P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary (Typ. @ V_{GS} = -4.5V, T_A = +25°C)

V_{DSS}	$R_{DS(on)}$	Q_g	Q_{gd}	I_D
-20V	55mΩ	2.9nC	0.5nC	-3.5A

Description and Applications

This new generation MOSFET is 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 Management
- Load Switch
- Battery Protection

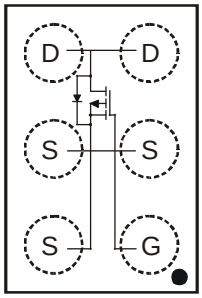
Features and Benefits

- LD-MOS Technology with the Lowest Figure of Merit:
  $R_{DS(on)}$ = 55mΩ to Minimize On-State Losses
  Q_g = 2.9nC for Ultra-Fast Switching
- $V_{gs(th)}$ = -0.6V typ. for a Low Turn-On Potential
- CSP with Footprint 1.5mm × 1.0mm
- Height = 0.62mm for Low Profile
- **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: U-WLB1510-6
- Terminal Connections: See Diagram Below
- Weight: 0.0018 grams (Approximate)

U-WLB1510-6



Top View

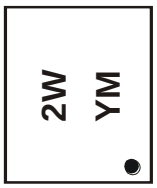
Ordering Information (Note 4)

Part Number	Case	Packaging
DMP2070UCB6-7	U-WLB1510-6	3,000/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

U-WLB1510-6



2W = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

Year	2011	2012	2013	2014	2015	2016	2017
Code	Y	Z	A	B	C	D	E

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
Continuous Drain Current (Note 4) V_{GS} = -4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	-2.5 -2.0	A
Continuous Drain Current (Note 5) V_{GS} = -4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	-3.5 -2.8	A
Pulsed Drain Current **(Note 6)**			I_{DM}	-12	A
Maximum Continuous Body Diode Forward Current (Note 5)			I_S	-1.8	A

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 4)	P_D	0.92	W
Total Power Dissipation (Note 5)	P_D	1.47	W
Thermal Resistance, Junction to Ambient (Note 4)	$R_{\theta JA}$	136	°C/W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	84	°C/W
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}	-20	-	-	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current @T_C = +25°C	I_{DSS}	-	-	-1	µA	V_{DS} = -16V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	-	-	±100	nA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	-0.4	-0.6	-1.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	-	55	70	mΩ	V_{GS} = -4.5V, I_D = - 1A
			70	90		V_{GS} = -2.5V, I_D = -1A
			90	110		V_{GS} = -1.8V, I_D = -1A
			110	150		V_{GS} = -1.5V, I_D = -1A
Forward Transfer Admittance	$\|Y_{fs}\|$	-	12	-	S	V_{DS} = -10V, I_D = -1A
Diode Forward Voltage (Note 5)	V_{SD}	-	-0.7	-1	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	-	210	-	pF	V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	92	-	pF	
Reverse Transfer Capacitance	C_{rss}	-	38	-	pF	
Series Gate Resistance	R_G		5.3	-	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (4.5V)	Q_g	-	2.9	-	nC	V_{GS} = -4.5V, V_{DS} = -10V, I_D = -1A ,
Gate-Source Charge	Q_{gs}	-	0.3	-	nC	
Gate-Drain Charge	Q_{gd}	-	0.5	-	nC	
Turn-On Delay Time	$t_{D(on)}$	-	7.3	-	ns	V_{DD} = -10V, V_{GS} = -4.5V, I_{DS} = -1A, R_G = 20Ω,
Turn-On Rise Time	t_r	-	14.0	-	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	42.6	-	ns	
Turn-Off Fall Time	t_f	-	32	-	ns	

Notes:
4. Device mounted on FR-4 PCB with minimum recommended pad layout.
5. Device mounted on FR4 material with 1-inch^2 (6.45-cm^2), 2-oz. (0.071-mm thick) Cu.
6. 300ms pulse, pulse duty cycle ≤ 2%.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

