

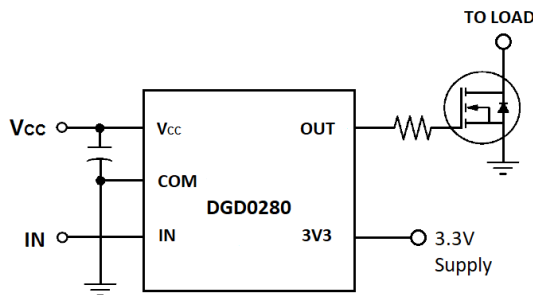
Description

The DIODES™ DGD0280 low-side MOSFET and IGBT driver is capable of driving 2.8A of peak current. The DGD0280 logic inputs are compatible with standard TTL and CMOS levels (down to 3.3V) to interface easily with MCUs. Internal undervoltage lockout (UVLO) protects the MOSFET with loss of supply by turning off the output when VCC falls below operating range. Fast and well matched propagation delays allow high-speed operation, enabling a smaller, more compact power-switching design using smaller associated components.

The DGD0280 has an integrated LDO that outputs 3.3V at $\pm 1\%$ tolerance with the ability to supply 15mA. The DGD0280 provides a non-inverted output. The DGD0280 comes in a space-saving TSOT25 package and operates over an extended -40°C to $+125^{\circ}\text{C}$ temperature range.

Applications

- DC-DC converters
- Line drivers
- Motor controls
- Switch mode power supplies



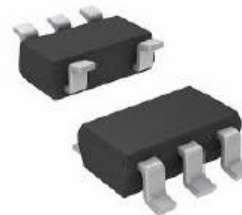
Typical Configuration

Features

- Efficient Low Cost Solution for Driving MOSFETs and IGBTs
- Integrated LDO (3.3V, 15mA Output)
- 3.3V LDO at 1% Accuracy at $+25^{\circ}\text{C}$
- Wide Supply Voltage Operating Range: 4.5V to 18V
- 2.5A Source / 2.8A Sink Output Current Capability
- Undervoltage Lockout for VCC Supply
- Fast Propagation Delay (35ns Typ)
- Fast Rise and Fall Times (20ns Typ)
- Logic Input (IN) 3.3V Capability
- Extended Temperature Range: -40°C to $+125^{\circ}\text{C}$
- **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-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

Mechanical Data

- Package: TSOT25
- Package Material: Molded Plastic. "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminals: Finish—Matte Tin Plated Leads. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.016 grams (Approximate)



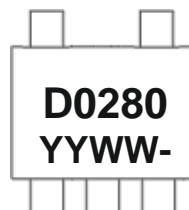
TSOT25

Ordering Information (Note 4)

| Part Number | Package | Marking Code | Reel Size (Inches) | Tape Width (mm) | Packing | |
|-------------|---------|--------------|--------------------|-----------------|---------|---------|
| | | | | | Qty. | Carrier |
| DGD0280WT-7 | TSOT25 | D0280 | 7 | 8 | 3000 | Reel |

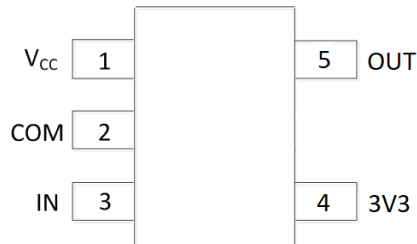
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- 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



D0280 = Product Type Marking Code (See Table Above)
YY = Year (ex: 23 = 2023)
WW or WW - = Week (01 to 53)

