SYNCHRONOUS MOSFET CONTROLLER IN SOT26

Description

The ZXGD3113W6 is intended to drive a MOSFET configured as an ideal diode replacement. The device is comprised of a differential amplifier detector stage and high current driver. The detector monitors the reverse voltage of the MOSFET, such that if the body diode conduction occurs, a positive voltage is applied to the MOSFET's Gate Pin.

Once the positive voltage is applied to the Gate, the MOSFET switches on. The detector's output voltage is then proportional to the MOSFET Drain-Source voltage, and this is applied to the Gate via the driver. This action provides a rapid MOSFET turn-off at zero Drain current.

Applications

- Flyback Converters

Features

- 3.5V to 40V V_{CC} Range
- Operating up to 250kHz
- Suitable for Discontinuous Conduction Mode (DCM), Critical Conduction Mode (CrCM), and Continuous Conduction Mode (CCM) Operation
- Proportional Gate Drive Control
- Detector Threshold Voltage: -10mV
- Standby Current: 6mA
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

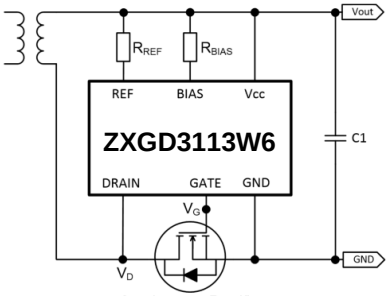
Mechanical Data

- Case: SOT26
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish – Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.018 grams (Approximate)

SOT26

Top View

Typical Configuration



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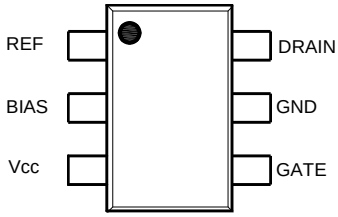

Top View
Pin-Out

Ordering Information (Note 4)

Product	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXGD3113W6-7	2B2	7	8	3000

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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

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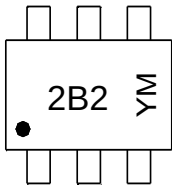


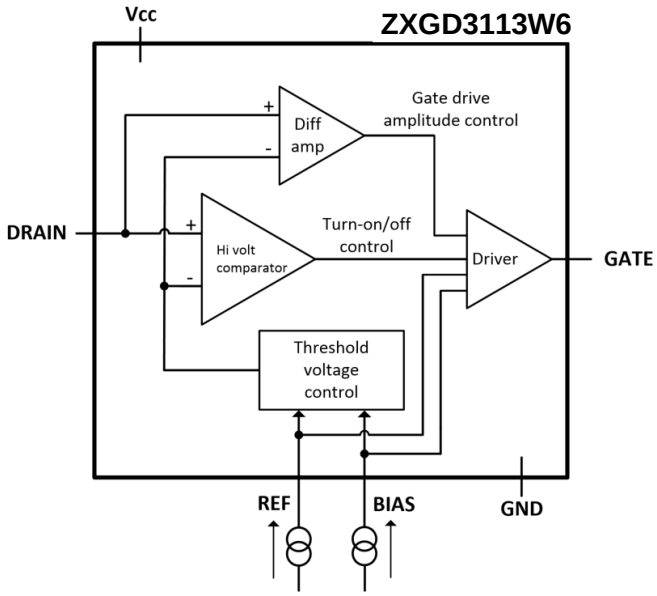
2B2 = Product Type Marking Code
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: E = 2017)
M or $\overline{M}$ = Month (ex: 9 = September)

Date Code Key

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Code	E	F	G	H	I	J	K	L	M	N	O

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

Functional Block Diagram



Pin Number	Name	Description and Function
1	REF	**Reference** This pin is connected to V_{CC} via a resistor, R_{REF}. R_{REF} sets the source current into this pin
2	BIAS	**Bias** This pin is connected to V_{CC} via a resistor, R_{BIAS}. R_{BIAS} sets the source current into this pin.
3	V_{CC}	**Power Supply** This is the supply pin. It is recommended to decouple this point to Ground closely with a ceramic capacitor.
4	GATE	**Gate Drive** This pin sources and sinks current to and from the synchronous MOSFET Gate.
5	GND	**Ground** This is the ground reference point. Connect to the synchronous MOSFET Source terminal.
6	DRAIN	**Drain** This pin is connected to the Drain pin of the synchronous MOSFET.

