

60V +175°C N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D Max T _A = +25°C
001/	$18m\Omega$ @ $V_{GS} = 10V$	9.4A
60V	$27.5 \text{m}\Omega$ @ $V_{GS} = 4.5 \text{V}$	7.6A

Features

- Rated to +175°C—Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production
 Ensures More Reliable and Robust End Application
- Low R_{DS(ON)}—Ensures On-State Losses Are Minimized
- 0.6mm Profile—Ideal for Low-Profile Applications
- PCB Footprint of 4mm²
- Sidewall Plated for Improved Optical Inspection
- 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
- PPAP Capable (Note 4)

Description

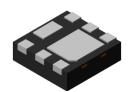
This MOSFET is designed to meet the stringent requirements of Automotive applications. The device is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Power Management Functions
- DC-DC Converters
- Backlighting

U-DFN2020-6 (SWP) (Type F)



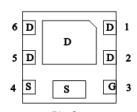




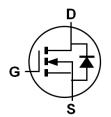
Bottom View

Mechanical Data

- Case: U-DFN2020-6
- 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 Copper Leadframe;
 Solderable per MIL-STD-202, Method 208 ®
- Weight: 0.007 grams (Approximate)



Pin Out Bottom View



Internal Schematic

Ordering Information (Note 5 & 6)

Part Number	Case	Quantity Per Reel
DMTH6016LFDFWQ-7	U-DFN2020-6 (SWP) (Type F)	3,000
DMTH6016LFDFWQ-7R	U-DFN2020-6 (SWP) (Type F)	3,000
DMTH6016LFDFWQ-13	U-DFN2020-6 (SWP) (Type F)	10,000

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
- 2. See https://www.diodes.com/quality/lead-free/ 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to https://www.diodes.com/quality/.
- 5. The options -7 and -7R stand for different taping orientations. Please refer to Diodes Incorporated's website at https://www.diodes.com for further details.
- 6. For packaging details, see https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



66 = Product Type Marking Code YM = Date Code Marking Y = Year (ex: F = 2018) M = Month (ex: 9 = September)

Date Code Key

Year	2	017	2018	20	019	2020	20:	21	2022	202	23	2024
Code		Е	F	(G	Н			J	K		L
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	0	N	D



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

Characteristic	Symbol	Value	Unit	
Drain-Source Voltage		V_{DSS}	60	V
Gate-Source Voltage		V_{GSS}	±20	V
	$\Gamma_{A} = +25^{\circ}C$ $\Gamma_{A} = +100^{\circ}C$	D	9.4 6.6	Α
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I _{DM}	70	Α	
Continuous Source-Drain Diode Current (Note 8)	Is	3.0	Α	
Pulsed Source-Drain Diode Current (10µs Pulse, Duty Cycle = 1%)	I _{SM}	70	Α	
Avalanche Current, L = 0.1mH	I _{AS}	15.3	Α	
Avalanche Energy, L = 0.1mH		E _{AS}	11.7	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 7)	$T_A = +25^{\circ}C$	P_{D}	1.06	W
Thermal Resistance, Junction to Ambient (Note 7)		$R_{\theta JA}$	141	°C/W
Total Power Dissipation (Note 8)	T _A = +25°C	P_{D}	2.3	W
Thermal Resistance, Junction to Ambient (Note 8)		$R_{\theta JA}$	63	°C/W
Thermal Resistance, Junction to Case (Note 8)	T _C = +25°C	R _{0JC}	9.6	°C/W
Operating and Storage Temperature Range		T _{J,} T _{STG}	-55 to +175	°C

