LOW-SIDE IGBT GATE DRIVER WITH OCP IN TSOT26

Description

The DGD44175 is a low-side IGBT gate driver capable of driving 2.6A of peak current. The DGD44175 logic inputs are compatible with standard TTL and CMOS levels (down to 3.3V) to interface easily with MCUs and have a -10Vdc max capability for increased ruggedness on input line.

The OCP function has a -0.25V threshold that turns off the ouputs and brings EN/FLT* to 0V as a fault indicator; also the same pin EN/FLT* can be externally controlled to enable and disable the device. A UVLO turns off the outputs when VCC falls below UVLO threshold and also engages FLT* to L.

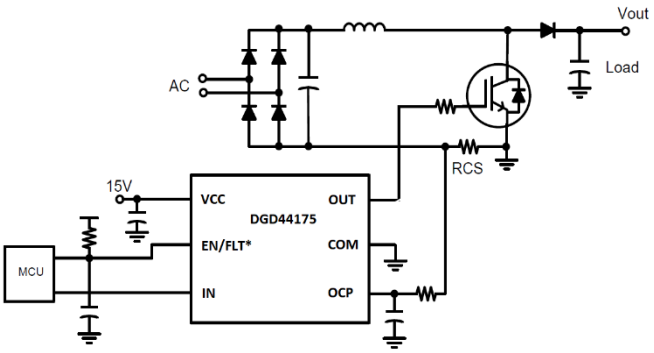
The DGD44175 is offered in the TSOT26 package and the operating temperature extends from -40°C to +125°C.

Features

- Provides Fast Gate Charge to Power IGBTs
- VCC Operating Voltage Range: 13.2V to 20V
- Overcurrent Protection with Negative Voltage Threshold
- -10Vdc Max Input Capability of OCP Pin for Increased Ruggedness on Return Line
- OCP Pin Threshold Negative Voltage (-0.25V) for Negative Current Sense Function
- 3.2A Source / 2.6A Sink Output Current Capability
- Fast Propagation Delays (45ns Typical)
- Fast Rise and Fall Times (10ns Typical)
- Logic Input 3.3V Capability
- Single Pin for Fault Output And Enable
- Programmable Fault Clear Time
- UVLO protection
- Offered in an TSOT26 package
- Extended Temperature Range: -40°C to +125°C
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q101, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Applications

- PFC boost converters
- Appliances
- Air conditioners



Typical Configuration

Mechanical Data

- Package: TSOT26
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Copper Leadframe (Lead Free Plating) Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.013 grams (Approximate)

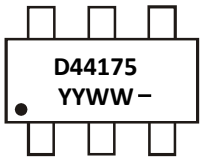
TSOT26
Top View

Ordering Information (Note 4)

Orderable Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty	Carrier
DGD44175WU-7	TSOT26	D44175	7	8	3,000	Reel

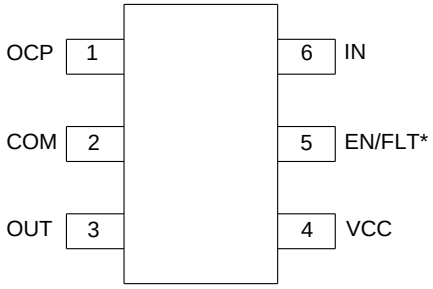
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



D44175 = Product Type Marking Code
YY = Year (ex: 25 = 2025)
WW = Week (01 to 53)
The bar "-" next to "YYWW" indicates SAT assembly

