

## Load Switch with Level-Shift

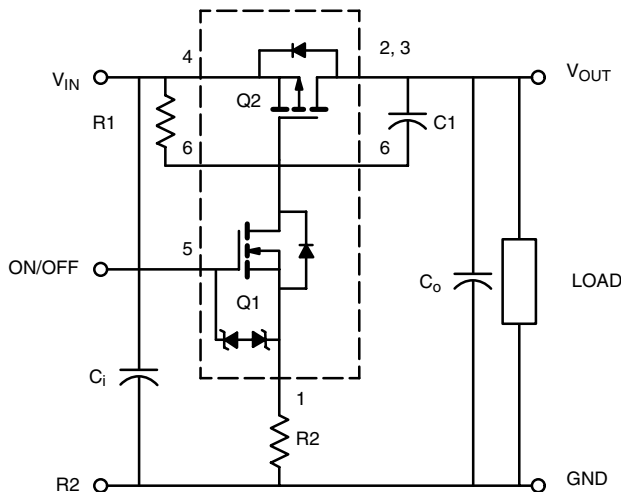
### PRODUCT SUMMARY

$V_{DS2}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
1.8 to 8	0.215 at $V_{IN} = 4.5$ V	$\pm 1.2$
	0.300 at $V_{IN} = 2.5$ V	$\pm 1.0$
	0.440 at $V_{IN} = 1.8$ V	$\pm 0.7$

### DESCRIPTION

The Si1865DL includes a p- and n-channel MOSFET in a single SC70-6 package. The low on-resistance p-channel TrenchFET is tailored for use as a load switch. The n-channel, with an external resistor, can be used as a level-shift to drive the p-channel load-switch. The n-channel MOSFET has internal ESD protection and can be driven by logic signals as low as 1.5 V. The Si1865DL operates on supply lines from 1.8 V to 8 V, and can drive loads up to 1.2 A.

### APPLICATION CIRCUITS



Si1865DL

### COMPONENTS

R1	Pull-Up Resistor	Typical 10 k $\Omega$ to 1 m $\Omega$ *
R2	Optional Slew-Rate Control	Typical 0 k $\Omega$ to 100 k $\Omega$ *
C1	Optional Slew-Rate Control	Typical 1000 pF

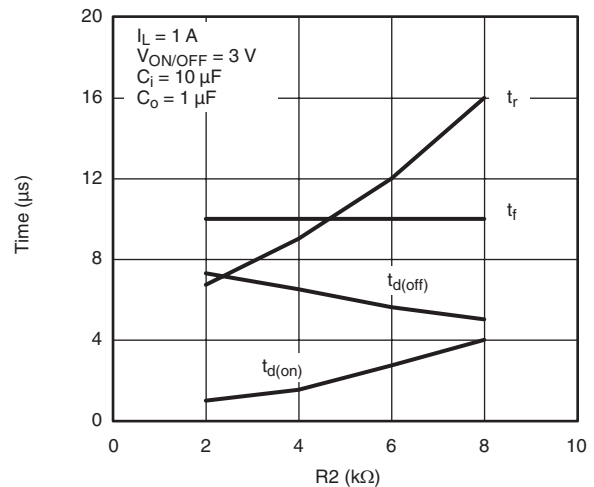
\* Minimum R1 value should be least 10 x R2 to ensure Q1 turn-on.

### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- 215 m $\Omega$  Low  $R_{DS(on)}$  TrenchFET®
- 1.8 V to 8 V Input
- 1.5 V to 8 V Logic Level Control
- Low Profile, Small Footprint SC70-6 Package
- 2000 V ESD Protection On Input Switch,  $V_{ON/OFF}$
- Adjustable Slew-Rate
- 1.8 V Rated
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