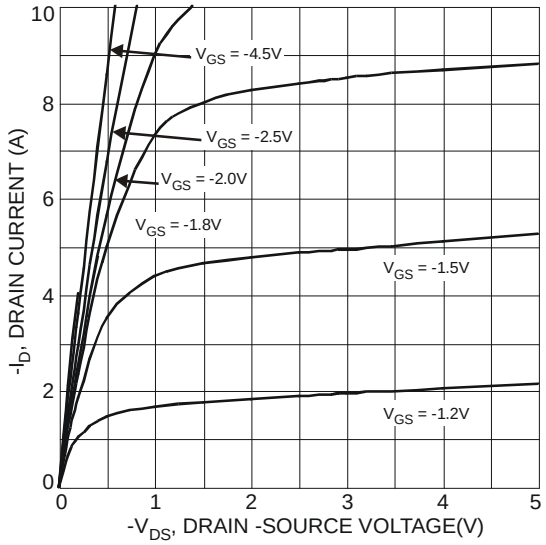


Fig. 1 Typical Output Characteristics

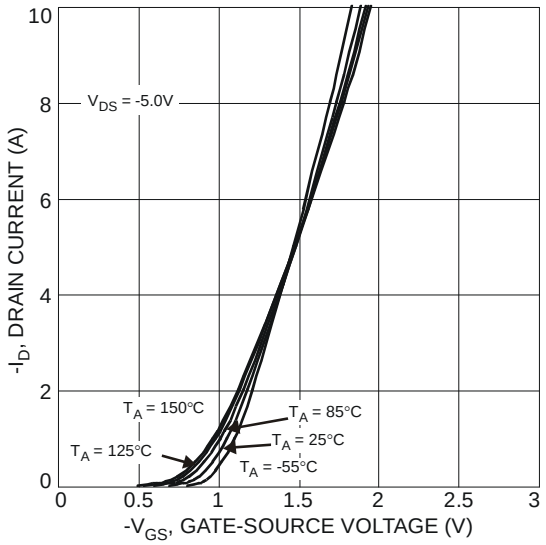


Fig. 2 Typical Transfer Characteristics

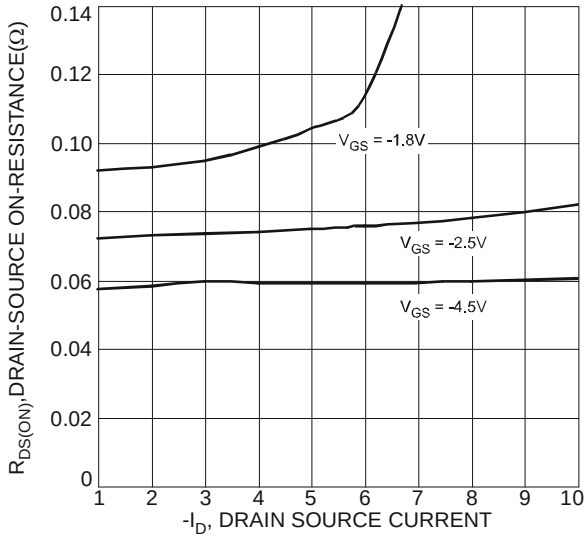


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

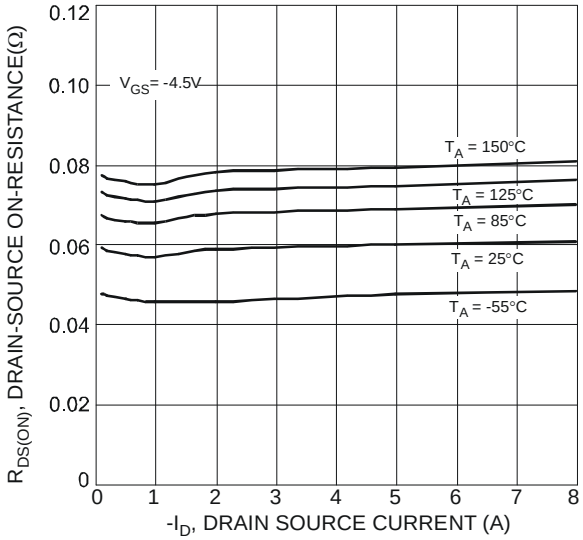


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

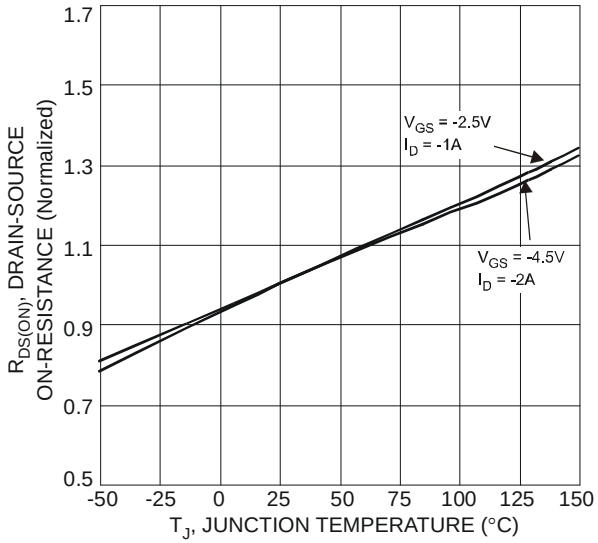