Pin Diagrams

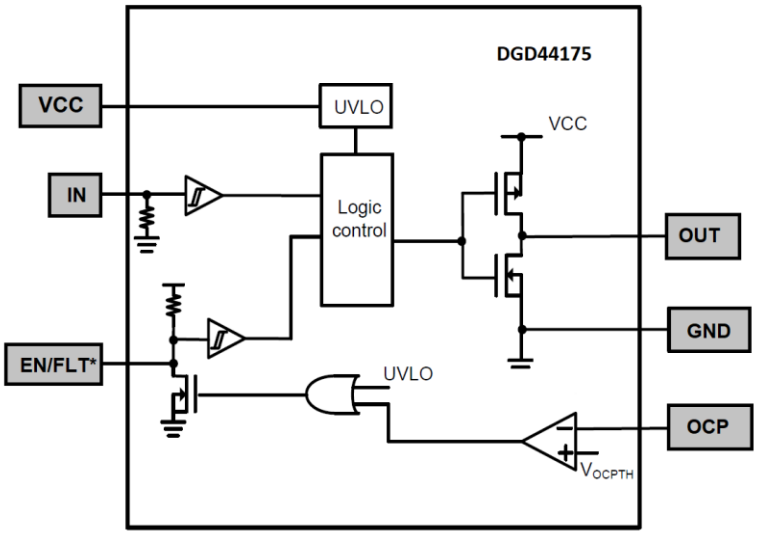


Top View: TSOT26

Pin Descriptions

Pin Number	Pin Name	Function
1	OCP	Overcurrent Protection Sense Pin
2	COM	Supply Return
3	OUT	Gate Drive Output
4	VCC	Supply Input
5	EN/FLT*	Enable/Fault reporting pin: as Enable, the IC is disabled with EN = L; as a Fault reporting pin, FLT* is L when the IC is in UVLO or OCP. For fault clear time, a pullup resistor is needed to logic supply and a cap to GND (see electrical specifications for example values).
6	IN	Logic Input, In Phase with OUT

Functional Block Diagram



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

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	-0.3 to +24	V
Output Voltage (OUT)	V_{OUT}	0 to V_{CC}	V
Voltage at Overcurrent Protection Pin (OCP)	V_{OCP}	-10 to V_{CC}+0.3	V
Voltage at Enable and Fault Reporting Pin (EN/FLT*)	$V_{EN/FLT*}$	-0.3 to V_{CC}+0.3	V
Logic-Input Voltage (IN)	V_{IN}	-10 to V_{CC}+0.3	V

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

Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor (Note 5)	P_D	0.85	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	147	°C/W
Operating Temperature	T_J	+150	°C
Lead Temperature (Soldering, 10s)	T_L	+300	
Storage Temperature Range	T_{STG}	-55 to +150	

Note: 5. For a device mounted with the exposed collector pad on 25mm × 25mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady state.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	13.2	20	V
Output Voltage (OUT)	V_{OUT}	0	V_{CC}	V
Logic-Input Voltage (IN)	V_{IN}	-5	5	V
Voltage at Overcurrent Protection Pin (OCP)	V_{OCP}	-5	V_{CC}	V
Voltage at Enable and Fault Reporting Pin (EN/FLT*)	$V_{EN/FLT*}$	0	5	V
Ambient Temperature	T_A	-40	+125	°C

DC Electrical Characteristics (V_{CC} = 15V, @T_A = +25°C, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Logic “1” Input Voltage, IN and EN	V_{IH}	2.4	2.2	—	V	—
Logic “0” Input Voltage, IN and EN	V_{IL}	—	1.0	0.8	V	—
Logic “1” Input Bias Current, IN	I_{IN+}	35	50	70	µA	V_{IN} = 5V
Logic “0” Input Bias Current, IN	I_{IN-}	—	6	10	µA	V_{IN} = 0V
Quiescent V_{CC} Supply Current	I_{CCQ}	—	0.7	1.2	mA	V_{IN} = 0V or 5V
V_{CC} Supply Undervoltage Positive Going Threshold	V_{CCUV+}	10.9	12.2	13.2	V	—
V_{CC} Supply Undervoltage Negative Going Threshold	V_{CCUV-}	10	11.3	12.3	V	—
High Level Output Voltage, V_{CC} - V_O	V_{OH}	—	0.02	0.1	V	I_O = 2mA
Low Level Output Voltage, V_O	V_{OL}	—	0.02	0.1	V	—
Current Limit Threshold Voltage	V_{OCPTH}	-285	-250	-215	mV	—
Output High Short-Circuit Pulsed Current	I_{O+}	2.0	3.2	—	A	V_O = 15V, PW ≤ 10µs
Output Low Short-Circuit Pulsed Current	I_{O-}	2.0	2.6	—	A	V_O = 0V, PW ≤ 10µs
EN/FLT* Pulldown Sinking Current	I_{FLT*}	18	—	—	mA	$V_{EN/FLT*}$ = 0.4V
Output High Resistance	R_{OH}	—	2.5	—	Ω	I_O = 20mA
Output Low Resistance	R_{OL}	—	1.8	—	Ω	I_O = 20mA

AC Electrical Characteristics (V_{CC} = 15V, C_L = 1000pF, @T_A = +25°C, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Turn-On Rise Time	t_r	—	10	—	ns	—
Turn-Off Fall Time	t_f	—	9	—	ns	—
Turn-On Propagation Delay	t_{ON}	—	45	75	ns	—
Turn-Off Propagation Delay	t_{OFF}	—	28	75	ns	—
Delay Matching	t_{DM}	—	17	—	ns	—
Enable Low to OUT Off Timing	t_{EM_OUT}	—	30	75	ns	—
OCP to OUT Off Timing	t_{OCP_OUT}	—	540	—	ns	—
OCP to EN/FLT* Going L Timing	t_{OCP_FLT*}	—	500	—	ns	—
Fault Clear Time	t_{FLT_CLR}	—	100	—	µs	C_{FLT} = 150pF, R_{FLT} = 1MΩ
Overcurrent Protection Blanking Time	t_{OCP_BLK}	—	180	—	ns	—
V_{CC} UVLO Filter Time	t_{UVLO}	—	2	—	µs	—