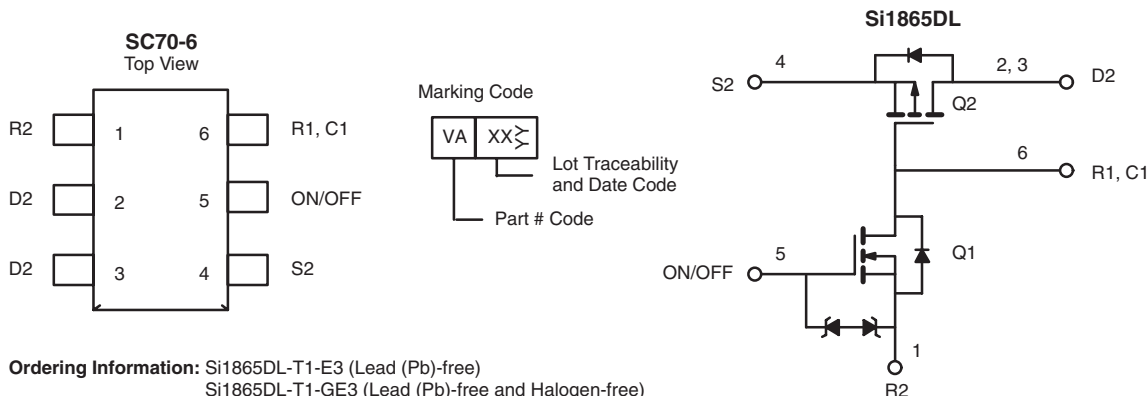


Note: For R2 switching variations with other  $V_{IN}/R1$  combinations see Typical Characteristics

**Switching Variation**  
R2 at  $V_{IN} = 2.5$  V,  $R1 = 20$  k $\Omega$

The Si1865DL is ideally suited for high-side load switching in portable applications. The integrated n-channel level-shift devices saves space by reducing external components. The slew rate is set externally so that rise-times can be tailored to different load types.

## FUNCTIONAL BLOCK DIAGRAM



**Ordering Information:** Si1865DL-T1-E3 (Lead (Pb)-free)  
Si1865DL-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Input Voltage		V <sub>IN</sub>	8	V
ON/OFF Voltage		V <sub>ON/OFF</sub>	8	
Load Current	Continuous <sup>a, b</sup>	I <sub>L</sub>	± 1.2	A
	Pulsed <sup>b, c</sup>		± 3	
Continuous Intrinsic Diode Conduction <sup>a</sup>		I <sub>S</sub>	- 0.4	
Maximum Power Dissipation <sup>a</sup>		P <sub>D</sub>	0.4	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C
ESD Rating, MIL-STD-833D Human Body Model (100 pF, 1500 Ω)		ESD	2	kV

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (continuous current) <sup>a</sup>	R <sub>thJA</sub>	260	320	°C/W
Maximum Junction-to-Foot (Q2)	R <sub>thJC</sub>	180	220	

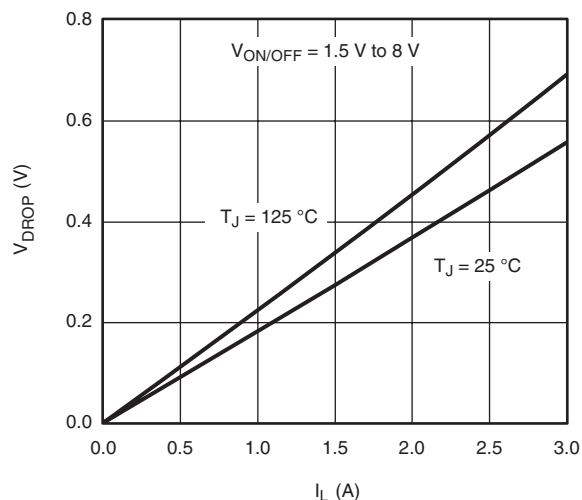
SPECIFICATIONS T <sub>J</sub> = 25 °C unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
OFF Characteristics						
Reverse Leakage Current	V <sub>IN</sub>	V <sub>IN</sub> = 8 V, V <sub>ON/OFF</sub> = 0 V			1	μA
Diode Forward Voltage	I <sub>Q</sub>	I <sub>S</sub> = - 0.4 A		0.85	1.1	V
ON Characteristics						
Input Volatge	V <sub>IN</sub>		1.8		8	V
On-Resistance (P-Channel) at 1 A	R <sub>DS(on)</sub>	V <sub>ON/OFF</sub> = 1.5 , V <sub>IN</sub> = 4.5 V, I <sub>D</sub> = 1.2 A		0.180	0.215	Ω
		V <sub>ON/OFF</sub> = 1.5 , V <sub>IN</sub> = 2.5 V, I <sub>D</sub> = 1.0 A		0.250	0.300	
		V <sub>ON/OFF</sub> = 1.5 , V <sub>IN</sub> = 1.8 V, I <sub>D</sub> = 0.7 A		0.367	0.440	
On-State (P-Channel) Drain-Current	I <sub>D(on)</sub>	V <sub>IN-OUT</sub> ≤ 0.2 V, V <sub>IN</sub> = 5 V, V <sub>ON/OFF</sub> = 1.5 A	1			A
		V <sub>IN-OUT</sub> ≤ 0.3 V, V <sub>IN</sub> = 3 V, V <sub>ON/OFF</sub> = 1.5 A	1			