Pin Diagrams

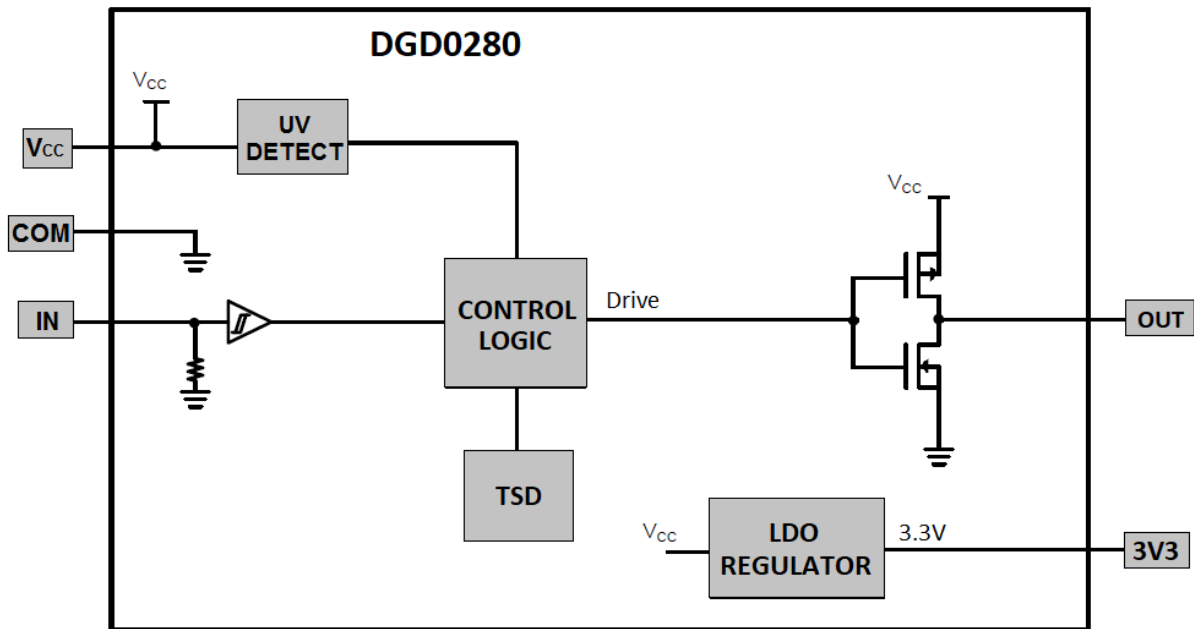


Top View: TSOT25

Pin Descriptions

| Pin Number | Pin Name | Function |
|------------|----------|--------------------------------|
| 1 | V_{CC} | Supply Input |
| 2 | COM | Supply Return |
| 3 | IN | Logic Input, In Phase with OUT |
| 4 | 3V3 | LDO Regulator 3.3V Output |
| 5 | OUT | Gate Drive Output |

Functional Block Diagram



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

| Characteristic | Symbol | Value | Unit |
|-------------------------------|------------------|------------------------------|------|
| Low-Side Fixed Supply Voltage | V _{CC} | -0.3 to +22 | V |
| Output Voltage (OUT) | V _{OUT} | -0.3 to V _{CC} +0.3 | V |
| Logic Input Voltage (IN) | V _{IN} | -5 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 | 0.89 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | R _{θJA} | 117 | °C/W |
| Thermal Resistance, Junction to Case (Note 5) | R _{θJC} | 12.5 | °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. When mounted on a standard JEDEC 2-layer FR-4 board with minimum recommended pad layout.

ESD Ratings (Note 6)

| Characteristic | Symbol | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge – Human Body Model | ESD HBM | 2000 | V | 2 |
| Electrostatic Discharge – Charged Device Model | ESD CDM | 1000 | V | IV |

Note: 6. Refer to JEDEC specification JESD22-A114 and JESD22-C101.

Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|--------------------------|------------------|-----|-----------------|------|
| Supply Voltage | V _{CC} | 4.5 | 18 | V |
| Output Voltage (OUT) | V _{OUT} | 0 | V _{CC} | V |
| Logic Input Voltage (IN) | V _{IN} | 0 | 5 | V |
| Ambient Temperature | T _A | -40 | +125 | °C |