Timing Waveforms

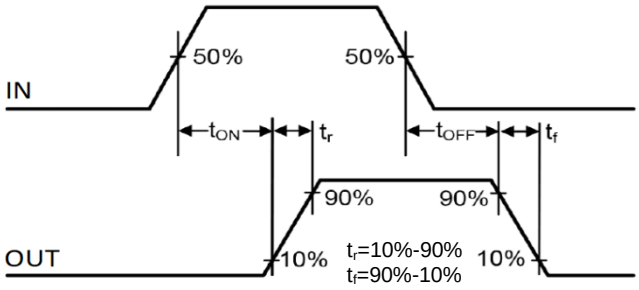


Figure 1. Switching Time Waveform Definitions

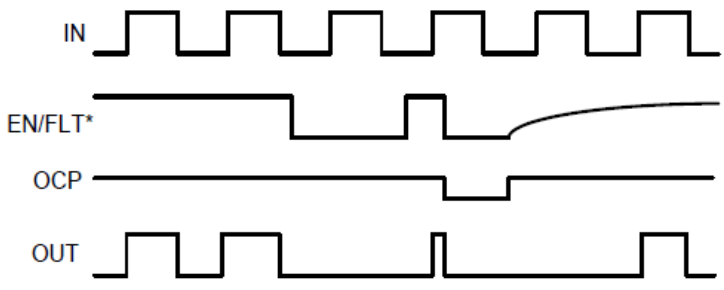


Figure 2. Input/Output timing diagram

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

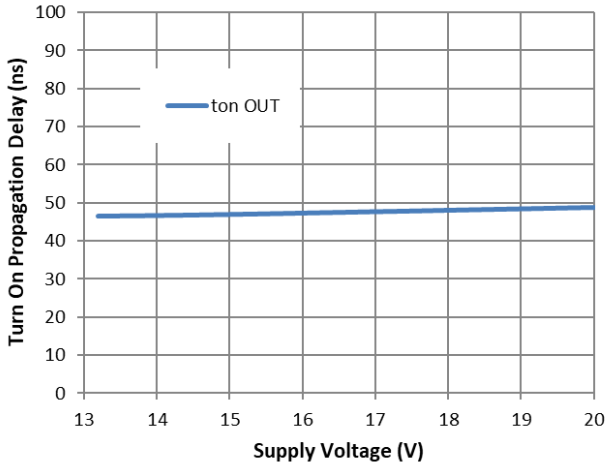


Figure 3. Turn-on Propagation Delay vs. Supply Voltage

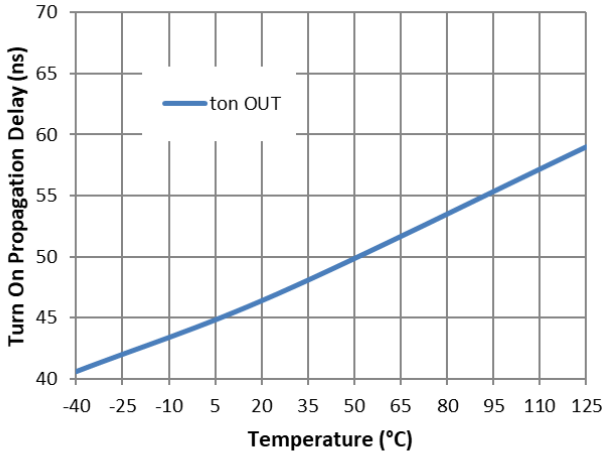


Figure 4. Turn-on Propagation Delay vs. Temperature

