

N-CHANNEL ENHANCEMENT MODE FIELD MOSFET
Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	Package	I_S $T_A = +25^\circ C$
24V	26m Ω @ $V_{GS} = 4.5V$	X1-WLB1818-4	6.0A

Description

This new generation MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) with thin WLCSP packaging process and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

- Battery Management
- Load Switch
- Battery Protection

Features

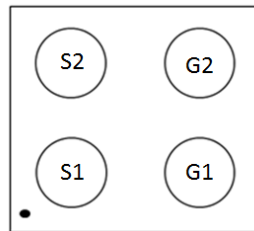
- Built-in G-S Protection Diode Against ESD 2kV HBM
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

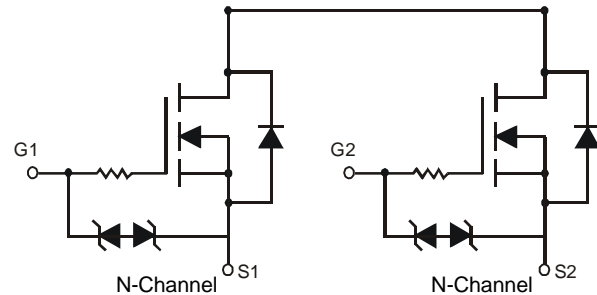
- Case: X1-WLB1818-4
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram



X1-WLB1818-4



Top View



Equivalent Circuit

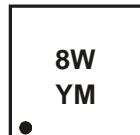
Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2023UCB4-7	X1-WLB1818-4	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

X1-WLB1818-4



8W = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: Y = 2011)
 M or \bar{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 _{SSS}	24	V
Gate-Source Voltage (Note 5)			V _{GSS}	±12	V
Continuous Source Current @ T _A = +25°C (Note 6)	Steady State	T _A = +25°C	I _S	6.0	A
		T _A = +70°C		4.8	
Pulsed Source Current @ T _A = +25°C (Notes 6 & 7)			I _{SM}	20	A