DC Electrical Characteristics (V_{CC} = 12V, @T_A = +25°C, unless otherwise specified.) (Note 7)

| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|--|-----------------------|-------|------|-------|------|---|
| Logic "1" Input Voltage | V _{IH} | 2.0 | — | — | V | — |
| Logic "0" Input Voltage | V _{IL} | — | — | 0.8 | V | — |
| Input Hysteresis | V _{IH_HYS} | — | 0.5 | — | V | — |
| Logic "1" Input Bias Current | I _{IN+} | — | 7.5 | 20 | μA | V _{IN} = 3V |
| Logic "0" Input Bias Current | I _{IN-} | — | — | 1 | μA | V _{IN} = 0V |
| Quiescent V _{CC} Supply Current | I _{CCQ} | — | — | 250 | μA | Inputs Open |
| Operating V _{CC} Supply Current | I _{CCO} | — | 1.5 | — | mA | f _s = 100kHz, C _L = 1000pF |
| | | — | 12.5 | — | | f _s = 1MHz, C _L = 1000pF |
| V _{CC} Supply Undervoltage Positive Going Threshold | V _{CCUV+} | 4.5 | 4.75 | 5.0 | V | — |
| V _{CC} Supply Undervoltage Negative Going Threshold | V _{CCUV-} | 4.2 | 4.5 | 4.8 | V | — |
| Output High Short-Circuit Pulsed Current | I _{O+} | — | 2.5 | — | A | V _O = 0V, PW ≤ 10μs |
| Output Low Short-Circuit Pulsed Current | I _{O-} | — | 2.8 | — | A | V _O = 15V, PW ≤ 10μs |
| LDO Output Voltage | V _{LDO} | 3.267 | 3.3 | 3.333 | V | I _{OUT} = 10mA |
| LDO Line Regulation | V _{LDO_LINE} | — | 21 | 38 | mV | V _{CC} = 5V to 18V, I _{OUT} = 10mA |
| LDO Load Regulation | V _{LDO_LOAD} | — | — | 10 | mV | V _{CC} = 12V, I _{OUT} = 0.1mA to 10mA |
| Maximum LDO Current | I _{LDO_MAX} | — | 15 | — | mA | R _L = 220Ω |
| LDO Current Limit | I _{LDO_LIM} | 20 | 68 | — | mA | R _L = 0Ω |
| Thermal Shutdown Turn-On | T _{SD(ON)} | — | +150 | — | °C | — |
| Thermal Shutdown Turn-Off | T _{SD(OFF)} | — | +125 | — | °C | — |

Note: 7. The V_{IN} and I_{IN} parameters are applicable to the logic input pin: IN. The V_O and I_O parameters are applicable to the output pin: OUT.

AC Electrical Characteristics (V_{CC} = 12V, @T_A = +25°C, unless otherwise specified.)

| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|----------------------------|------------------|-----|-----|-----|------|-------------------------|
| Turn-On Rise Time | t _r | — | 20 | 35 | ns | C _L = 1000pF |
| Turn-Off Fall Time | t _f | — | 15 | 35 | ns | C _L = 1000pF |
| Turn-On Propagation Delay | t _{ON} | 20 | 35 | 50 | ns | — |
| Turn-Off Propagation Delay | t _{OFF} | 15 | 30 | 50 | ns | — |

Timing Waveforms

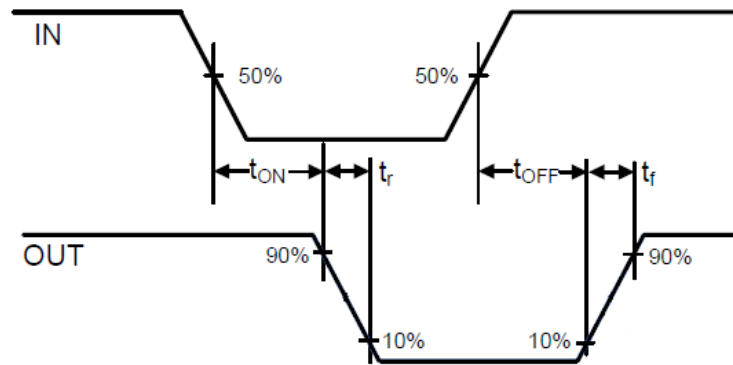


Figure 1. Switching Time Waveform Definitions

Typical Performance Characteristics ($V_{CC} = 12V$, $@T_A = +25^\circ C$, unless otherwise specified.)