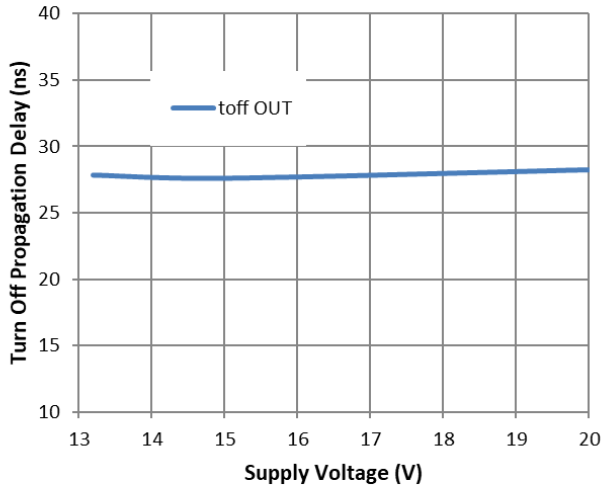


Figure 5. Turn-off Propagation Delay vs. Supply Voltage

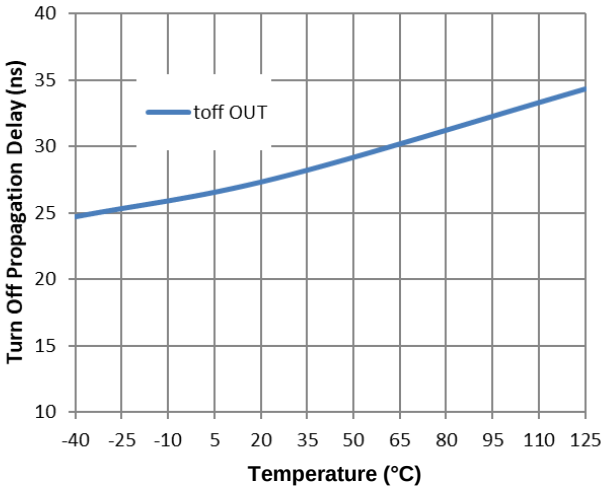


Figure 6. Turn-off Propagation Delay vs. Temperature

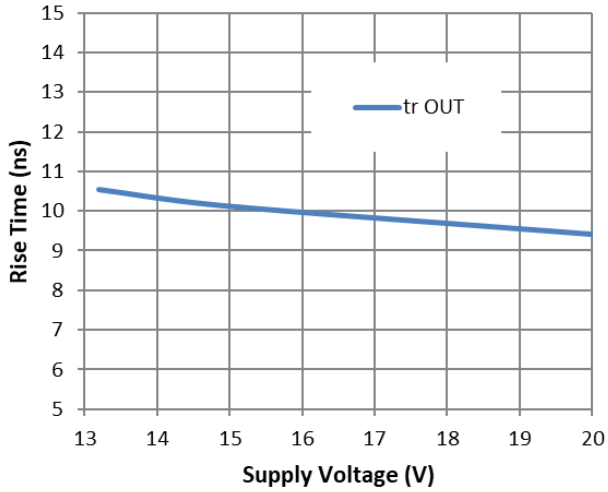


Figure 7. Rise Time vs. Supply Voltage

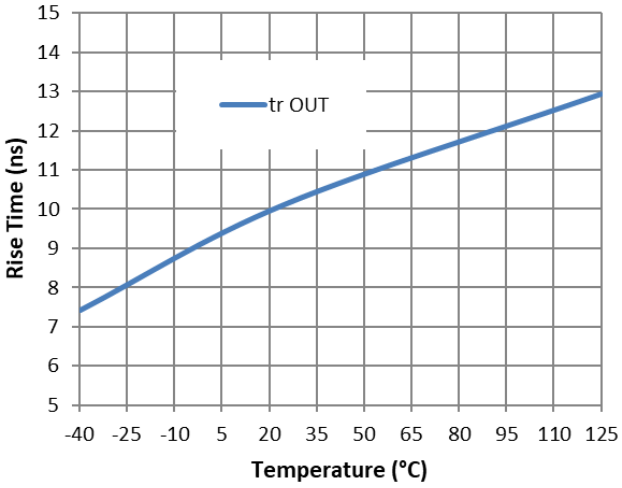


Figure 8. Rise Time vs. Temperature (°C)

Typical Performance Characteristics (@T_A = +25°C, unless otherwise specified.) (continued)

