



# Load Switch with Level-Shift

PRODUCT SUMMARY		
V <sub>DS2</sub> (V)	r <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)
1.8 to 8	0.215 @ V <sub>IN</sub> = 4.5 V	± 1.2
	0.300 @ V <sub>IN</sub> = 2.5 V	± 1.0
	0.440 @ V <sub>IN</sub> = 1.8 V	± 0.7



**ESD Protected  
2000 V  
1.8-V Rated**

## FEATURES

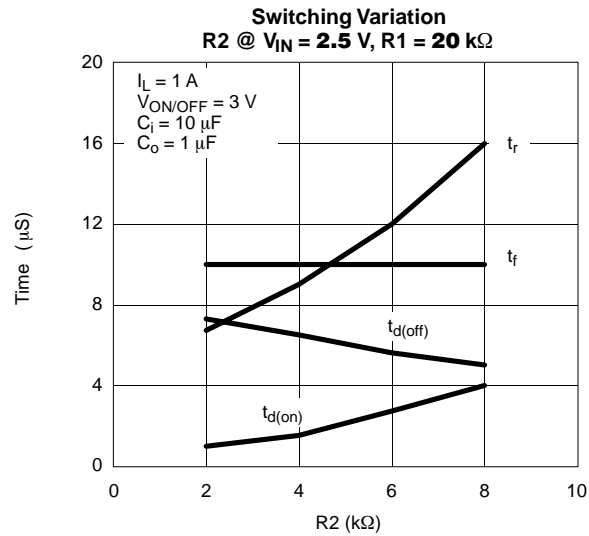
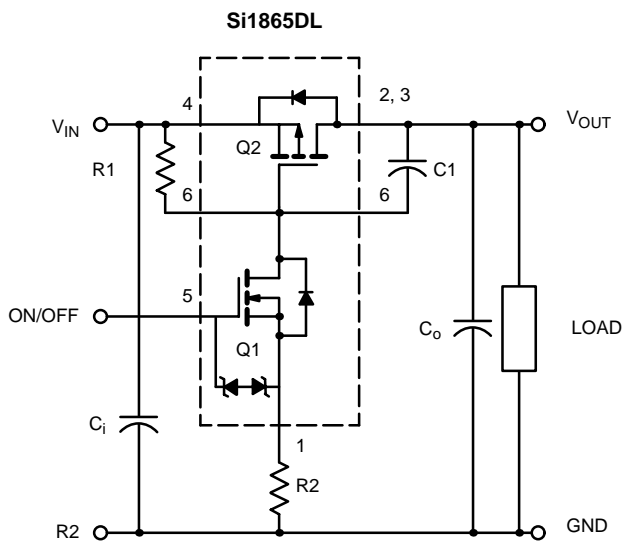
- 215-mΩ Low r<sub>DS(on)</sub> TrenchFET<sup>®</sup>
- 1.8 to 8-V Input
- 1.5 to 8-V Logic Level Control
- Low Profile, Small Footprint SC70-6 Package
- 2000-V ESD Protection On Input Switch, V<sub>ON/OFF</sub>
- Adjustable Slew-Rate

## 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 to 8 V, and can drive loads up to 1.2 A.

## APPLICATION CIRCUITS

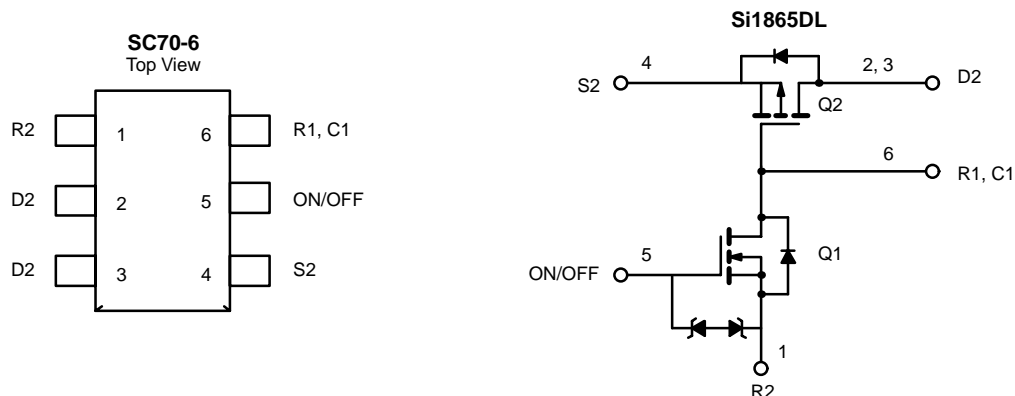


Note: For R2 switching variations with other V<sub>IN</sub>/R1 combinations See Typical Characteristics

