Load Switch with Level-Shift

PRODUCT SUMMARY		
V_{DS2} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
1.8 to 8	0.215 at V_{IN} = 4.5 V	± 1.2
	0.300 at V_{IN} = 2.5 V	± 1.0
	0.440 at V_{IN} = 1.8 V	± 0.7

FEATURES

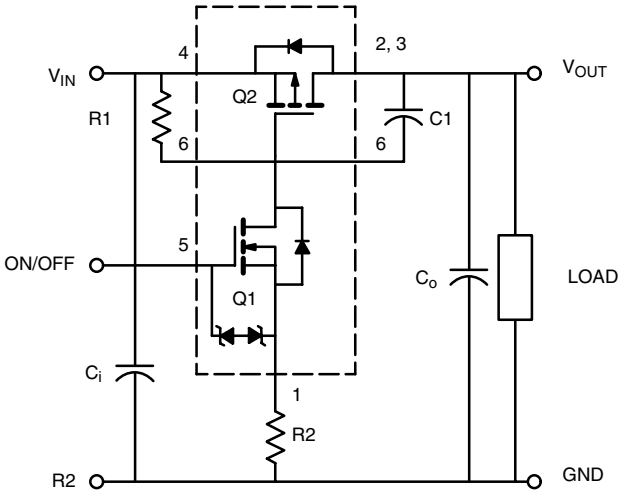
- **Halogen-free According to IEC 61249-2-21 Definition**
- 215 mΩ Low $R_{DS(on)}$ TrenchFET®
- 1.8 V to 8 V Input
- 1.5 V to 8 V Logic Level Control
- Low Profile, Small Footprint SC70-6 Package
- 2000 V ESD Protection On Input Switch, $V_{ON/OFF}$
- Adjustable Slew-Rate
- 1.8 V Rated
- Compliant to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

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

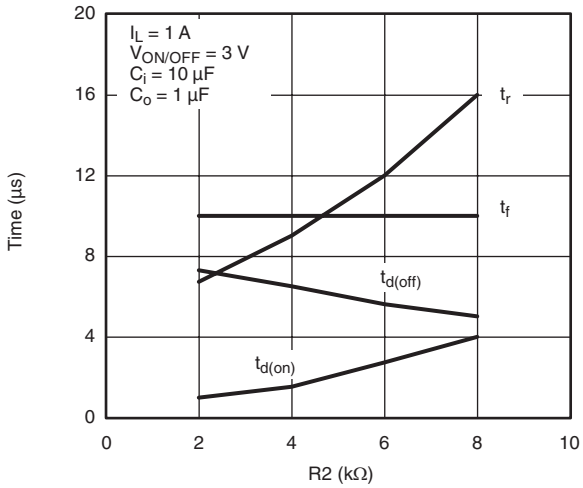
DESCRIPTION

The Si1865DL includes a p- and p-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



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

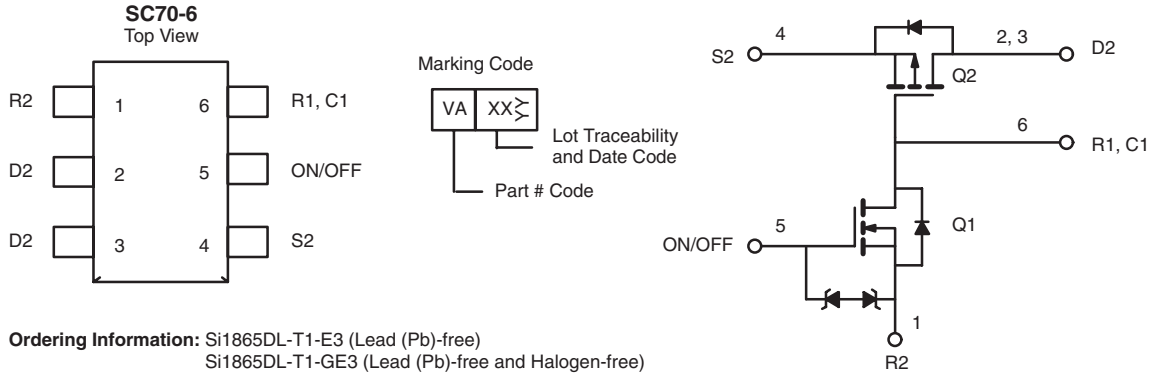
Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 20 kΩ

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

* Minimum R1 value should be 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 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_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Input Voltage		V_{IN}	8	V
ON/OFF Voltage		$V_{ON/OFF}$	8	
Load Current	Continuous[a, b]	I_L	± 1.2	A
	Pulsed[b, c]		± 3	
Continuous Intrinsic Diode Conduction[a]		I_S	- 0.4	
Maximum Power Dissipation[a]		P_D	0.4	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
ESD Rating, MIL-STD-833D Human Body Model (100 pF, 1500 Ω)		ESD	2	kV