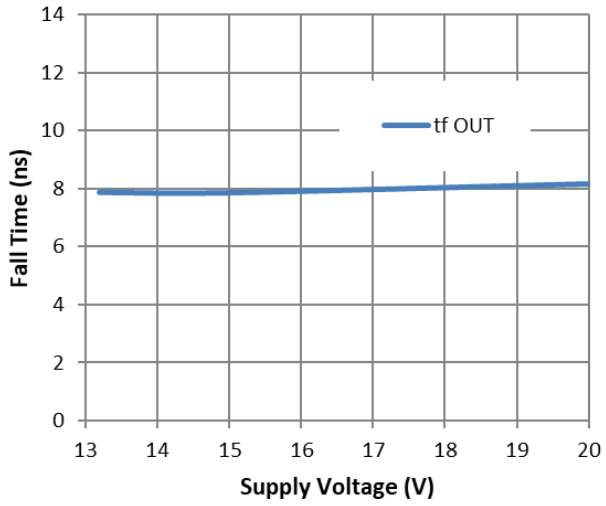


Figure 9. Fall Time vs. Supply Voltage

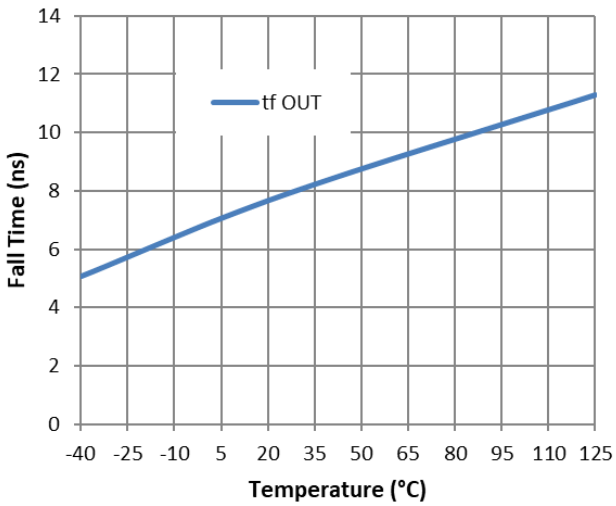


Figure 10. Fall Time vs. Temperature

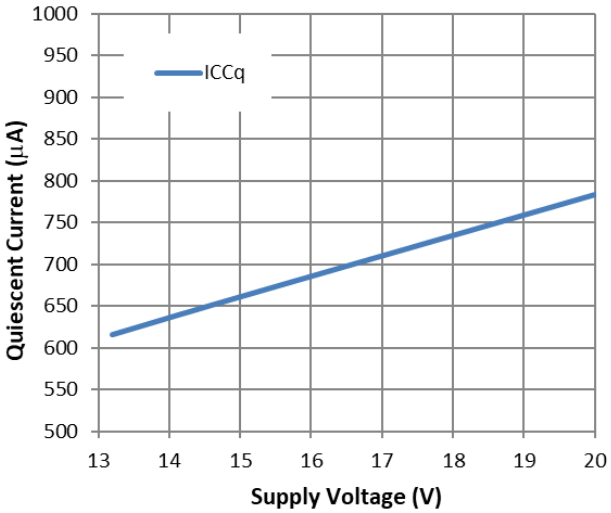


Figure 11. Quiescent Current vs. Supply Voltage

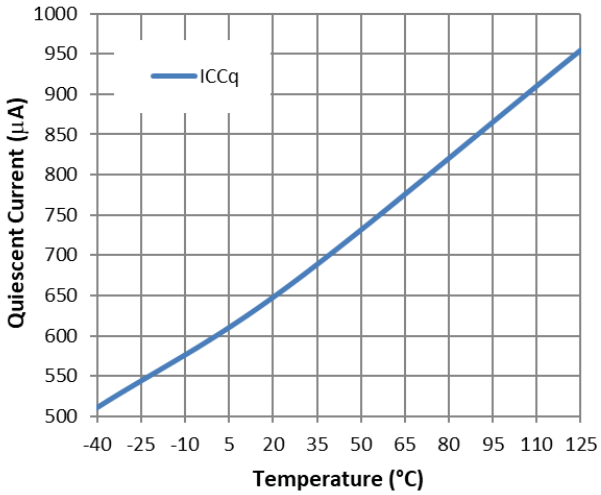