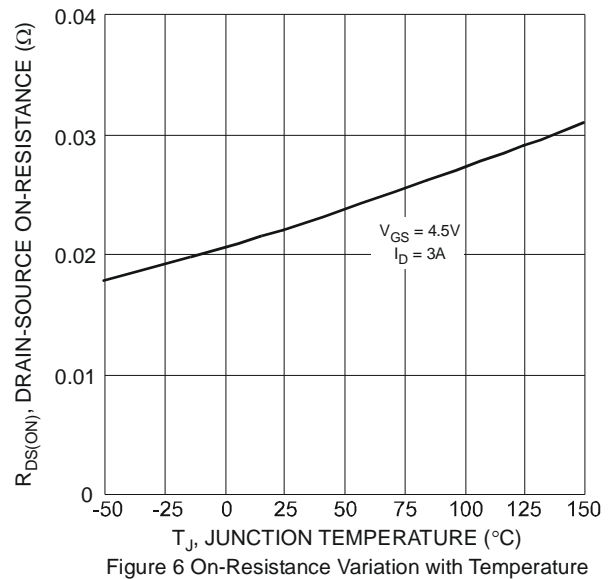
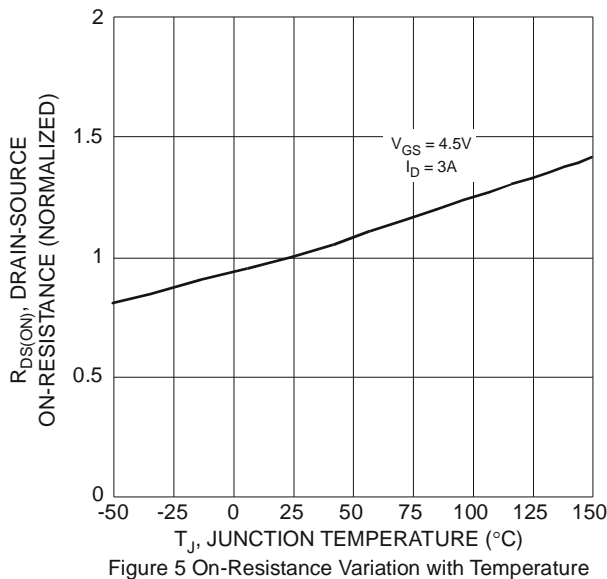
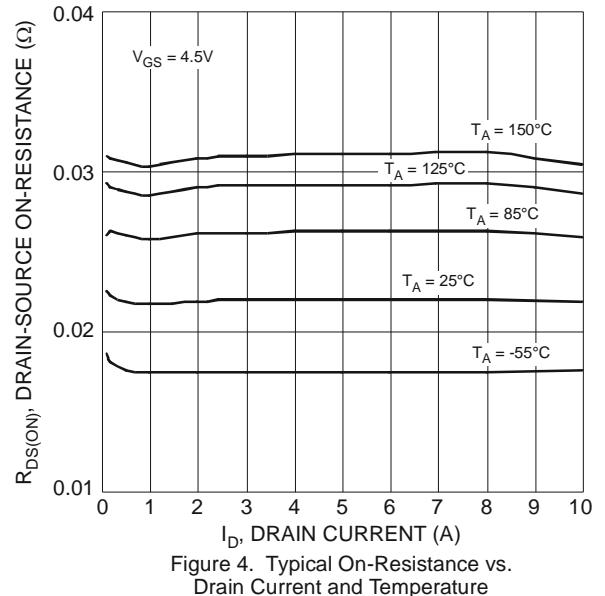
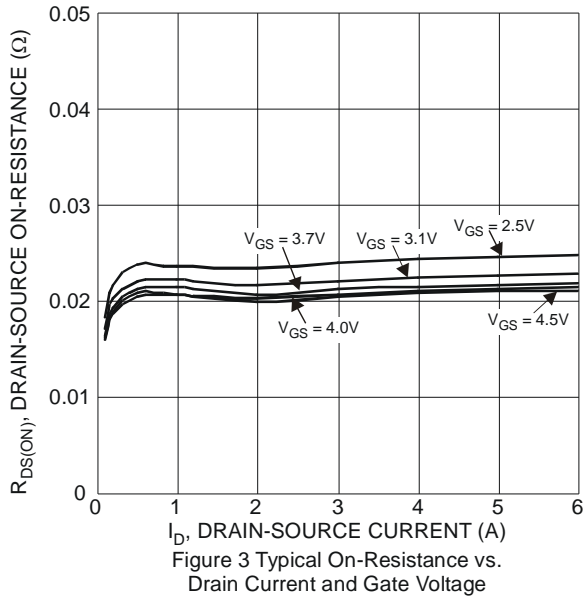
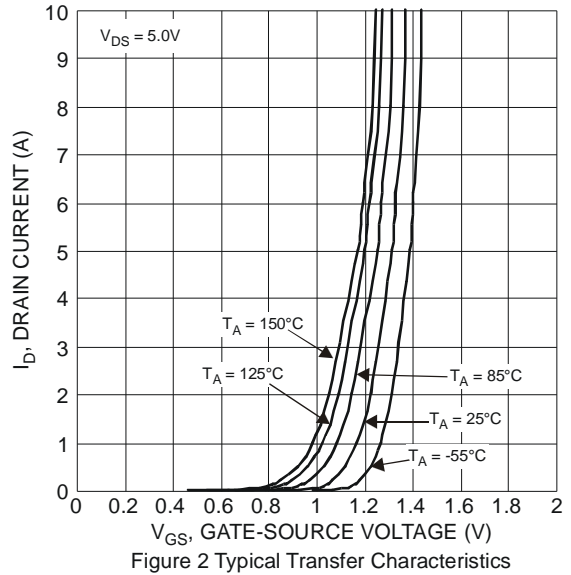
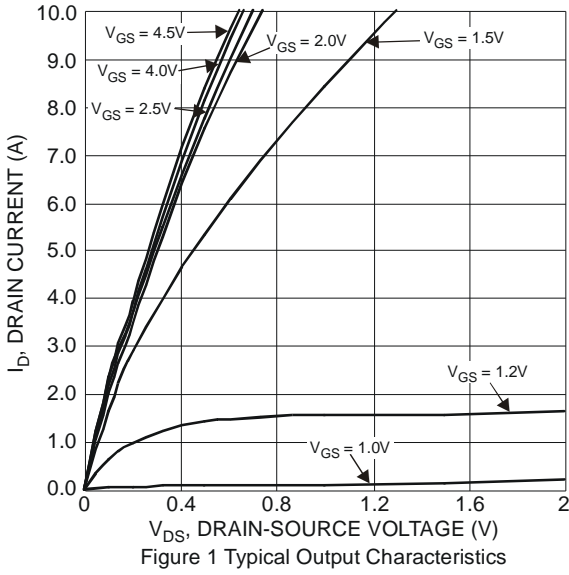
Thermal Characteristics