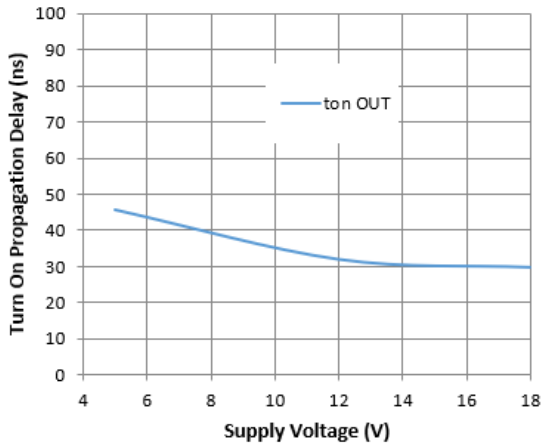


Figure 2. Turn-on Propagation Delay vs. Supply Voltage

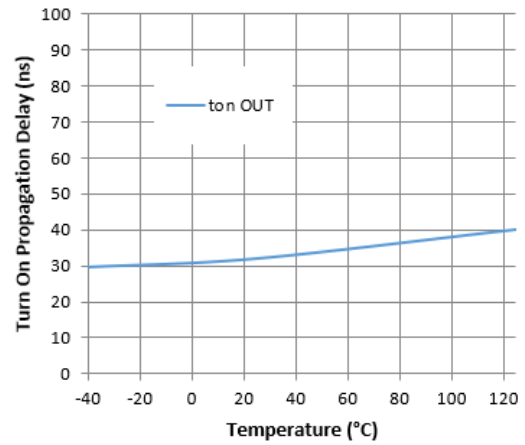


Figure 3. Turn-on Propagation Delay vs. Temperature

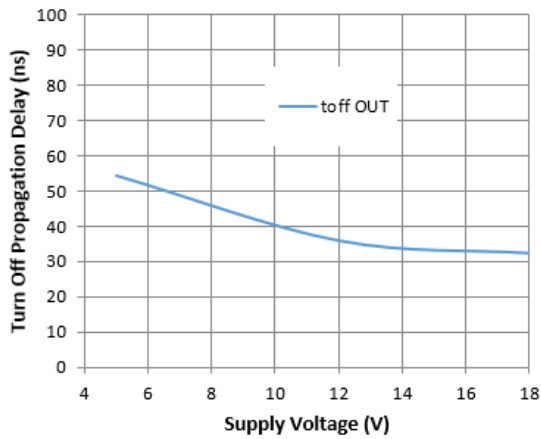


Figure 4. Turn-off Propagation Delay vs. Supply Voltage

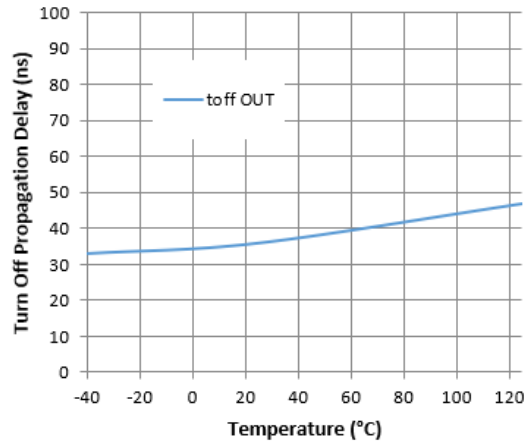


Figure 5. Turn-off Propagation Delay vs. Temperature

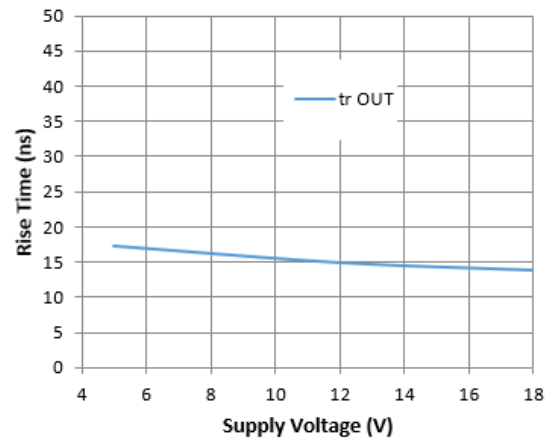


Figure 6. Rise Time vs. Supply Voltage

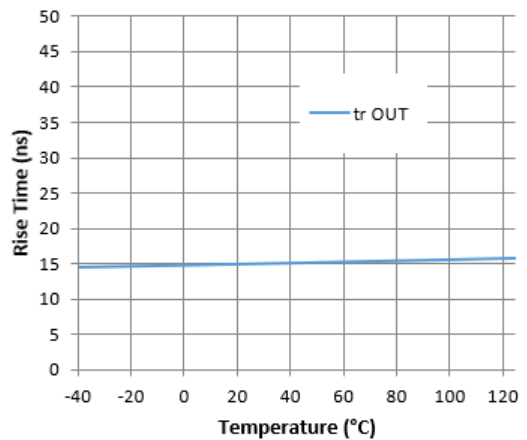


Figure 7. Rise Time vs. Temperature

Typical Performance Characteristics (continued)

