.5V, I _D = 4.2A
Forward Transfer Admittance	Y _{fs}	–	9	–	S	V _{DS} = 5V, I _D = 5A
Diode Forward Voltage	V _{SD}	–	0.75	1.0	V	V _{GS} = 0V, I _S = 1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iSS}	–	389	–	pF	V _{DS} = 10V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	–	72	–	pF	
Reverse Transfer Capacitance	C _{rSS}	–	63	–	pF	
Gate Resistance	R _g	–	2.1	–	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	–	5.7	–	nC	V _{DS} = 15V, I _D = 5.8A
Total Gate Charge (V _{GS} = 10V)	Q _g	–	12	–	nC	
Gate-Source Charge	Q _{gs}	–	0.7	–	nC	
Gate-Drain Charge	Q _{gd}	–	1.5	–	nC	
Turn-On Delay Time	t _{D(on)}	–	5	–	ns	V _{DS} = 10V, V _{GS} = 4.5V, R _G = 6Ω, I _{DS} = 1A
Turn-On Rise Time	t _r	–	8	–	ns	
Turn-Off Delay Time	t _{D(off)}	–	25	–	ns	
Turn-Off Fall Time	t _f	–	8	–	ns	
Reverse Recovery Time	t _{rr}	–	8.5	–	ns	I _F = 5A, di/dt = 100A/μs
Reverse Recovery Charge	Q _{rr}	–	2.1	–	nC	

- 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 1inch square copper plate.
 - I_{AR} and E_{AR} rating are based on low frequency and duty cycles to keep T_J = +25°C
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