Figure 12. Quiescent Current vs. Temperature

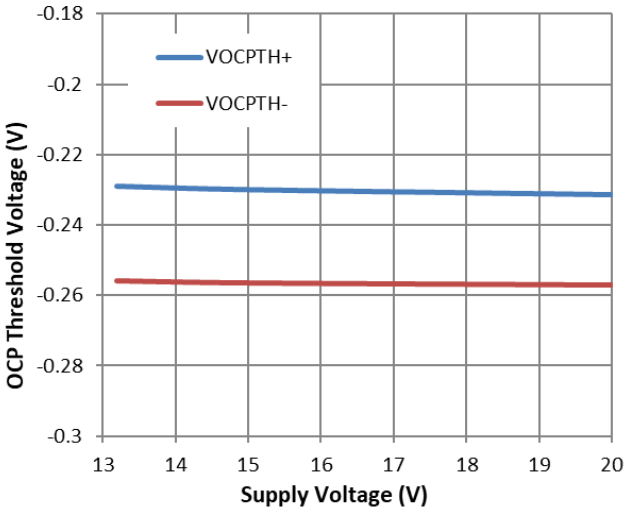


Figure 13. OCP Threshold Voltage vs. Supply Voltage

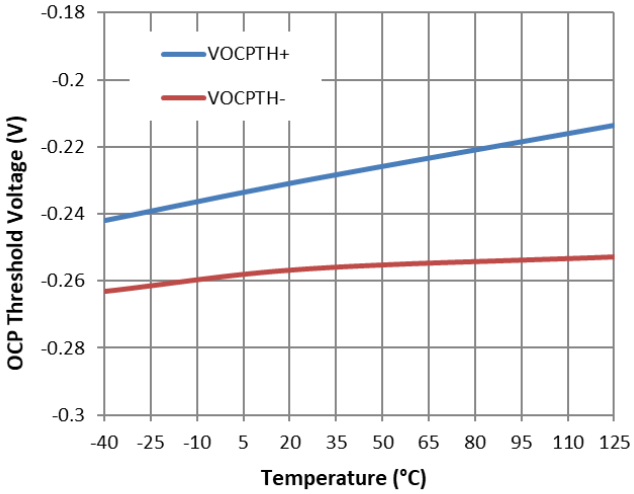


Figure 14. OCP Threshold Voltage vs. Temperature

Typical Performance Characteristics (@T_A = +25°C, unless otherwise specified.) (continued)