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Supply Voltage, Relative to GND	V_{CC}	40	V
Drain Pin Voltage	V_D	-3 to 160	V
Gate Output Voltage	V_G	-3 to V_{CC} +3	V
Gate Driver Peak Source Current	I_{SOURCE}	1.5	A
Gate Driver Peak Sink Current	I_{SINK}	3	A
Reference Voltage	V_{REF}	V_{CC}	V
Reference Current	I_{REF}	25	mA
Bias Voltage	V_{BIAS}	V_{CC}	V
Bias Current	I_{BIAS}	100	mA

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

Characteristic		Symbol	Value	Unit
Power Dissipation Linear Derating Factor	(Note 5)	P_D	500 5	mW mW/°C
	(Note 6)		731 5.8	
	(Note 7)		868 6.9	
	(Note 8)		1016 8.1	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	250	°C/W
	(Note 6)		171	
	(Note 7)		144	
	(Note 8)		123	
Thermal Resistance, Junction to Lead	(Note 9)	$R_{\theta JL}$	105	°C/W
Operating Temperature Range		T_J	-40 to +150	°C
Storage Temperature Range		T_{STG}	-55 to +150	

ESD Ratings (Note 10)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4000	V	3A
Electrostatic Discharge – Charged Device Model	ESD CDM	1000	V	IV
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

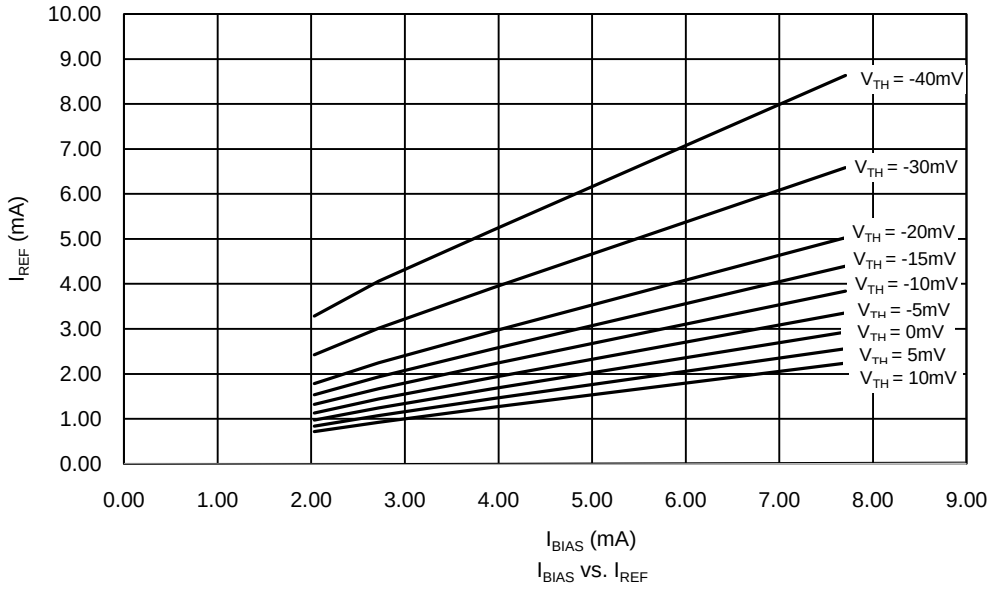
Notes:
5. For a device surface mounted on minimum recommended pad layout FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
6. Same as Note 5, except Pin 3 (V_{CC}) and Pin 2 (BIAS) are both connected to separate 5mm x 5mm 1oz copper heatsinks.
7. Same as Note 6, except both heatsinks are 10mm x 10mm.
8. Same as Note 6, except both heatsinks are 15mm x 15mm.
9. Thermal resistance from junction to solder-point at the end of each lead on Pin 3 (V_{CC}) and Pin 2 (Bias).
10. Refer to JEDEC specification JESD22-A114 JESD22-A115 and JESD22-C101.