Characteristic	Symbol	Value	Units
Power Dissipation, @ T _A = +25°C (Note 6)	P _D	1.45	W
Thermal Resistance, Junction to Ambient @ T _A = +25°C (Note 6)	R _{θJA}	88.21	°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 8)						
Source to Source Breakdown Voltage T _J = +25°C	V _{(BR)SS}	24	—	—	V	I _S = 1mA, V _{GS} = 0V TEST CIRCUIT 1
Zero Gate Voltage Source Current T _J = +25°C	I _{SSS}	—	—	1.0	μA	V _{SS} = 20V, V _{GS} = 0V TEST CIRCUIT 1
Gate-Body Leakage	I _{GSS}	—	—	±10	μA	V _{GS} = ±8V, V _{DS} = 0V TEST CIRCUIT 2
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(th)}	0.5	—	1.3	V	V _{SS} = 10V, I _S = 1.0mA TEST CIRCUIT 3
Static Source -Source On-Resistance	R _{SS(ON)}	17	21.5	25.5	mΩ	V _{GS} = 6.5V, I _S = 3.0A TEST CIRCUIT 5
		17.5	22	26		V _{GS} = 4.5V, I _S = 3.0A TEST CIRCUIT 5
		18.5	23	27		V _{GS} = 4.0V, I _S = 3.0A TEST CIRCUIT 5
		19	23.5	29		V _{GS} = 3.7V, I _S = 3.0A TEST CIRCUIT 5
		19.5	24	33		V _{GS} = 3.1V, I _S = 3.0A TEST CIRCUIT 5
		21.5	27	40		V _{GS} = 2.5V, I _S = 3.0A TEST CIRCUIT 5
Forward Transfer Admittance	Y _{fs}	—	12	—	S	V _{SS} = 10V, I _S = 3.0A TEST CIRCUIT 4
Body Diode Forward Voltage	V _{F(S-S)}	—	0.7	1	V	I _F = 3.0A, V _{GS} = 0V, TEST CIRCUIT 6
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iss}	—	2564	3333	pF	V _{SS} = 10V, V _{GS} = 0V, f = 1.0MHz TEST CIRCUIT 7
Output Capacitance	C _{oss}	—	197	275		
Reverse Transfer Capacitance	C _{rss}	—	183	260		
Total Gate Charge	Q _g	—	29	37	nC	V _{GS} = 4.5V, V _{SS} = 10V, I _S = 6A TEST CIRCUIT 9
Turn-On Delay Time	t _{D(on)}	—	10	15	ns	V _{DD} = 10V, R _L = 3.33Ω, I _S = 3.0A TEST CIRCUIT 8
Turn-On Rise Time	t _r	—	20	—	ns	
Turn-Off Delay Time	t _{D(off)}	—	75	110	ns	
Turn-Off Fall Time	t _f	—	29	—	ns	

- Notes:
5. AEC-Q101 VGS maximum is ±9.6V.
 6. Device mounted on FR4 material with 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu.
 7. Repetitive rating, pulse width limited by junction temperature.
 8. Short duration pulse test used to minimize self-heating effect.
 9. Guaranteed by design. Not subject to production testing.