COMPONENTS		
R1	Pull-Up Resistor	Typical 10 kΩ to 1 mΩ*
R2	Optional Slew-Rate Control	Typical 0 to 100 kΩ*
C1	Optional Slew-Rate Control	Typical 1000 pF

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

The Si1865DL is ideally suited for high-side load switching in portable applications. The integrated n-channel level-shift device 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**

**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>	±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	W
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150	°C
ESD Rating, MIL-STD-883D 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)**

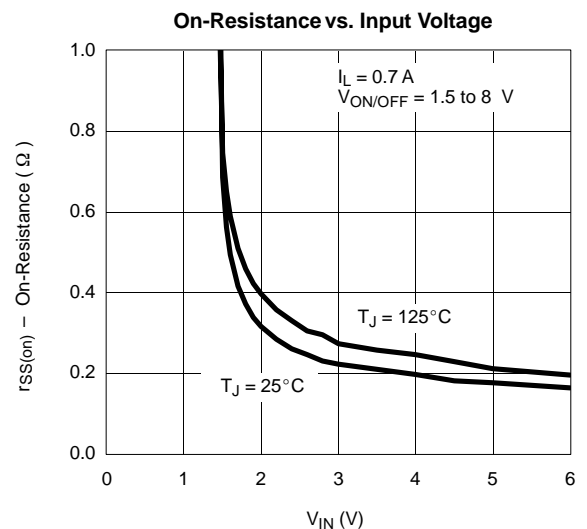
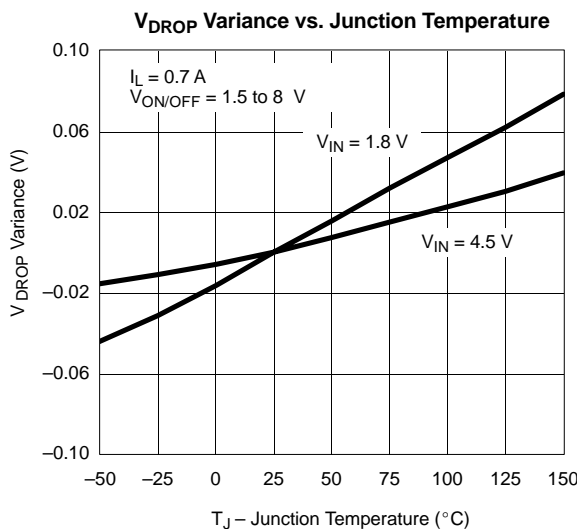
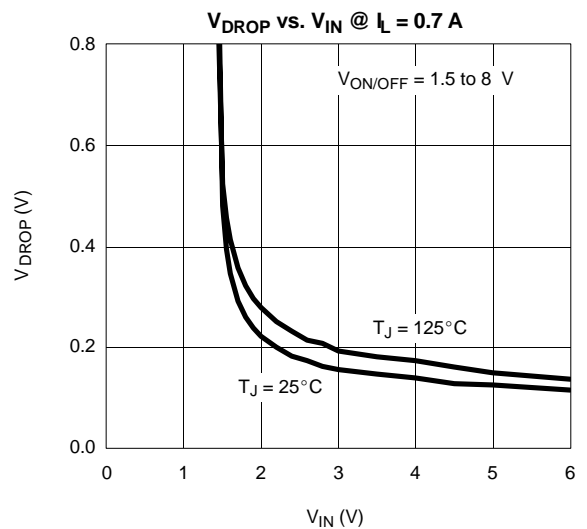