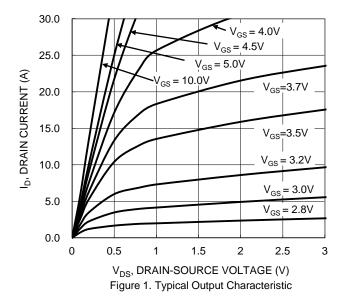
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition	
OFF CHARACTERISTICS (Note 9)							
Drain-Source Breakdown Voltage	BV _{DSS}	60	l	_	V	$V_{GS} = 0V, I_D = 250\mu A$	
Zero Gate Voltage Drain Current	I _{DSS}	_	_	1	μΑ	$V_{DS} = 48V, V_{GS} = 0V$	
Gate-Source Leakage	I _{GSS}	_	_	±100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
ON CHARACTERISTICS (Note 9)							
Gate Threshold Voltage	V _{GS(TH)}	1	_	3	V	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	
Static Drain-Source On-Resistance	Б		13.8	18	mΩ	$V_{GS} = 10V, I_D = 10A$	
Static Drain-Source On-Resistance	R _{DS(ON)}	_	20.3	27.5	11177	$V_{GS} = 4.5V, I_D = 6A$	
Diode Forward Voltage	V _{SD}	_	_	1.0	V	V _{GS} = 0V, I _S = 10A	
DYNAMIC CHARACTERISTICS (Note 10)		•		•			
Input Capacitance	C _{iss}	_	925	_		V _{DS} = 30V, V _{GS} = 0V, f = 1MHz	
Output Capacitance	Coss	_	242		pF		
Reverse Transfer Capacitance	C _{rss}	_	25.4	_		I = IIVII IZ	
Gate Resistance	Rg	_	1.3	_	Ω	$V_{DS} = 0V$, $V_{GS} = 0V$, $f = 1MHz$	
Total Gate Charge (V _{GS} = 4.5V)	Qg	_	7.5	_			
Total Gate Charge (V _{GS} = 10V)	Qg	_	15.3	_	nC	V 20V I 40A	
Gate-Source Charge	Q _{gs}	_	2.6	_	nc nc	$V_{DS} = 30V, I_{D} = 10A$	
Gate-Drain Charge	Q_{gd}	_	3.5	_			
Turn-On Delay Time	t _{D(ON)}	_	3.2	_			
Turn-On Rise Time	t _R	_	4.2	_		$V_{GS} = 10V, V_{DS} = 30V,$	
Turn-Off Delay Time	t _{D(OFF)}	_	14.5	_	ns	$R_g = 6\Omega$, $I_D = 10A$	
Turn-Off Fall Time	t _F	_	7.2	_		3	
Reverse Recovery Time	t _{RR}	_	20.8	_	ns	1 101 11/11 1001/	
Reverse Recovery Charge	Q _{RR}	_	11.4	_	nC	$I_F = 10A$, di/dt = 100A/ μ s	

- 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.
 Short duration pulse test used to minimize self-heating effect.
 Guaranteed by design. Not subject to product testing.







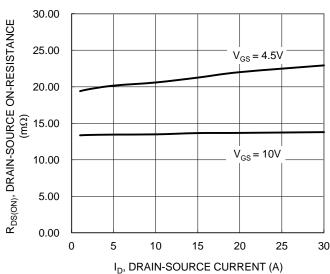


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

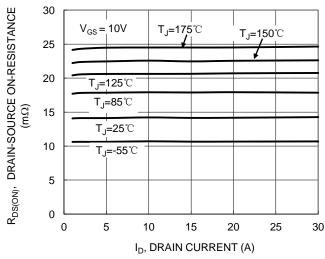


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

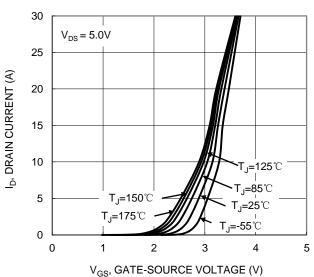


Figure 2. Typical Transfer Characteristic

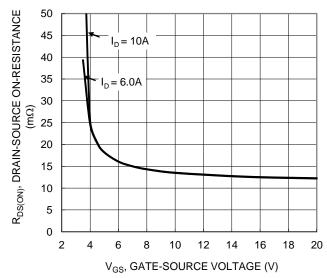


Figure 4. Typical Transfer Characteristic

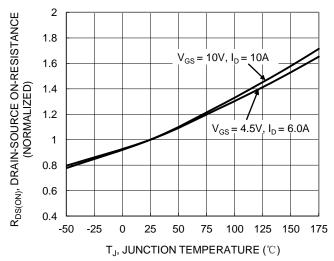


Figure 6. On-Resistance Variation with Temperature





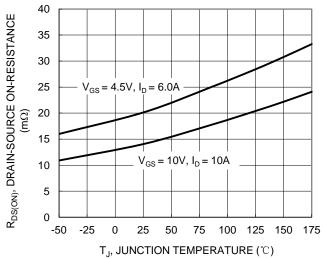
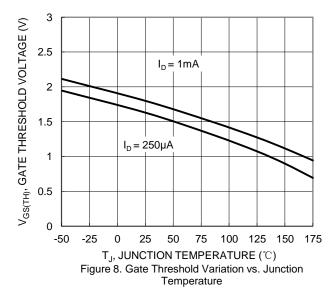
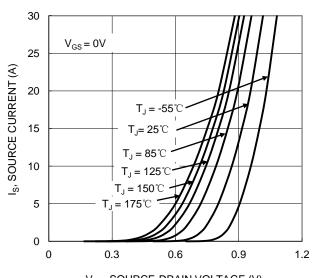