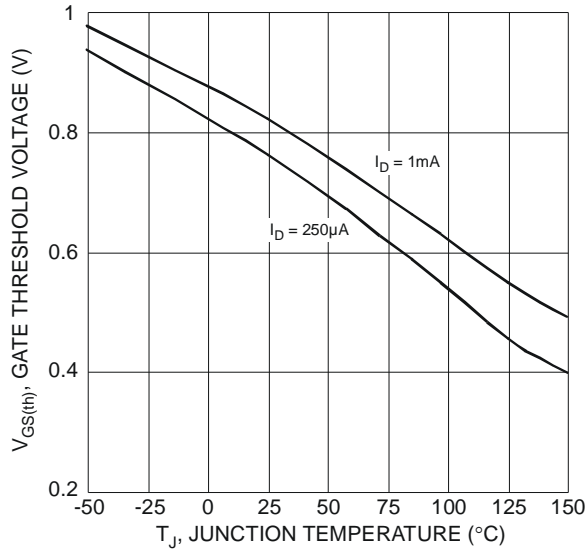


Figure 7 Gate Threshold Variation vs. Ambient Temperature

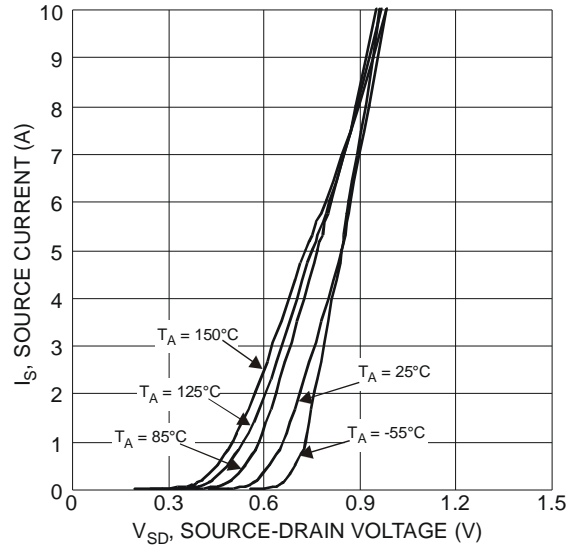


Figure 8 Diode Forward Voltage vs. Current

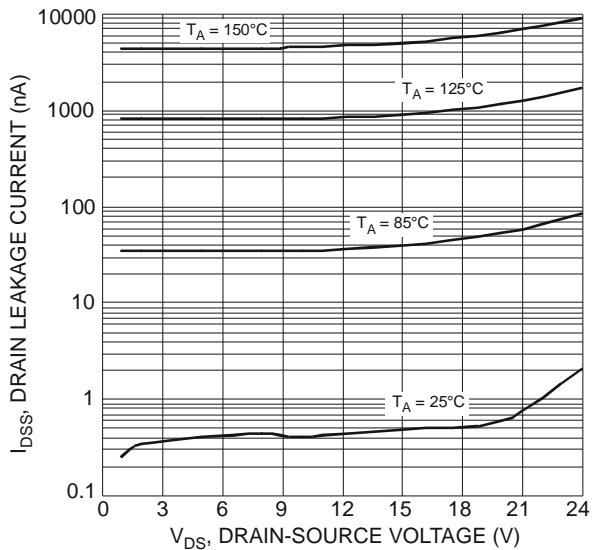


Figure 9 Typical Drain-Source Leakage Current vs. Voltage

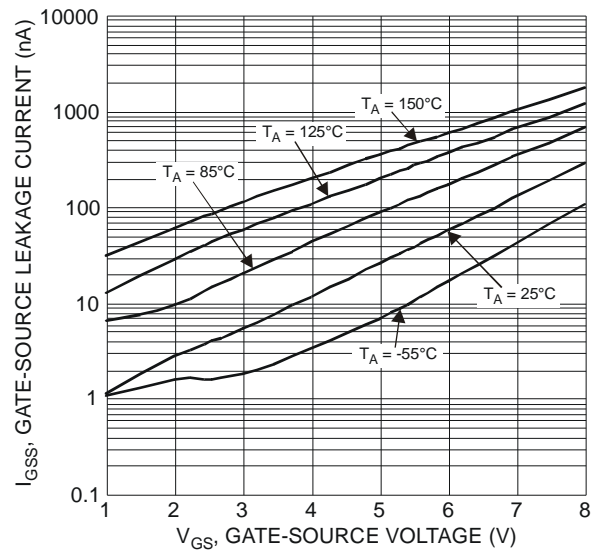