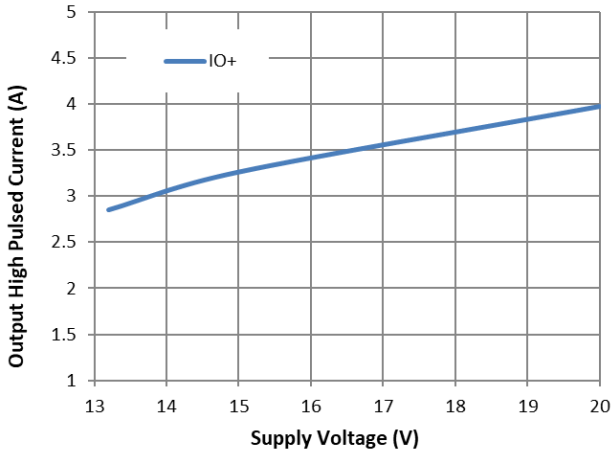


Figure 15. Output High Pulsed Current vs. Supply Voltage

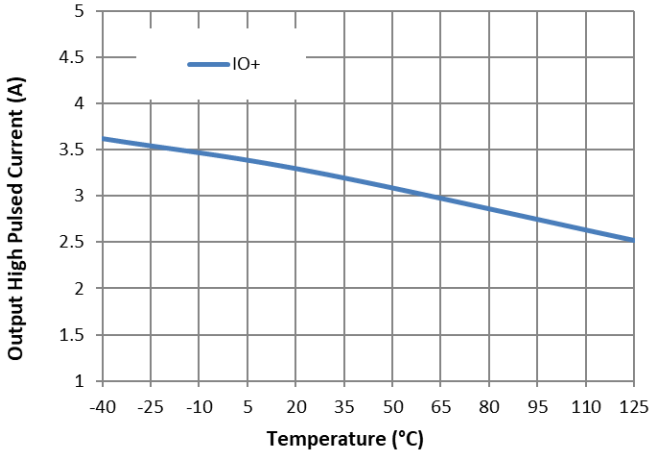


Figure 16. Output High Pulsed Current vs. Temperature

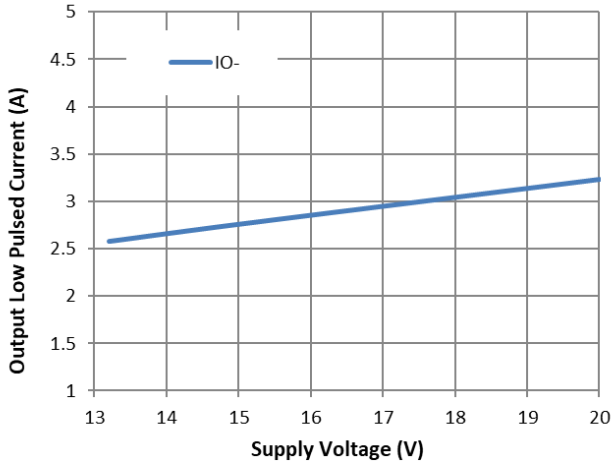


Figure 17. Output Low Pulsed Current vs. Supply Voltage

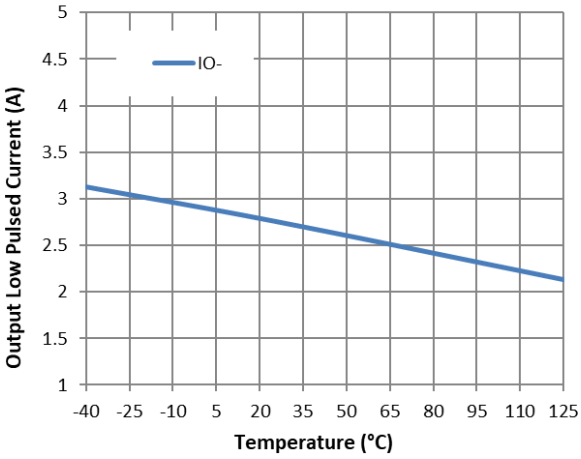


Figure 18. Output Low Pulsed Current vs. Temperature

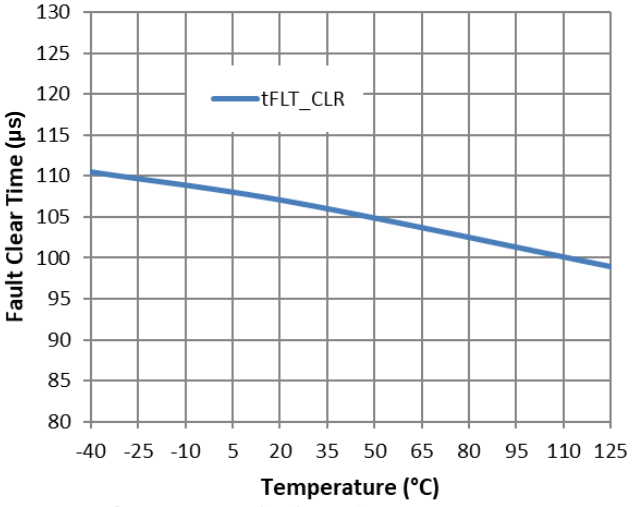


Figure 19. Fault Clear Time vs. Temperature

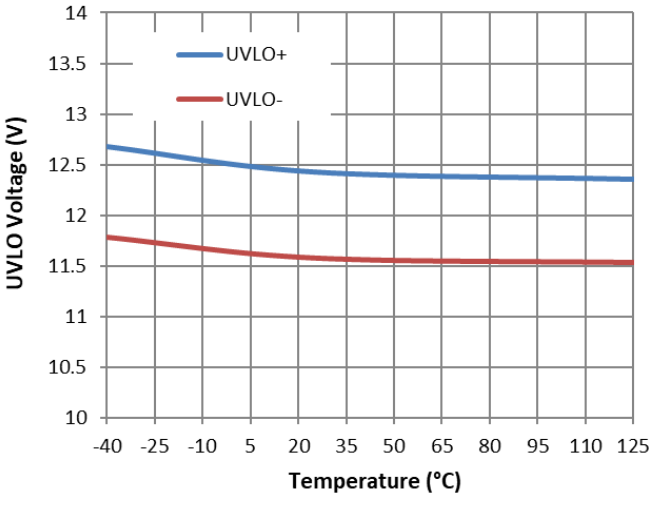


Figure 20. UVLO Voltage vs. Temperature

Typical Performance Characteristics (@T_A = +25°C, unless otherwise specified.) (continued)