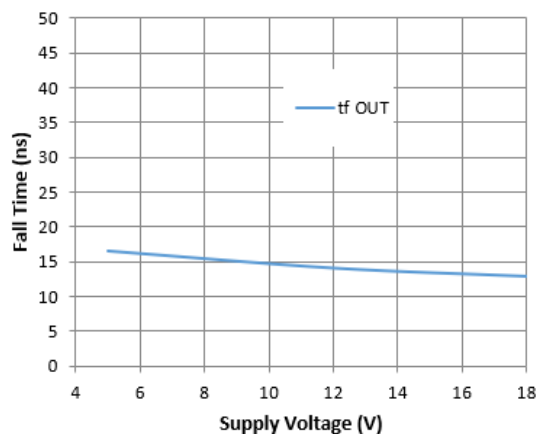


Figure 8. Fall Time vs. Supply Voltage

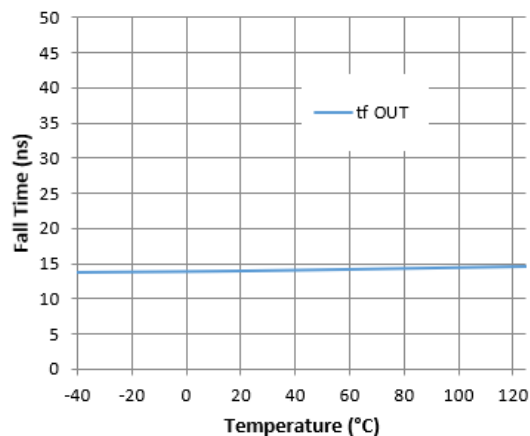


Figure 9. Fall Time vs. Temperature

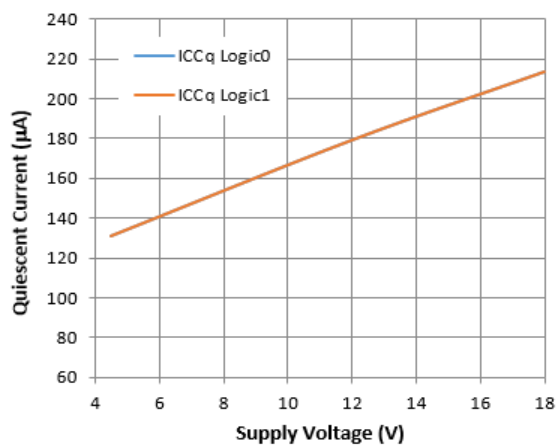


Figure 10. Quiescent Current vs. Supply Voltage

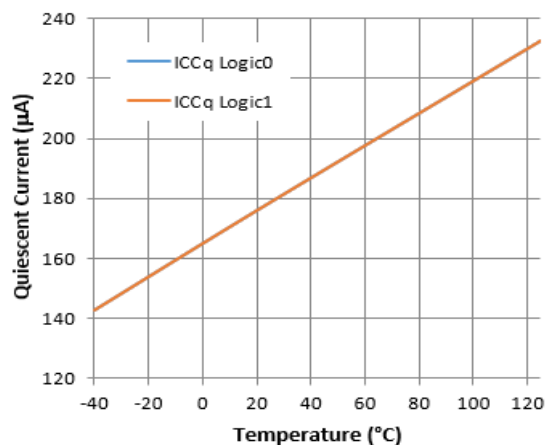


Figure 11. Quiescent Current vs. Temperature

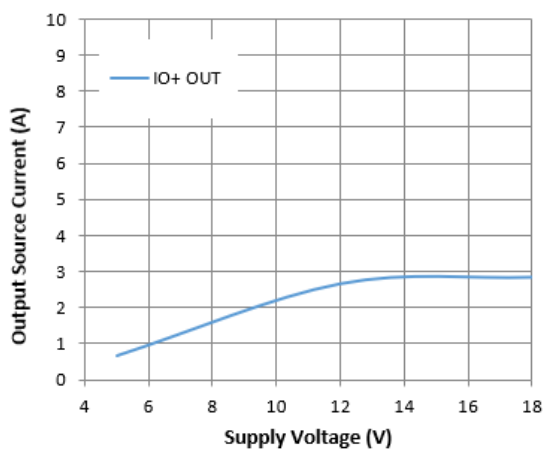


Figure 12. Output Source Current vs. Supply Voltage

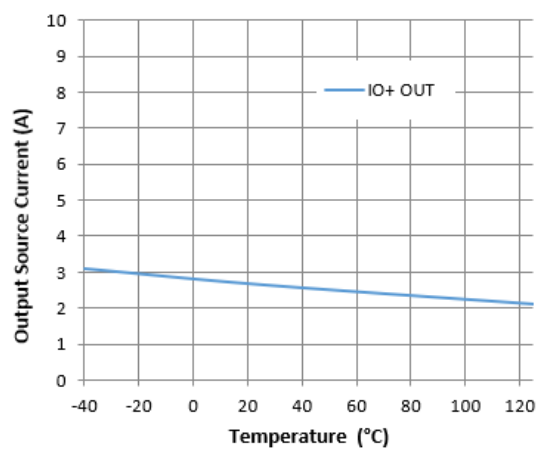


Figure 13. Output Source Current vs. Temperature

Typical Performance Characteristics (continued)