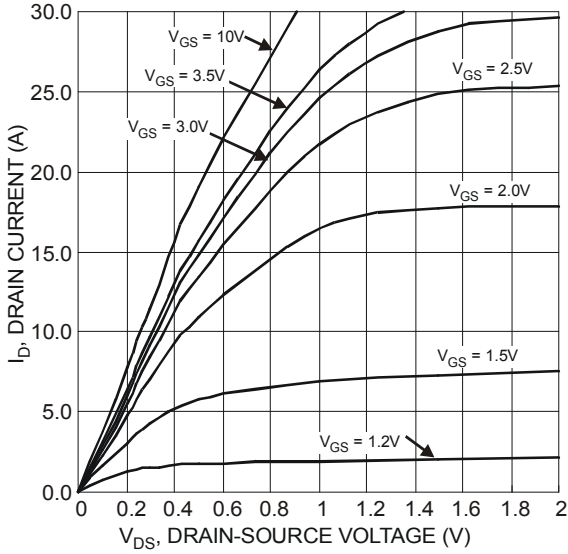


Figure 1 Typical Output Characteristics

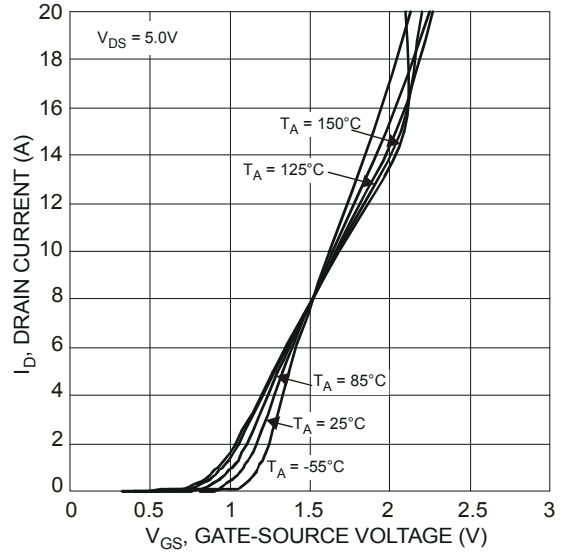


Figure 2 Typical Transfer Characteristics

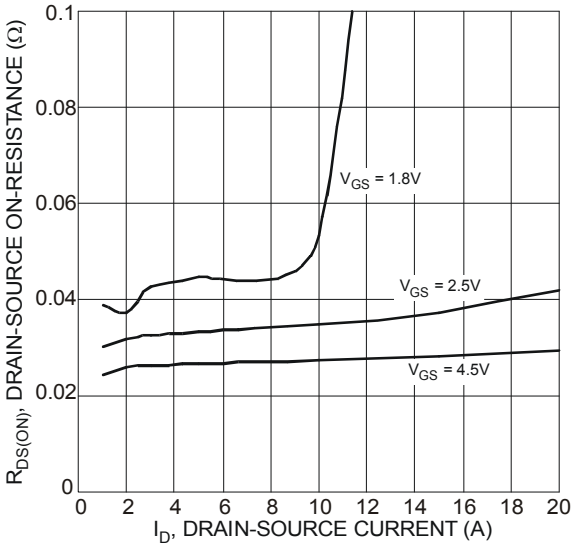


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

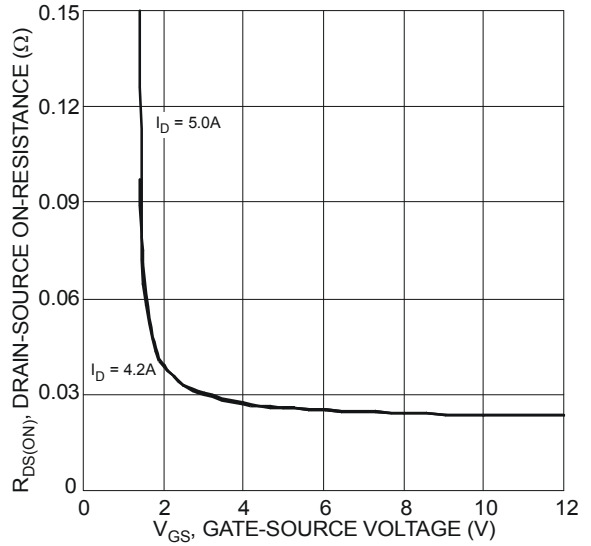


Figure 4 Typical Transfer Characteristics

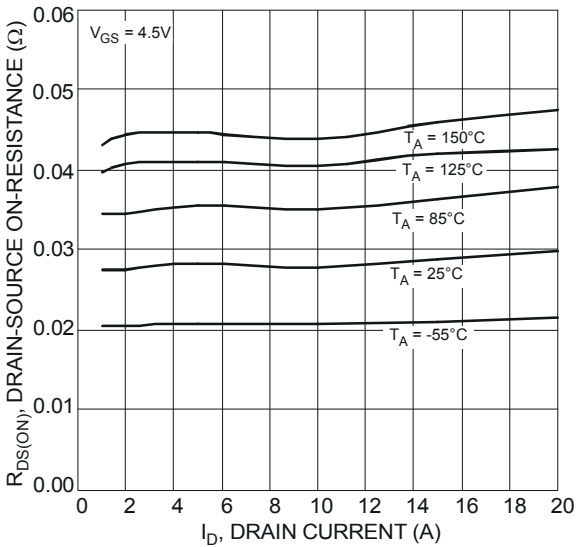


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

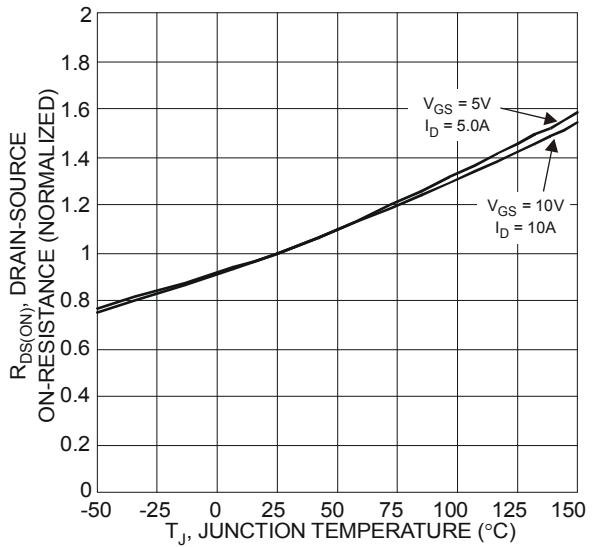


Figure 6 On-Resistance Variation with Temperature