Notes:

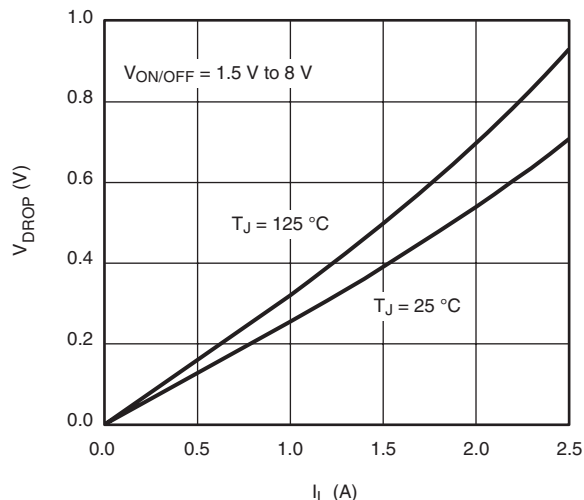
- a) Surface mounted on FR4 board.  
b)  $V_{IN} = 8\text{ V}$ ,  $V_{ON/OFF} = 8\text{ V}$ ,  $T_A = 25\text{ }^{\circ}\text{C}$ .  
c) Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

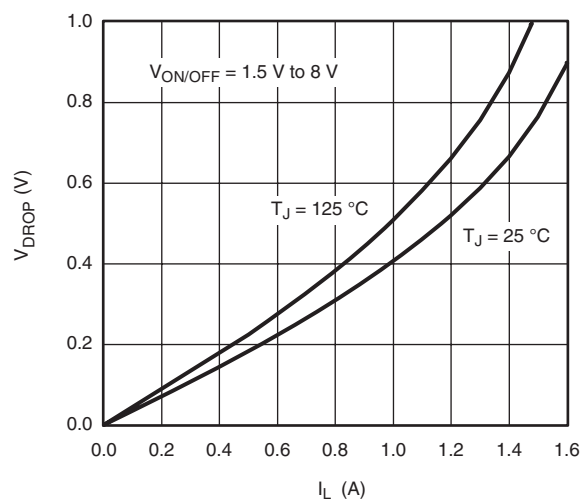
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



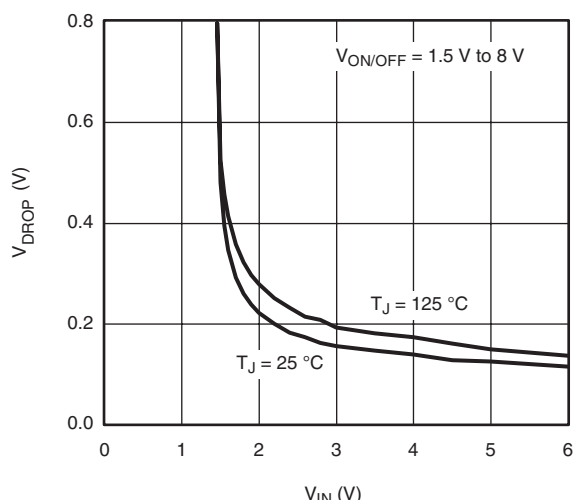
$V_{DROP}$  vs.  $I_L$  at  $V_{IN} = 4.5$  V