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

V_{CC} = 19V; R_{BIAS} = 4.7kΩ; R_{REF} = 8.2kΩ

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Input and Supply						
Quiescent Current	I_Q	—	6.2	—	mA	$V_D \geq 0V$
Gate Driver						
Turn-Off Threshold Voltage	V_T	-20	-10	0	mV	V_G = 1V
Gate Output Voltage	$V_{G(OFF)}$	0	0.73	1.0	V	$V_D \geq 1V$
	V_G	12.5	13.8	V_{CC}		V_D = -50mV
		17	17.8	V_{CC}		V_D = -100mV
Switching Performance for C_{LOAD} = 10nF						
Turn-On Propagation Delay	$t_{D(RISE)}$	—	250	—	ns	—
Turn-Off Propagation Delay	$t_{D(FALL)}$	—	27	—		
Gate Rise Time	t_R	—	187	—		From 10% of V_G to 10V
		—	360	—		From 10% to 90% of V_G
Gate Fall Time	t_F	—	210	—		From 90% to 10% of V_G
Source Current	I_{SOURCE}	—	0.5	—	A	Capacitive Load of 10nF
Sink Current	I_{SINK}	—	1.5	—		

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

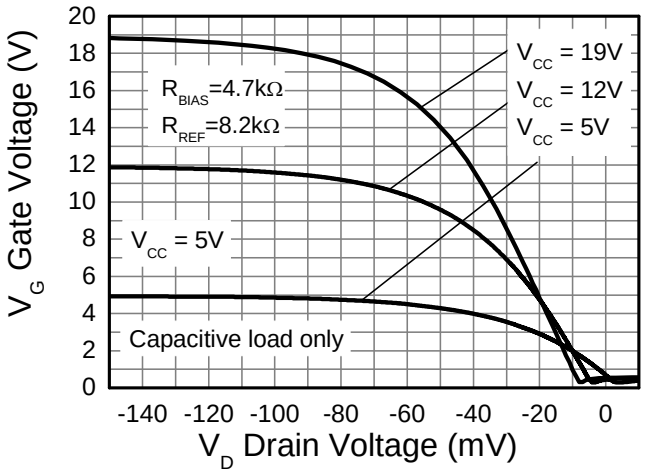


I_{BIAS} vs. I_{REF}

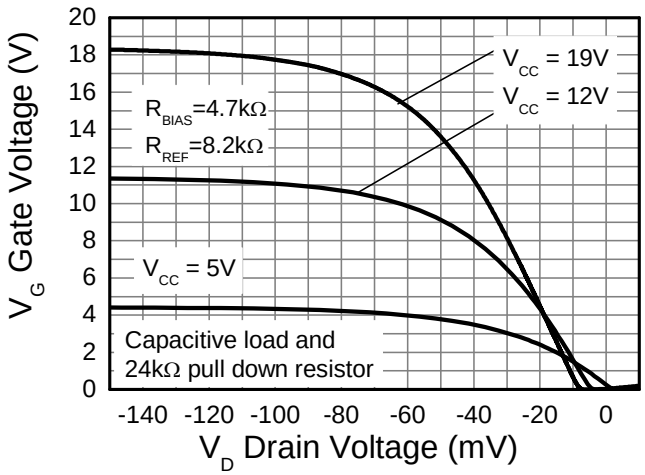
R_{BIAS} = ~ (V_{CC} -0.5)/I_{BIAS}

R_{REF} = ~ (V_{CC} – 0.7)/I_{REF}

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



Transfer Characteristic



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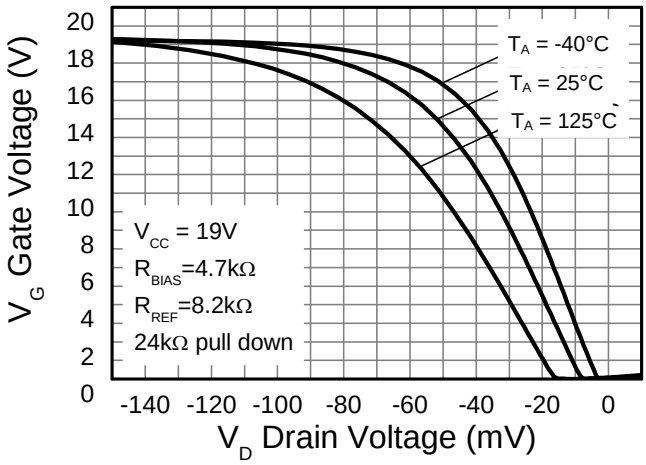