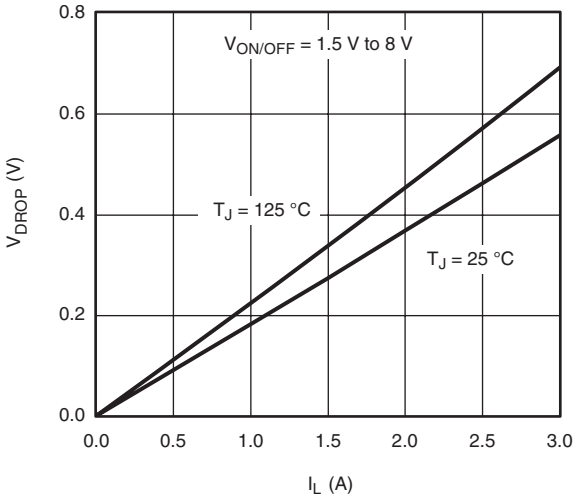
THERMAL RESISTANCE RATINGS				
Parameter	**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient (continuous current)[a]	R_{thJA}	260	320	°C/W
Maximum Junction-to-Foot (Q2)	R_{thJC}	180	220	

SPECIFICATIONS T_J = 25 °C unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
OFF Characteristics						
Reverse Leakage Current	V_{IN}	V_{IN} = 8 V, $V_{ON/OFF}$ = 0 V			1	µA
Diode Forward Voltage	I_Q	I_S = - 0.4 A		0.85	1.1	V
ON Characteristics						
Input Volatge	V_{IN}		1.8		8	V
On-Resistance (P-Channel) at 1 A	$R_{DS(on)}$	$V_{ON/OFF}$ = 1.5 , V_{IN} = 4.5 V, I_D = 1.2 A		0.180	0.215	Ω
		$V_{ON/OFF}$ = 1.5 , V_{IN} = 2.5 V, I_D = 1.0 A		0.250	0.300	
		$V_{ON/OFF}$ = 1.5 , V_{IN} = 1.8 V, I_D = 0.7 A		0.367	0.440	
On-State (P-Channel) Drain-Current	$I_{D(on)}$	$V_{IN-OUT} \leq$ 0.2 V, V_{IN} = 5 V, $V_{ON/OFF}$ = 1.5 A	1			A
		$V_{IN-OUT} \leq$ 0.3 V, V_{IN} = 3 V, $V_{ON/OFF}$ = 1.5 A	1			

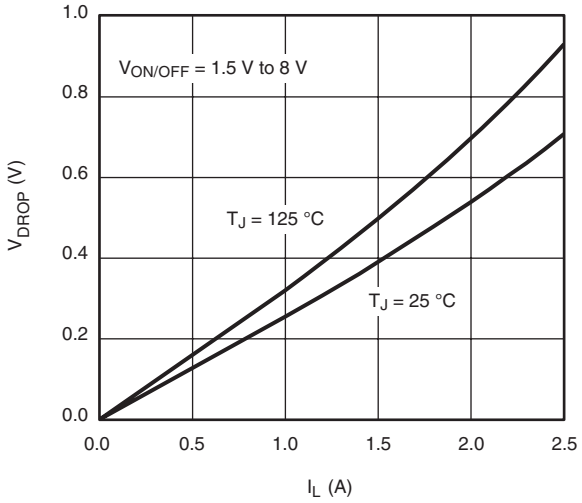
Notes:
a) Surface mounted on FR4 board.
b) V_{IN} = 8 V, $V_{ON/OFF}$ = 8 V, T_A = 25 °C.
c) Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

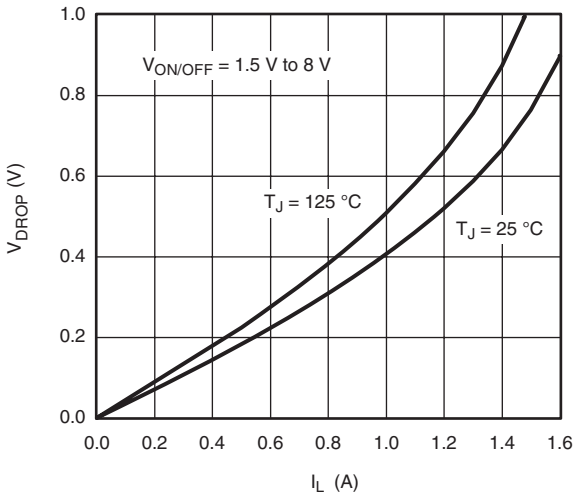
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