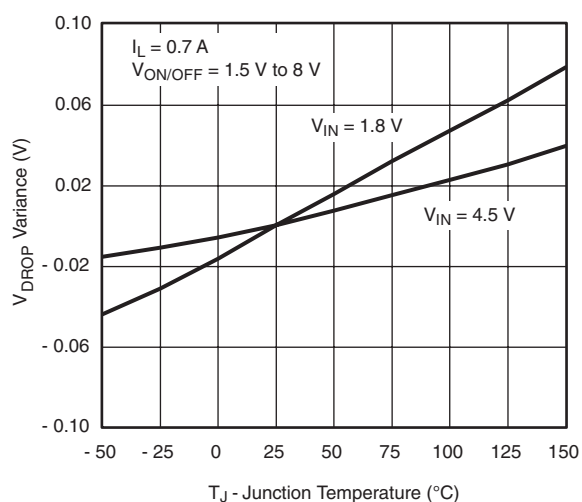
$V_{DROP}$  vs.  $I_L$  at  $V_{IN} = 2.5$  V



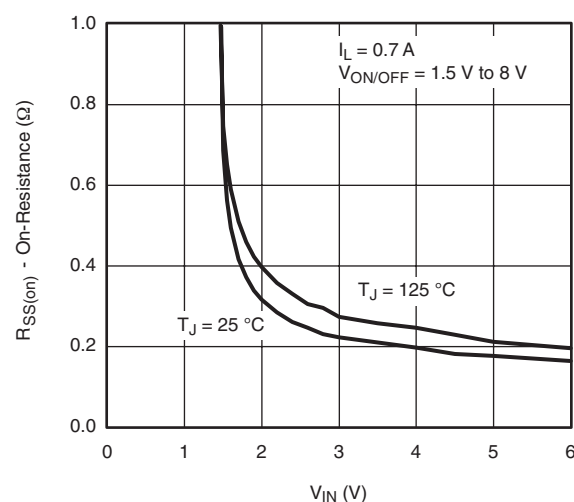
$V_{DROP}$  vs.  $I_L$  at  $V_{IN} = 1.8$  V



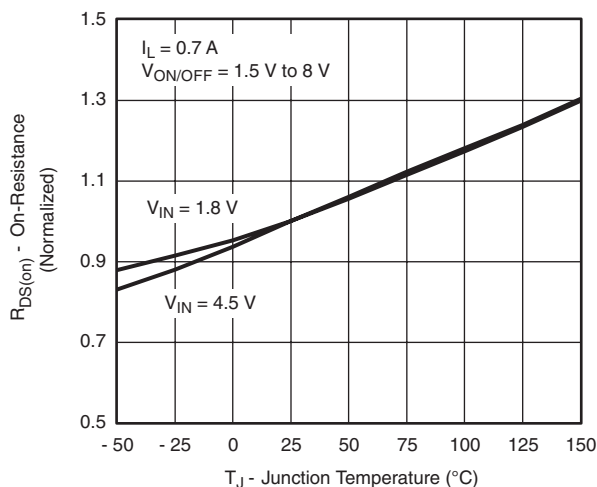
$V_{DROP}$  vs.  $I_L$  at  $I_L = 0.7$  A



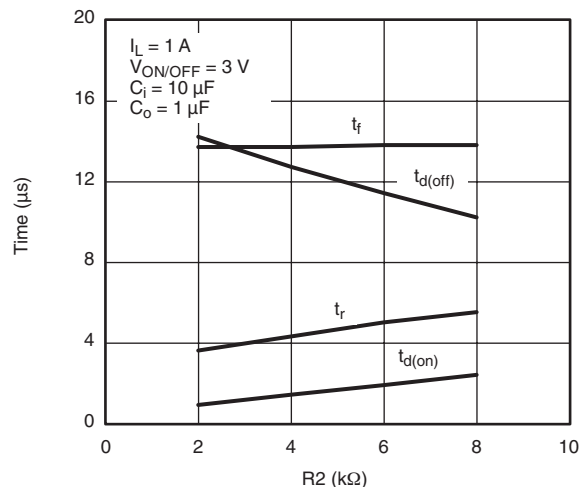
$V_{DROP}$  Variance vs. Junction Temperature