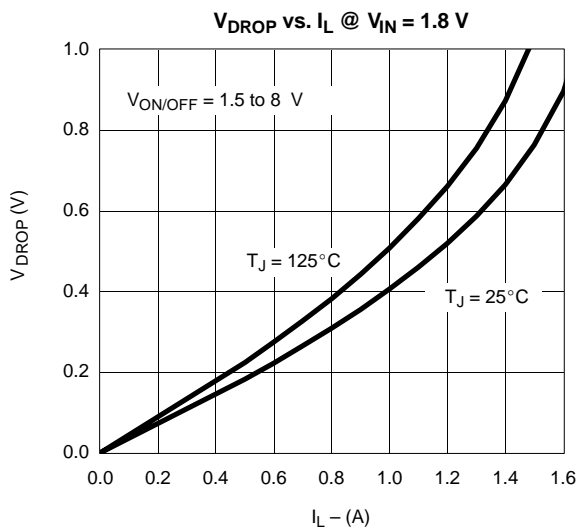
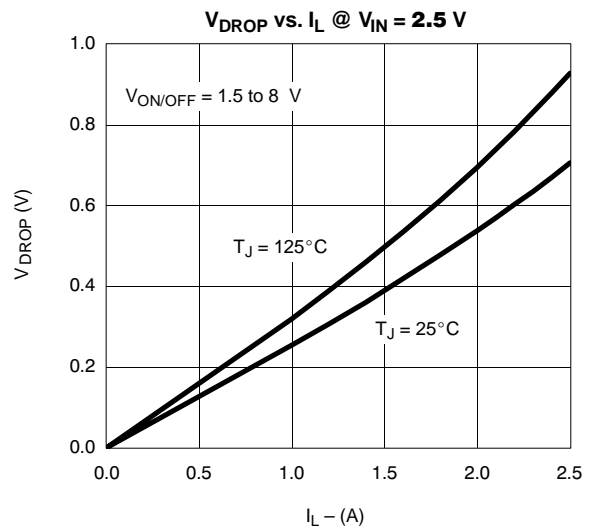
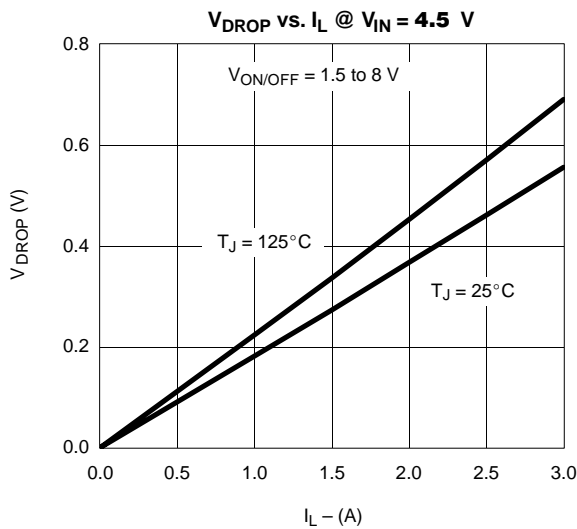
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Reverse Leakage Current	I <sub>FL</sub>	V <sub>IN</sub> = 8 V, V <sub>ON/OFF</sub> = 0 V			1	μA
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = -0.4 A		0.85	1.1	V
<b>ON Characteristics</b>						
Input Voltage Range	V <sub>IN</sub>		1.8		8	V
On-Resistance (p-channel) @ 1 A	r <sub>DS(on)</sub>	V <sub>ON/OFF</sub> = 1.5 V, 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, 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, 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 V	1			A
		V <sub>IN-OUT</sub> ≤ 0.3 V, V <sub>IN</sub> = 3 V, V <sub>ON/OFF</sub> = 1.5 V	1			