Figure 7. On-Resistance Variation with Temperature





V_{SD}, SOURCE-DRAIN VOLTAGE (V) Figure 9. Diode Forward Voltage vs. Current

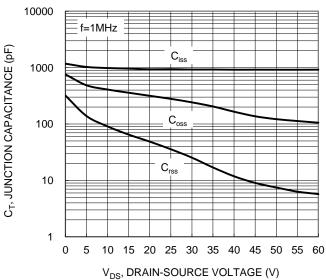
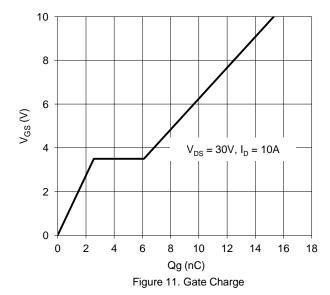


Figure 10. Typical Junction Capacitance



ID, DRAIN CURRENT (A) $P_W = 10ms$ 0.1 P_W =100ms $T_{J(Max)} = 175^{\circ}C$ $T_C = 25^{\circ}C$ 0.01 Single Pulse DUT on 1*MRP Board V_{GS}= 10V 0.001 0.1 100 V_{DS}, DRAIN-SOURCE VOLTAGE (V)

Figure 12. SOA, Safe Operation Area

100

10

1

 $R_{DS(ON)}$ Limited



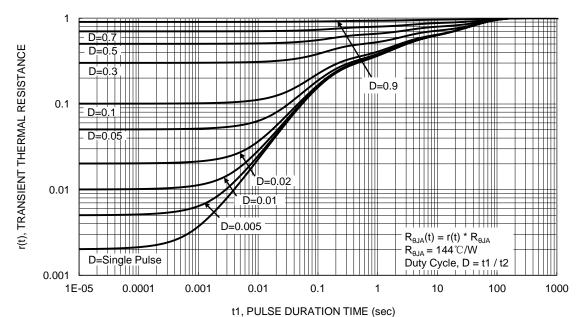


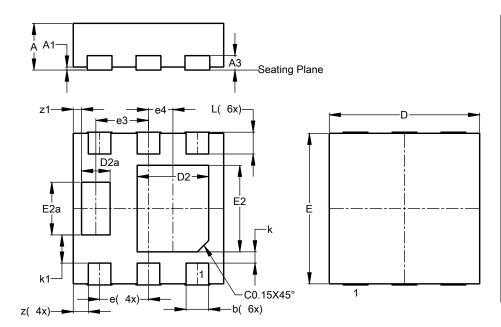
Figure 13. Transient Thermal Resistance



Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

U-DFN2020-6 (SWP) (Type F)

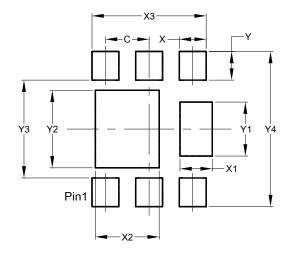


U-DFN2020-6 (SWP) (Type F)							
Dim	Min Max Typ						
Α	0.59	0.65	0.62				
A1	0.00	0.05	0.03				
A3	-	-	0.192				
b	0.28	0.38	0.33				
D	1.95	2.05	2.00				
D2	0.87	1.07	0.97				
D2a	0.35	0.45	0.40				
Е	1.95	2.05	2.00				
E2	1.07	1.27	1.17				
E2a	0.67	0.77	0.72				
е	0.65 BSC						
e3	0.70 BSC						
e4	0.325 BSC						
k	1		0.15				
k1			0.375				
L	0.225	0.355	0.305				
Z			0.20				
z1			0.11				
All Dimensions in mm							

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

U-DFN2020-6 (SWP) (Type F)



Dimensions	Value (in mm)				
С	0.650				
Х	0.400				
X1	0.480				
X2	0.950				
Х3	1.700				
Y	0.425				
Y1	0.800				
Y2	1.150				
Y3	1.450				
Y4	2.300				



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