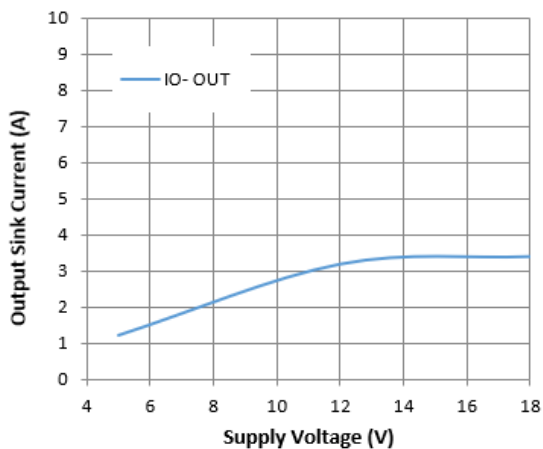


Figure 14. Output Sink Current vs. Supply Voltage

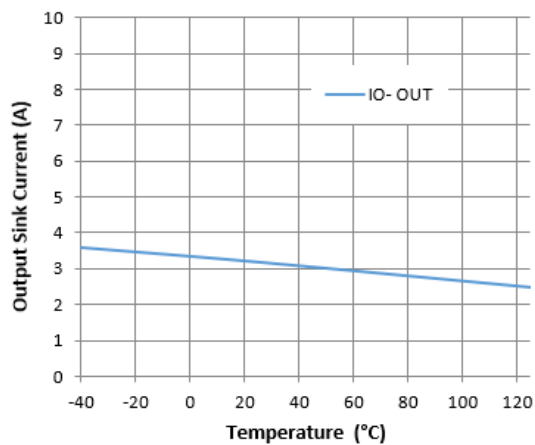


Figure 15. Output Sink Current vs. Temperature

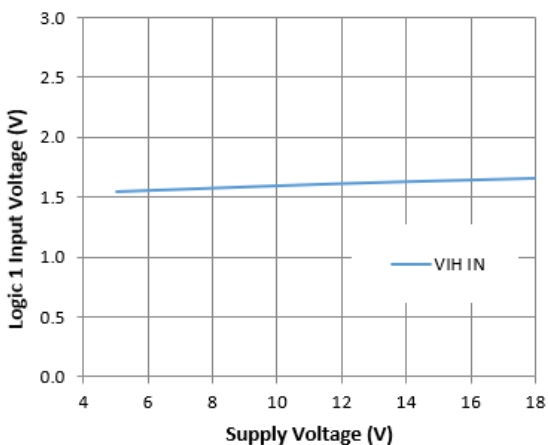


Figure 16. Logic 1 Input Voltage vs. Supply Voltage

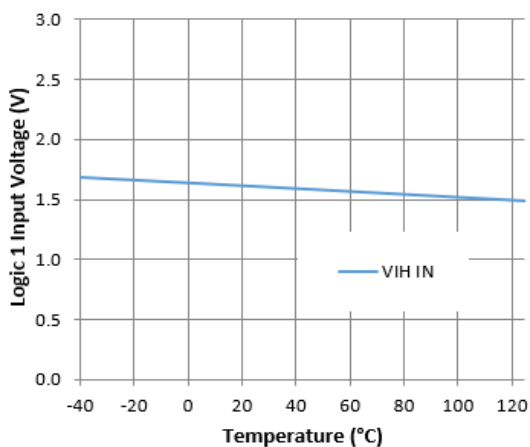