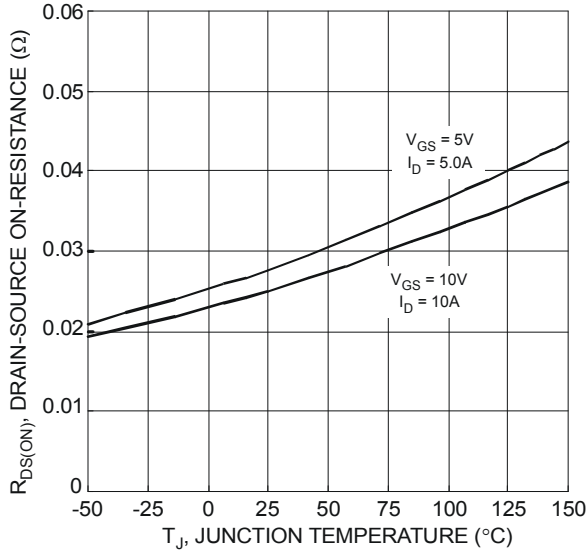


Figure 7 On-Resistance Variation with Temperature

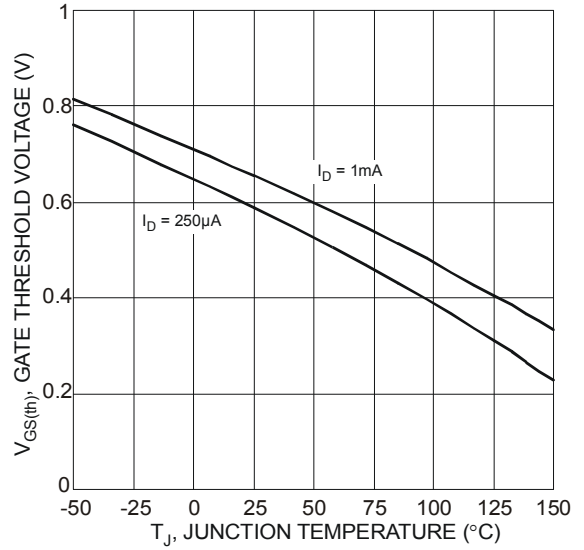


Figure 8 Gate Threshold Variation vs. Ambient Temperature

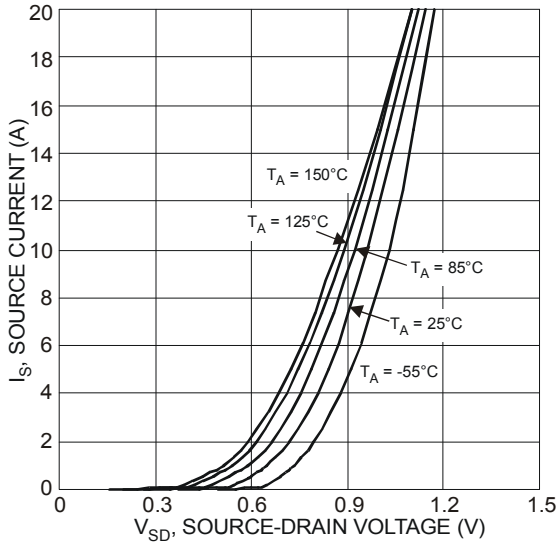


Figure 9 Diode Forward Voltage vs. Current

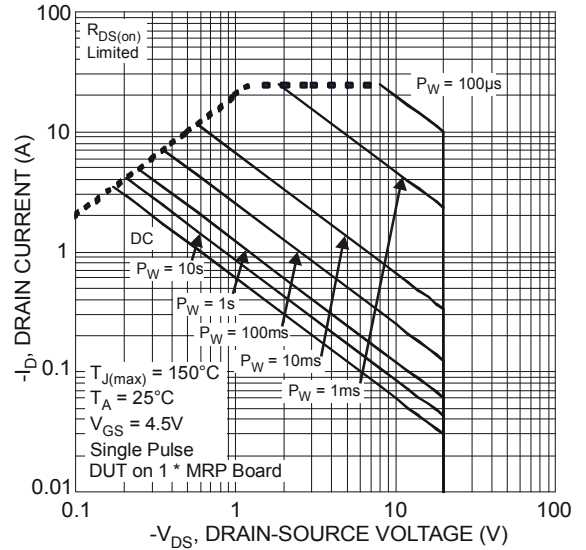


Figure 10 SOA, Safe Operation Area

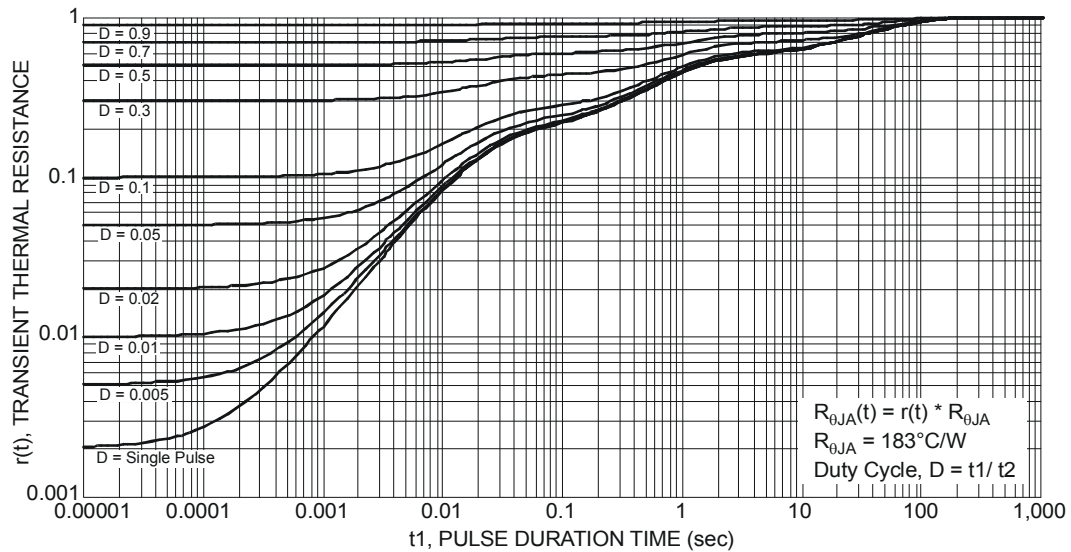
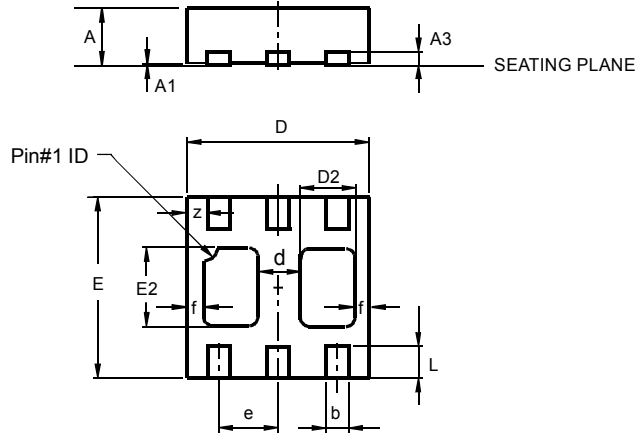


Figure 11 Transient Thermal Resistance

$R_{\theta JA}(t) = r(t) * R_{\theta JA}$
 $R_{\theta JA} = 183^{\circ}\text{C/W}$
 Duty Cycle, $D = t_1 / t_2$

Package Outline Dimensions

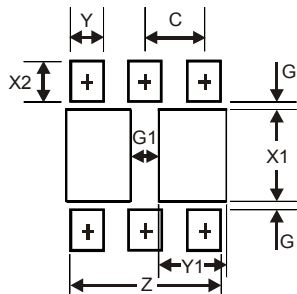
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



DFN2020-6 Type B			
Dim	Min	Max	Typ
A	0.545	0.605	0.575
A1	0	0.05	0.02
A3	—	—	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
d	—	—	0.45
D2	0.50	0.70	0.60
e	—	—	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
f	—	—	0.15
L	0.25	0.35	0.30
z	—	—	0.225
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	1.67
G	0.20
G1	0.40
X1	1.0
X2	0.45
Y	0.37
Y1	0.70
C	0.65

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