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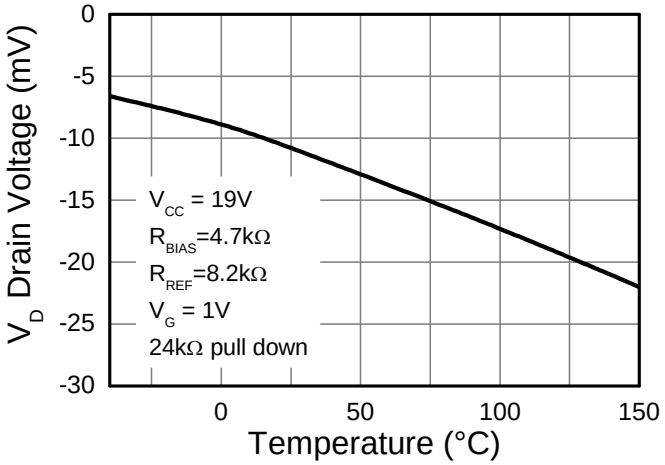
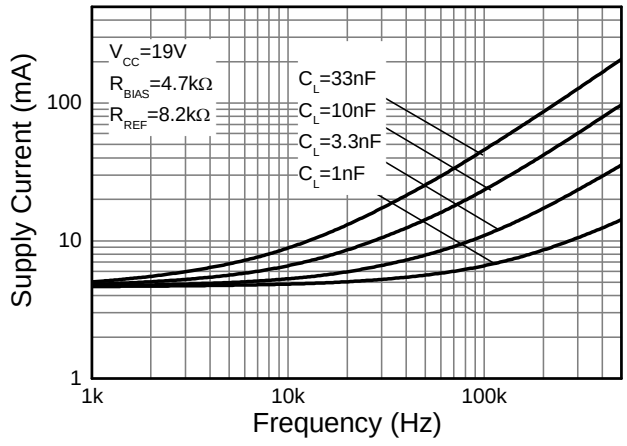
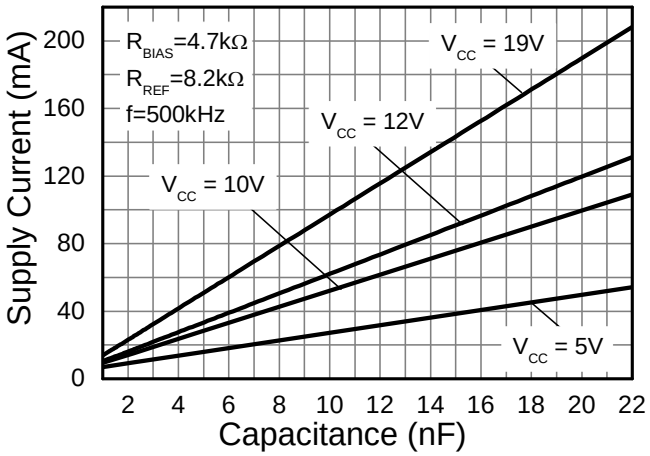