Fig. 5 On-Resistance Variation with Temperature

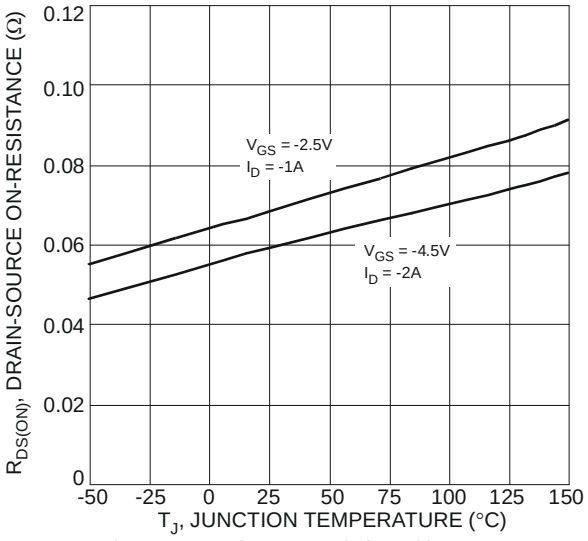


Fig. 6 On-Resistance Variation with Temperature

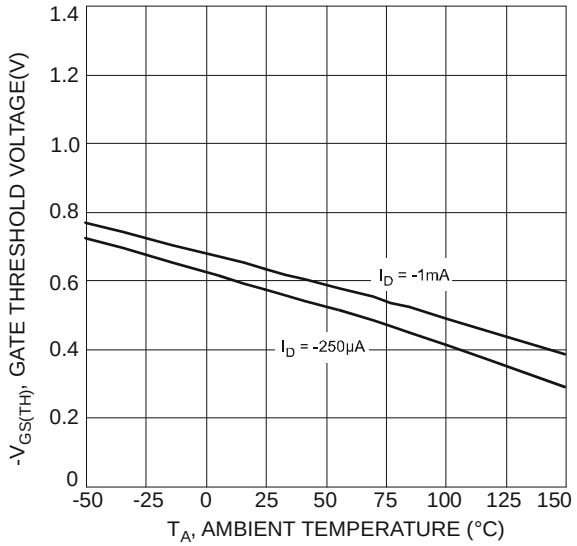


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

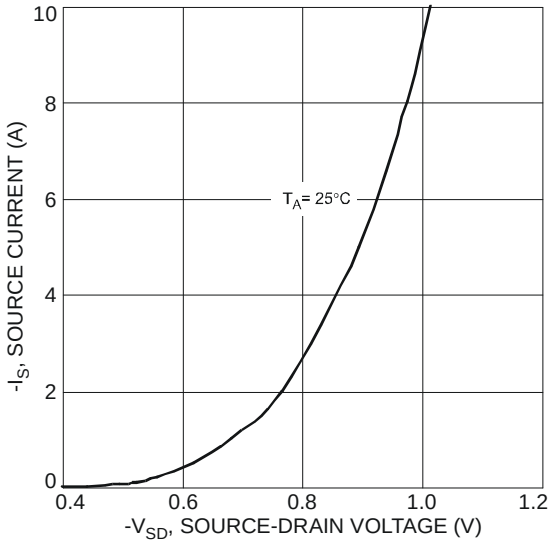


Fig. 8 Diode Forward Voltage vs. Current

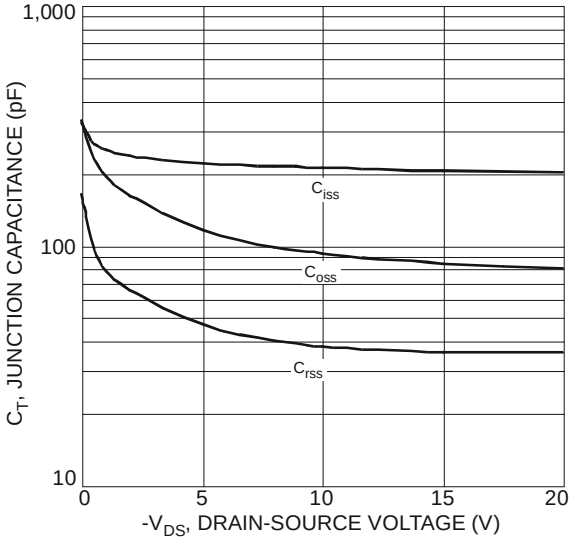


Fig. 9 Typical Junction Capacitance