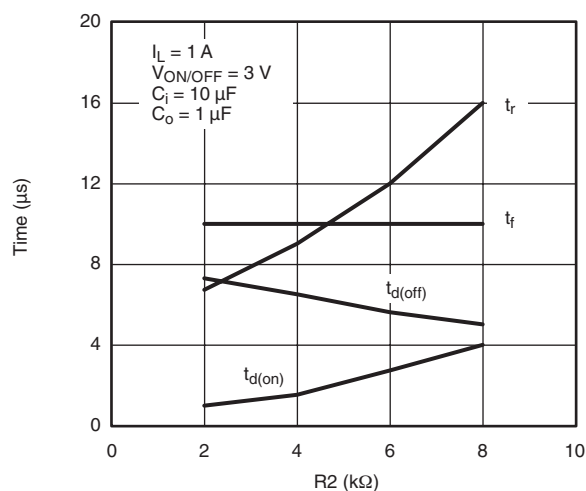
On-Resistance vs. Input Voltage

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

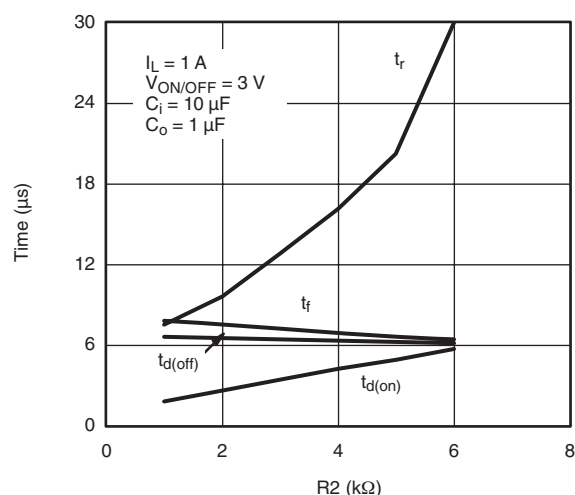
**Normalized On-Resistance vs.  
Junction Temperature**



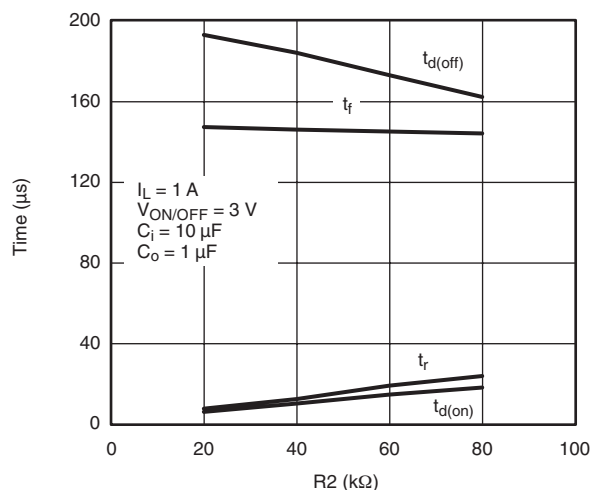
**Switching Variation  
R2 at  $V_{IN} = 1.8$  V,  $R_1 = 20$  k $\Omega$**