Figure 10 Typical Gate-Source Leakage Current vs. Gate-Source Voltage

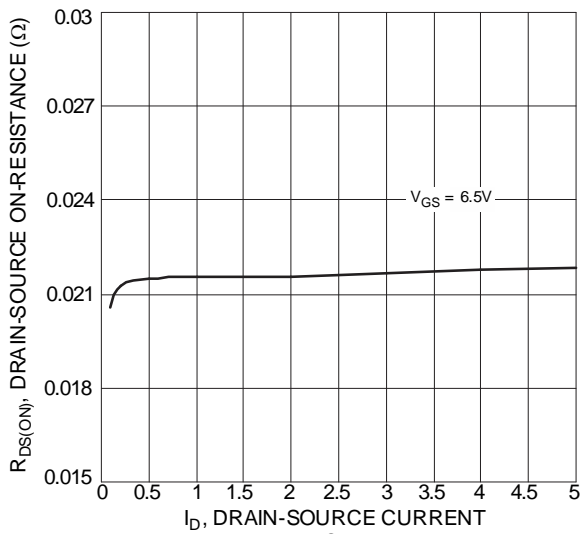


Figure 11 Typical On-Resistance vs. Drain Current and Gate Voltage

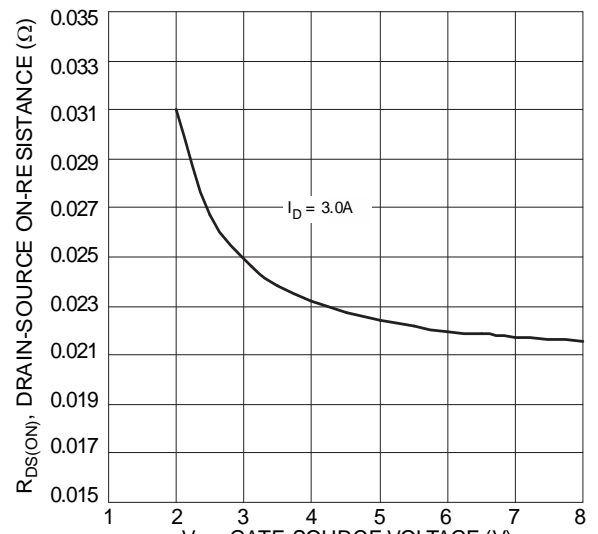
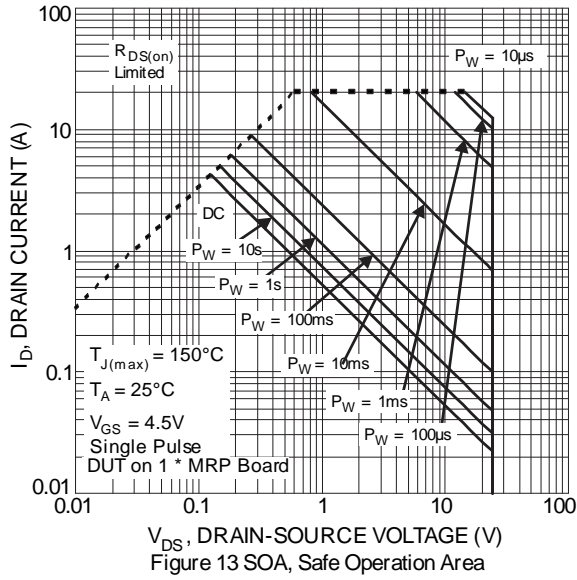
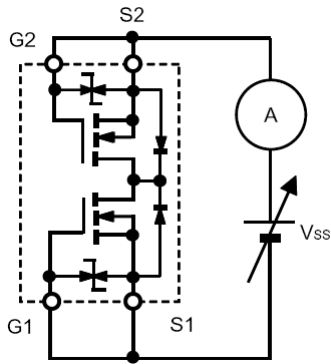


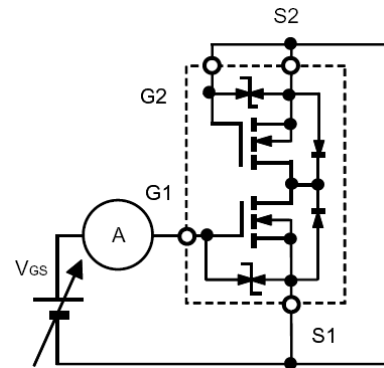
Figure 12 Typical Transfer Characteristic