Drain Sense Voltage vs Temperature

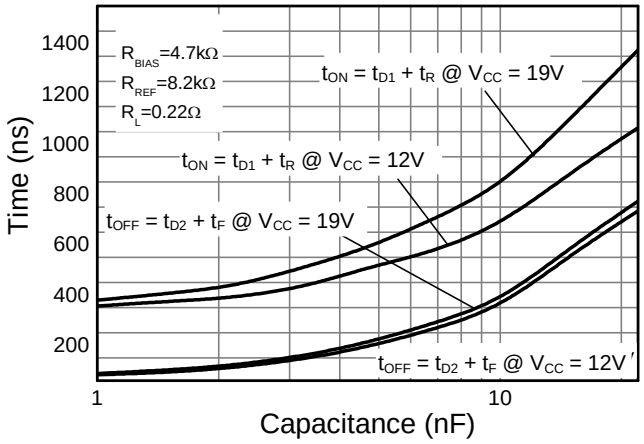


Supply Current vs Frequency

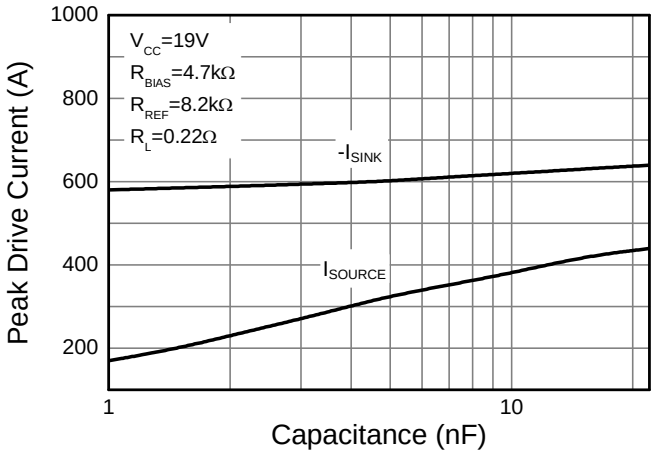


Supply Current vs Capacitive Load

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



Switching vs Capacitive Load



Gate Current vs Capacitive Load

Package Outline Dimensions

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

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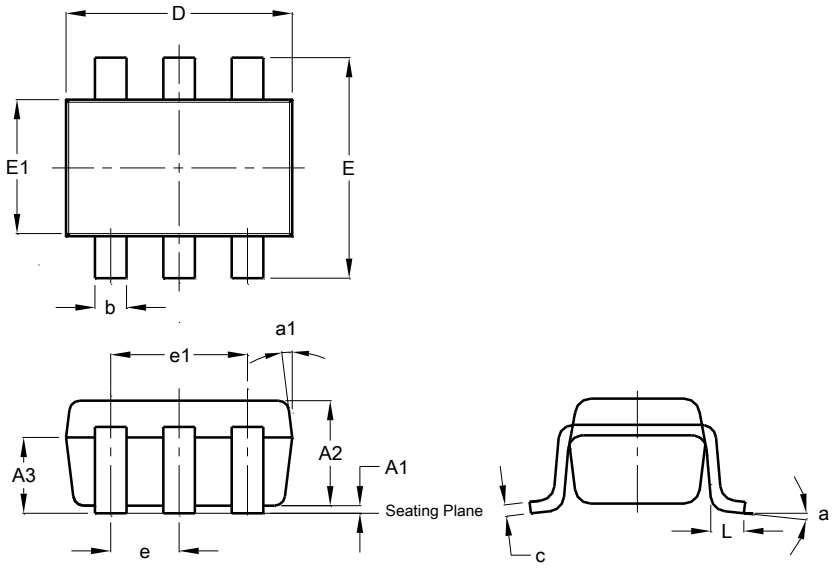

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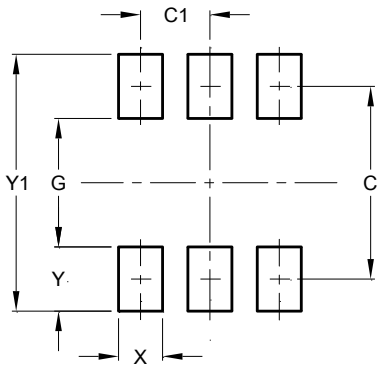
Dim	**Min**	**Max**	**Typ**
A1	0.013	0.10	0.05
A2	1.00	1.30	1.10
A3	0.70	0.80	0.75
b	0.35	0.50	0.38
c	0.10	0.20	0.15
D	2.90	3.10	3.00
e	-	-	0.95
e1	-	-	1.90
E	2.70	3.00	2.80
E1	1.50	1.70	1.60
L	0.35	0.55	0.40
a	-	-	8°
a1	-	-	7°
All Dimensions in mm			

Suggested Pad Layout

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

SOT26



Dimensions	Value (in mm)
C	2.40
C1	0.95
G	1.60
X	0.55
Y	0.80
Y1	3.20

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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