Figure 17. Logic 1 Input Voltage vs. Temperature

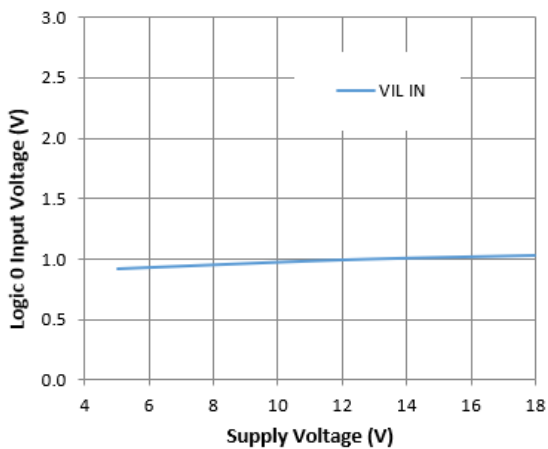


Figure 18. Logic 0 Input Voltage vs. Supply Voltage

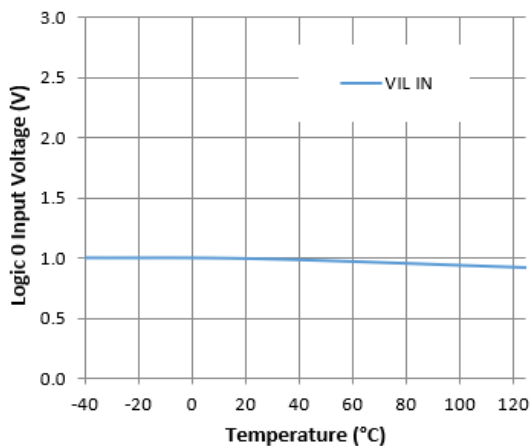


Figure 19. Logic 0 Input Voltage vs. Temperature

Typical Performance Characteristics (continued)