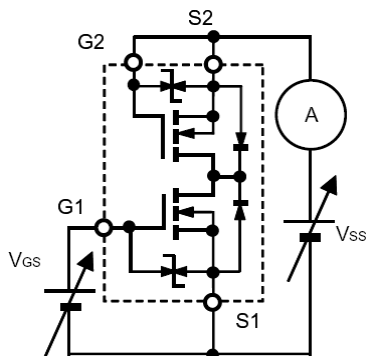
Test Circuits



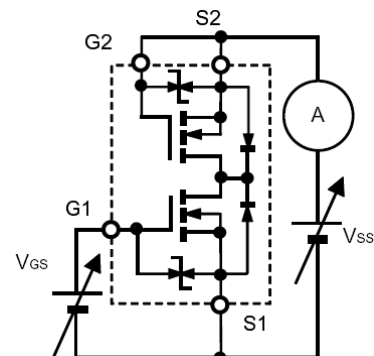
TEST CIRCUIT 1 I_{css}



TEST CIRCUIT 2 I_{css}
When FET1 is measured, between GATE and SOURCE of FET2 are shorted.

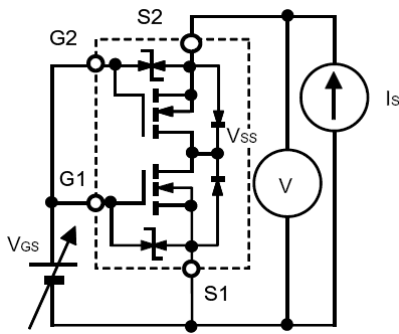


TEST CIRCUIT 3 $V_{GS(off)}$
When FET1 is measured, between GATE and SOURCE of FET2 are shorted.

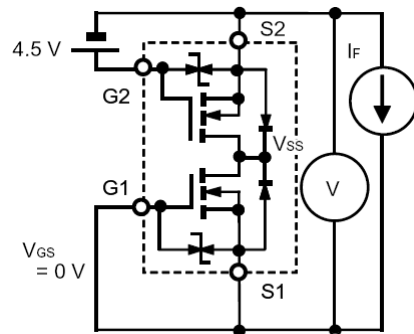


TEST CIRCUIT 4 $|y_{fs}|$
 $\Delta I_D / \Delta V_{GS}$

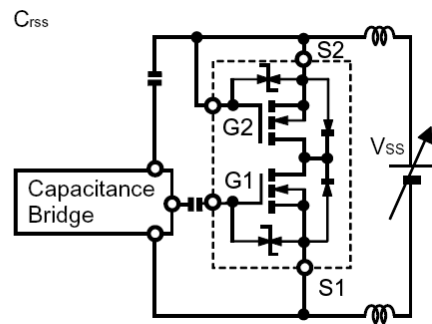
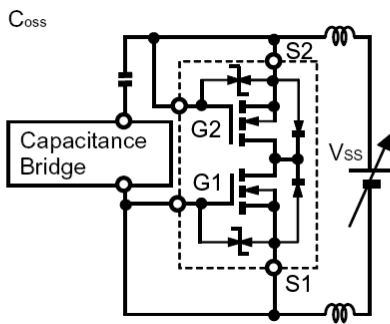
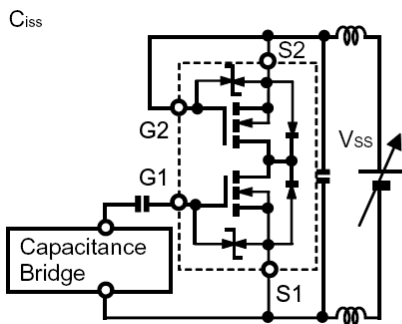
Test Circuits (cont.)