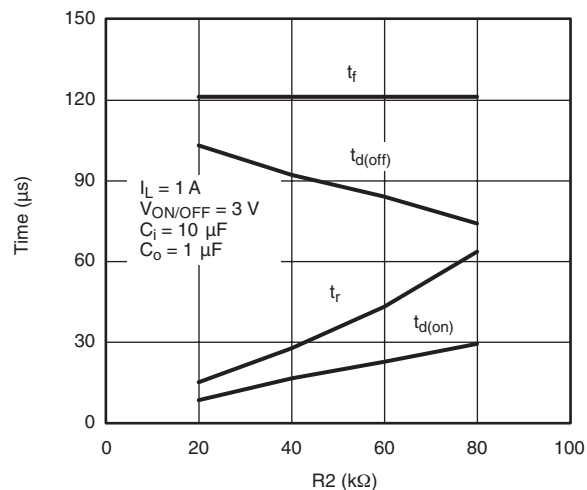
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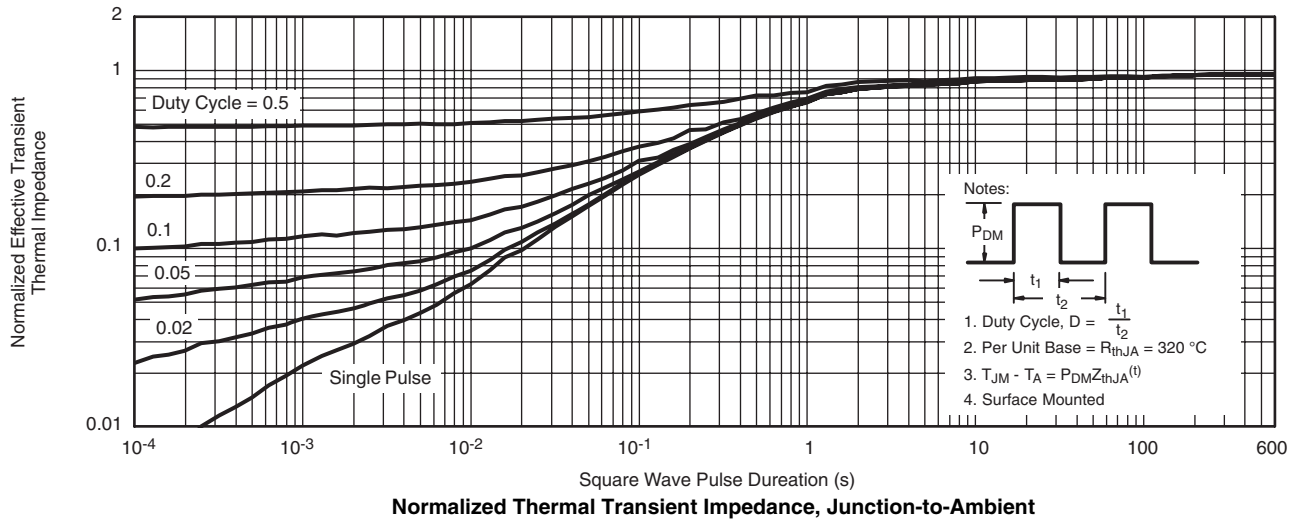
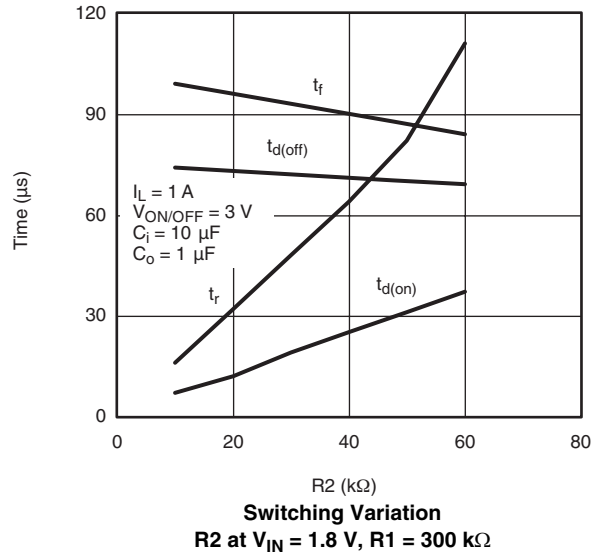


**Switching Variation  
R2 at  $V_{IN} = 4.5$  V,  $R_1 = 300$  k $\Omega$**



**Switching Variation  
R2 at  $V_{IN} = 2.5$  V,  $R_1 = 300$  k $\Omega$**

## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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