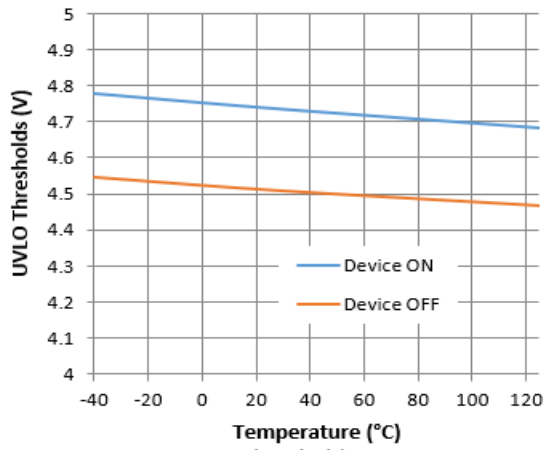


Figure 20. UVLO Thresholds vs. Temperature

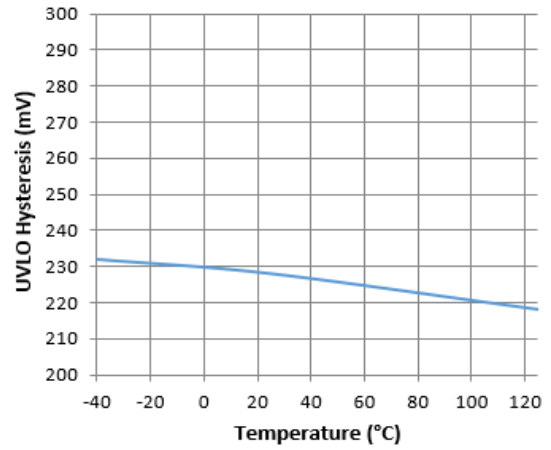
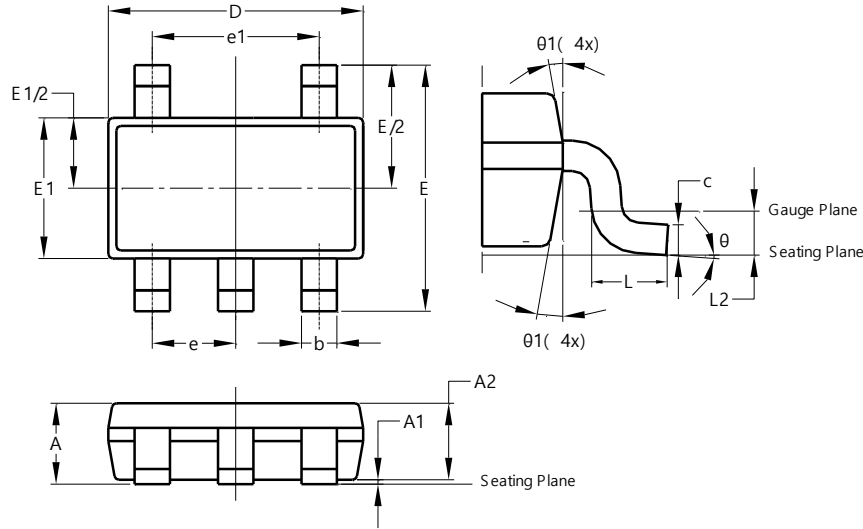


Figure 21. UVLO Hysteresis vs. Temperature

Package Outline Dimensions

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

TSOT25

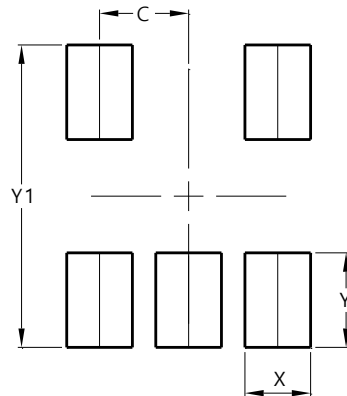


| TSOT25 | | | |
|----------------------|----------|------|------|
| Dim | Min | Max | Typ |
| A | — | 1.00 | — |
| A1 | 0.01 | 0.10 | — |
| A2 | 0.84 | 0.90 | — |
| b | 0.30 | 0.45 | — |
| c | 0.12 | 0.20 | — |
| D | — | — | 2.90 |
| E | — | — | 2.80 |
| E1 | — | — | 1.60 |
| e | 0.95 BSC | | |
| e1 | 1.90 BSC | | |
| L | 0.30 | 0.50 | — |
| L2 | 0.25 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.

TSOT25



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.950 |
| X | 0.700 |
| Y | 1.000 |
| Y1 | 3.199 |

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