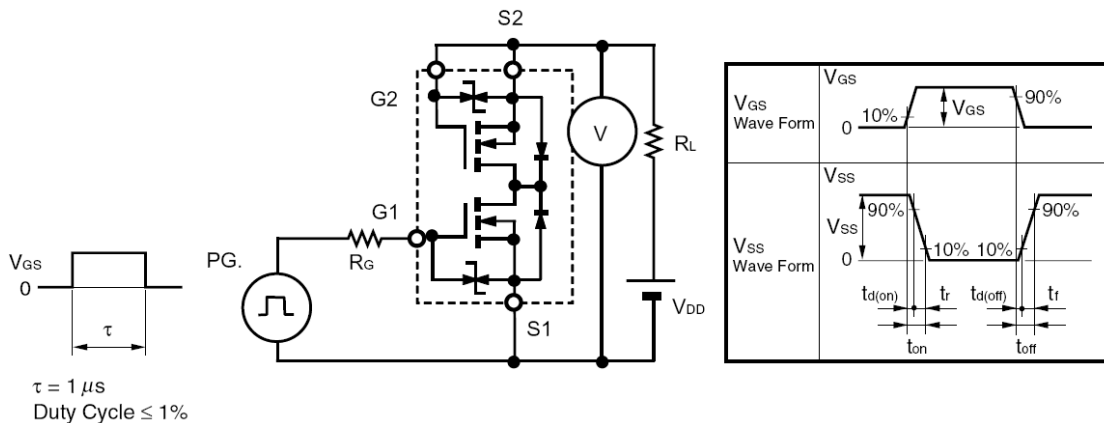
TEST CIRCUIT 5 $R_{SS(on)}$
 V_{SS}/I_S



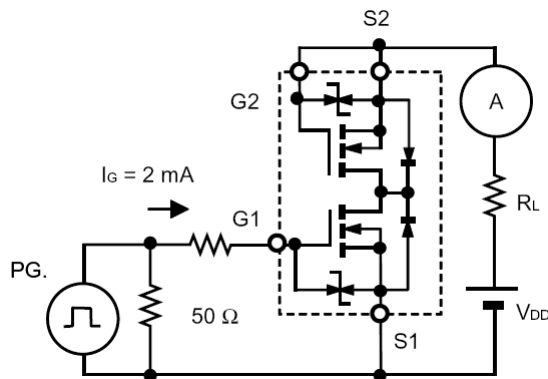
TEST CIRCUIT 6 $V_{F(S-S)}$
When FET1 is measured, FET2 is added $V_{GS} +4.5V$.



TEST CIRCUIT 7



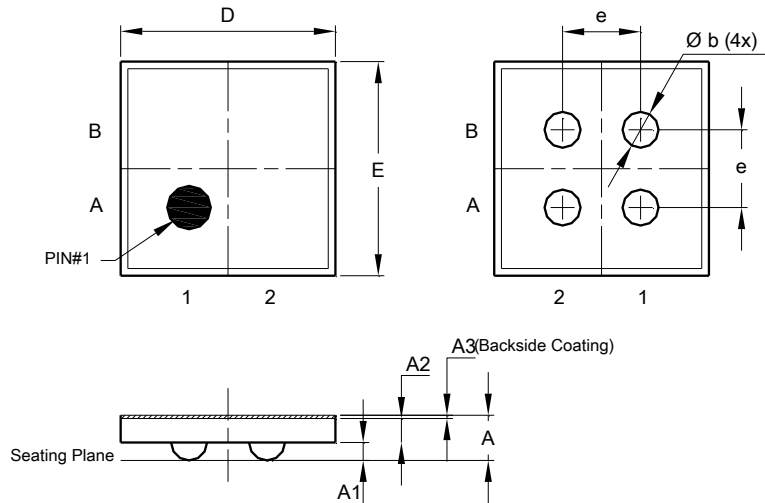
TEST CIRCUIT 8 $t_{d(on)}$, t_r , $t_{d(off)}$, t_f



TEST CIRCUIT 9 Q_G

Package Outline Dimensions

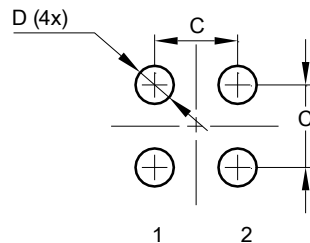
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version



X1-WLB1818-4			
Dim	Min	Max	Typ
A	0.3420	0.4080	0.3750
A1	0.1350	0.1650	0.1500
A2	0.1850	0.2150	0.2000
A3	0.0220	0.0280	0.0250
b	0.2700	0.3300	0.3000
D	1.7800	1.8000	1.7900
E	1.7800	1.8000	1.7900
e	0.650 BSC		
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	0.650
D	0.300

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