## Notes

- Surface Mounted on FR4 Board.
- V<sub>IN</sub> = 8 V, V<sub>ON/OFF</sub> = 8 V, T<sub>A</sub> = 25 °C.
- Pulse test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

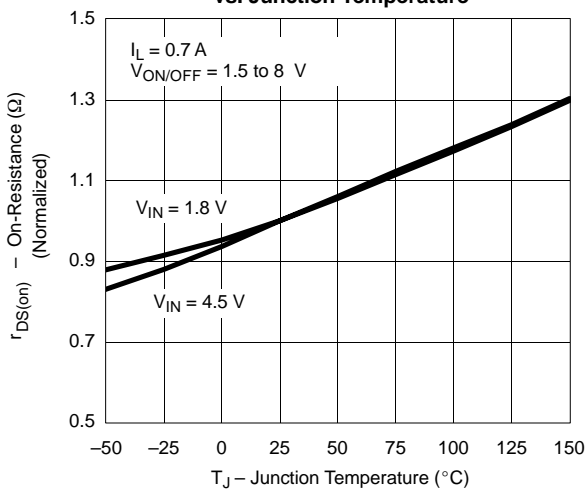


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

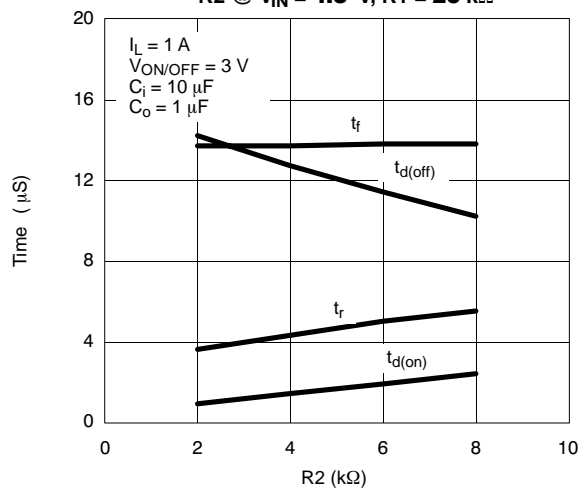


**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

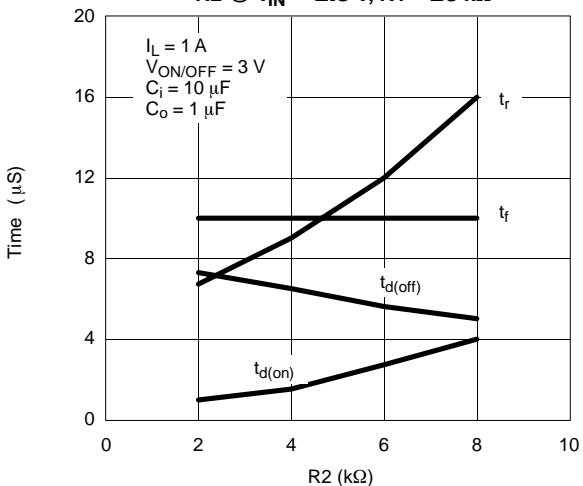
**Normalized On-Resistance vs. Junction Temperature**



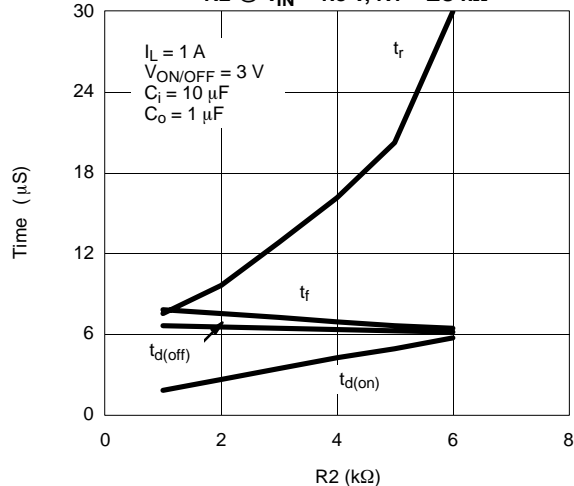
**Switching Variation R2 @ V\_IN = 4.5 V, R1 = 20 kΩ**



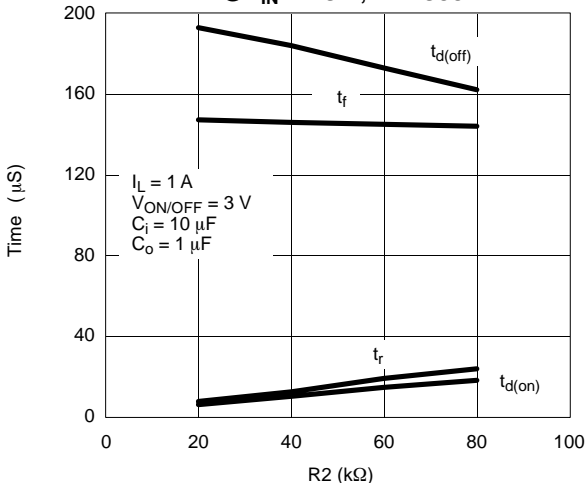
**Switching Variation R2 @ V\_IN = 2.5 V, R1 = 20 kΩ**



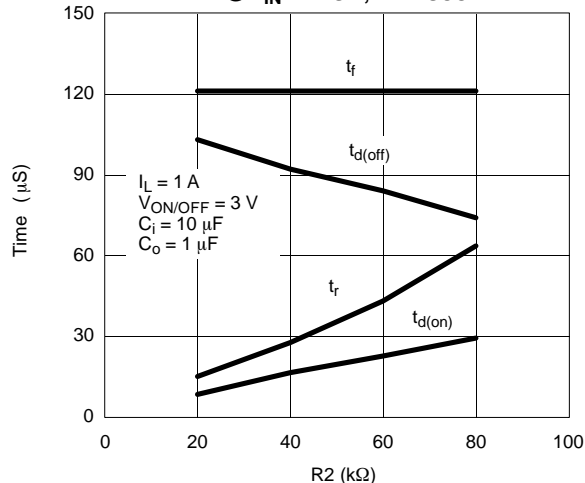
**Switching Variation R2 @ V\_IN = 1.8 V, R1 = 20 kΩ**



**Switching Variation R2 @ V\_IN = 4.5 V, R1 = 300 kΩ**



**Switching Variation R2 @ V\_IN = 2.5 V, R1 = 300 kΩ**



**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