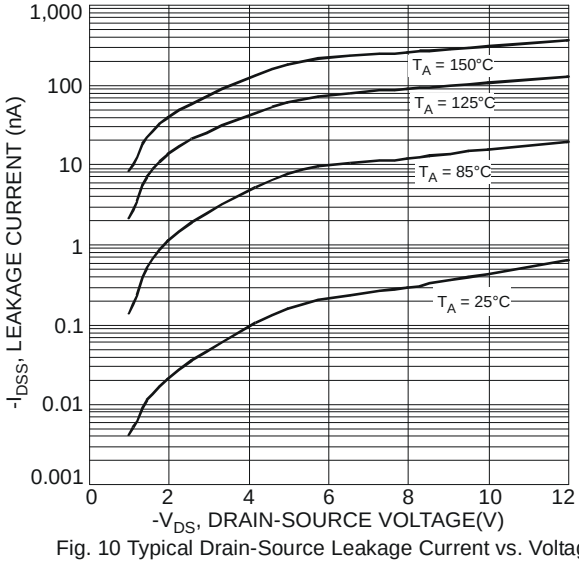


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

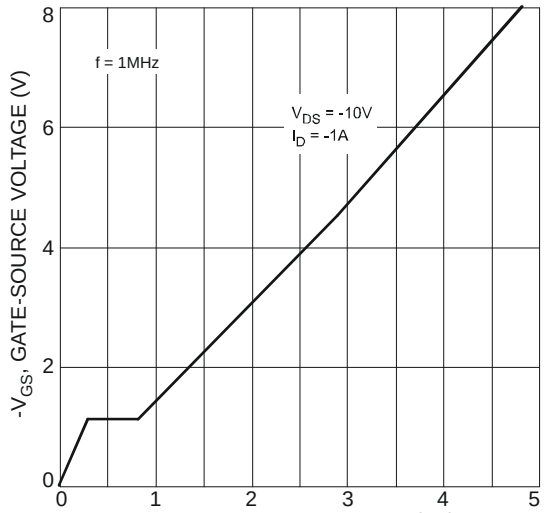


Fig. 11 Gate-Charge Characteristics

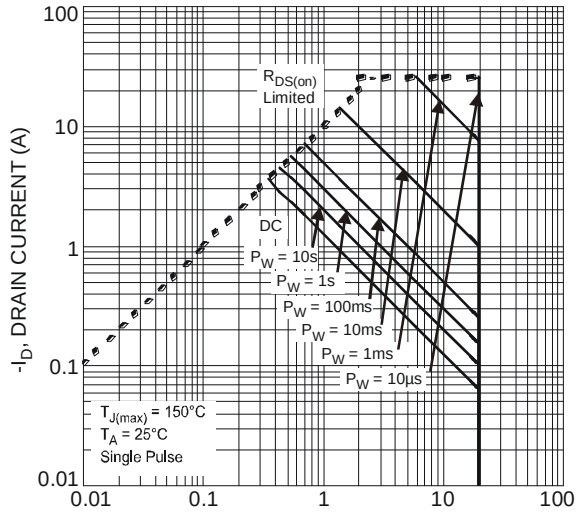


Fig. 12 SOA, Safe Operation Area

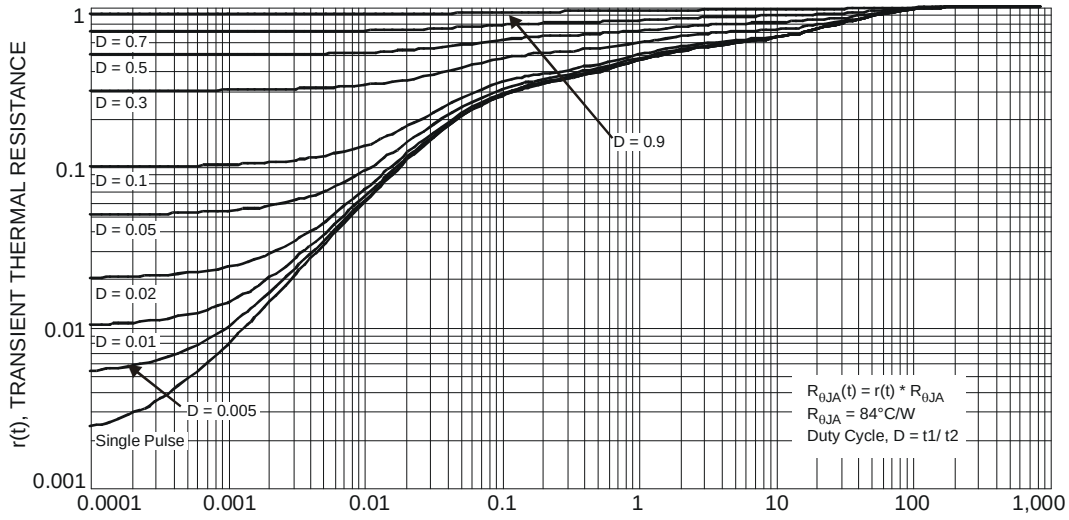
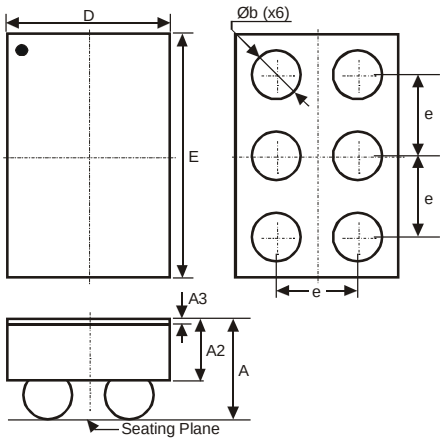


Fig. 13 Transient Thermal Resistance

Package Outline Dimensions

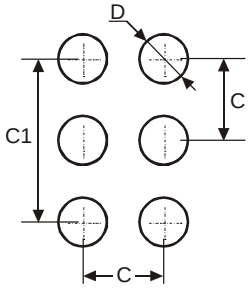
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



U-WLB1510-6			
Dim	**Min**	**Max**	**Typ**
D	0.90	1.00	1.00
E	1.40	1.50	1.50
A	–	0.62	–
A2	–	–	0.38
A3	0.020	0.030	0.025
b	0.27	0.37	0.32
e	–	–	0.50
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)
C	0.50
C1	1.00
D	0.25

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