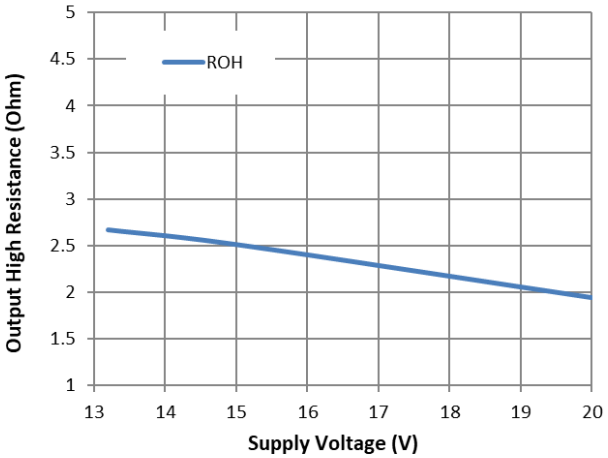


Figure 21. Output High Resistance vs. Supply Voltage

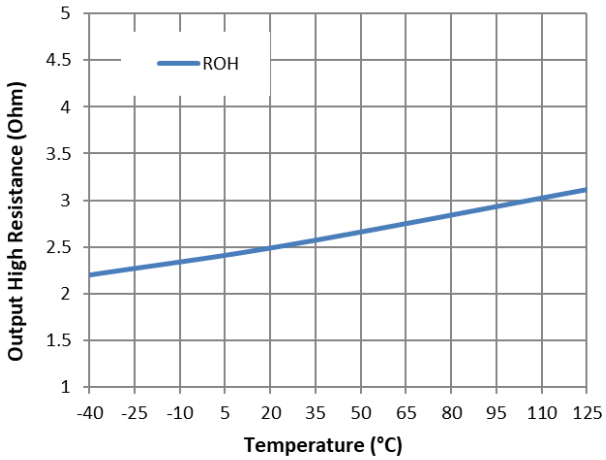


Figure 22. Output High Resistance vs. Temperature

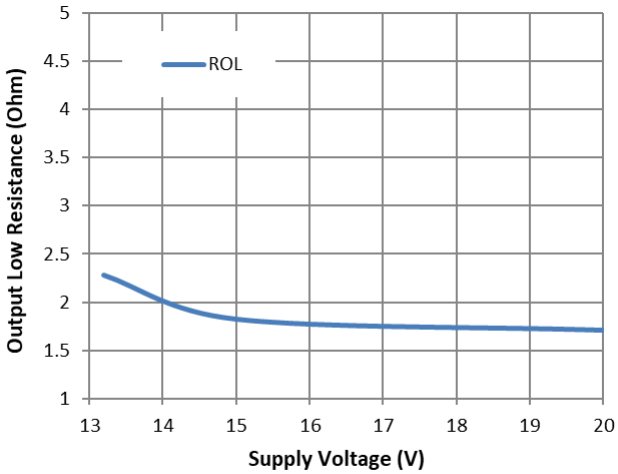


Figure 23. Output Low Resistance vs. Supply Voltage

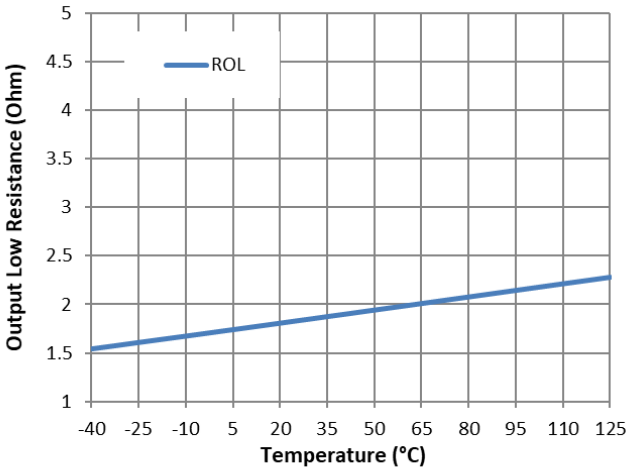
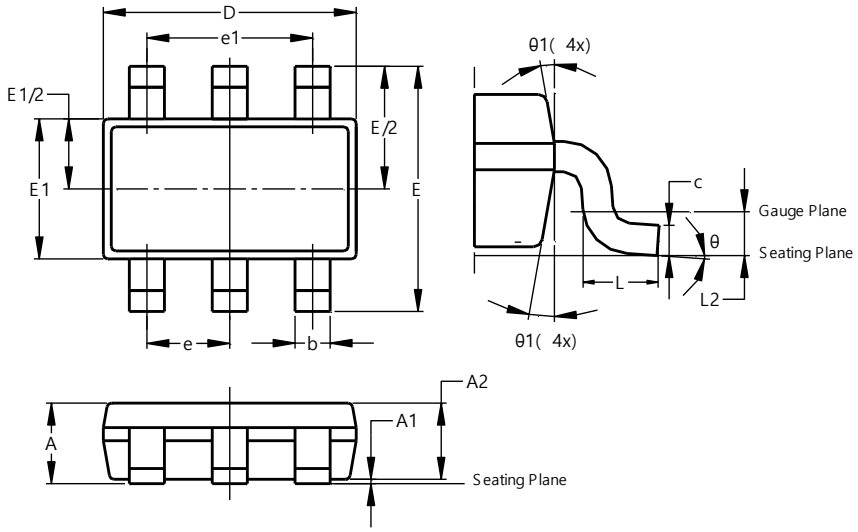


Figure 24. Output Low Resistance vs. Temperature

Package Outline Dimensions

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

TSOT26

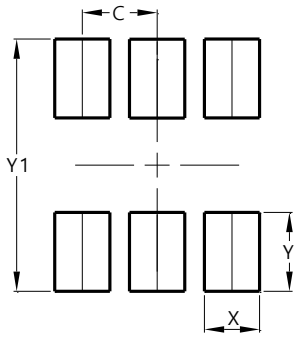


TSOT26			
Dim	**Min**	**Max**	**Typ**
A	–	1.00	–
A1	0.010	0.100	–
A2	0.840	0.900	–
D	2.800	3.000	2.900
E	2.800 BSC		
E1	1.500	1.700	1.600
b	0.300	0.450	–
c	0.120	0.200	–
e	0.950 BSC		
e1	1.900 BSC		
L	0.30	0.50	–
L2	0.250 BSC		
θ	0°	8°	4°
θ1	4°	12°	–
All Dimensions in mm			

Suggested Pad Layout

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

TSOT26



Dimensions	Value (in mm)
C	0.950
X	0.700
Y	1.000
Y1	3.200

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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