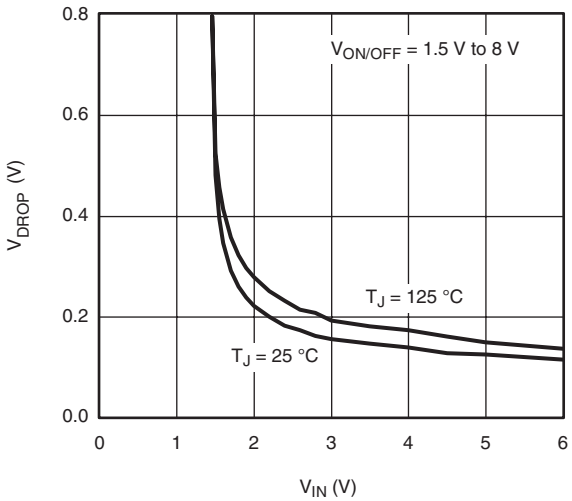
V_{DROP} vs. I_L at V_{IN} = 4.5 V



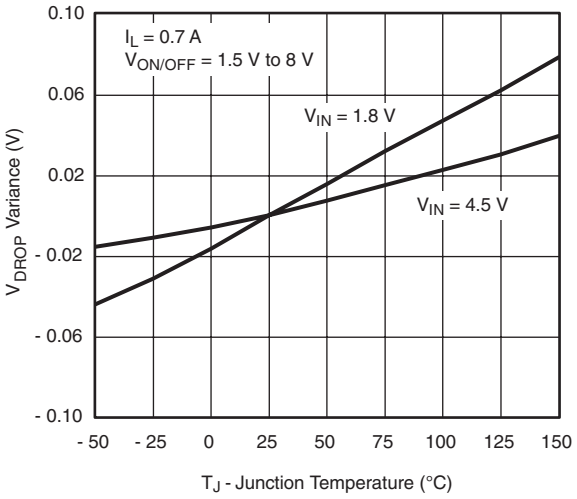
V_{DROP} vs. I_L at V_{IN} = 2.5 V



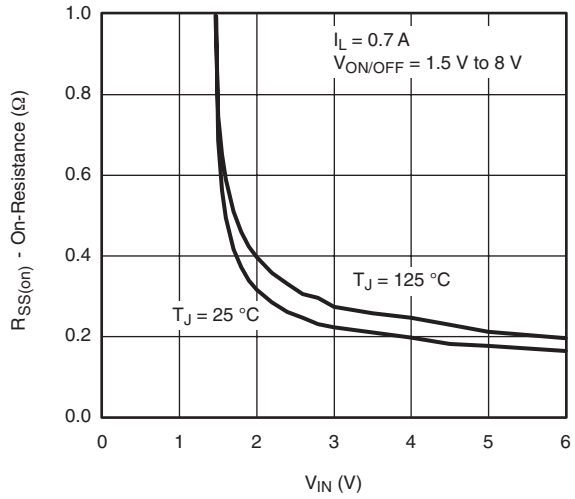
V_{DROP} vs. I_L at V_{IN} = 1.8 V



V_{DROP} vs. I_L at I_L = 0.7 V

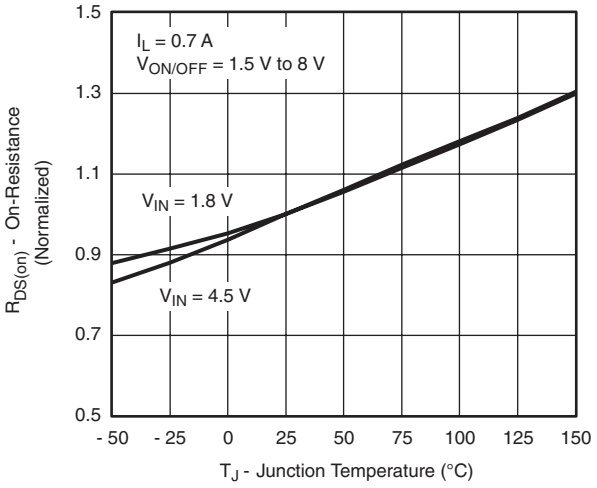


V_{DROP} Variance vs. Junction Temperature

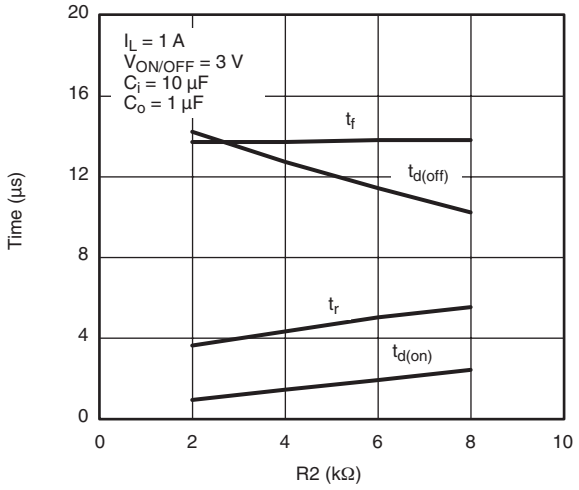


On-Resistance vs. Input Voltage

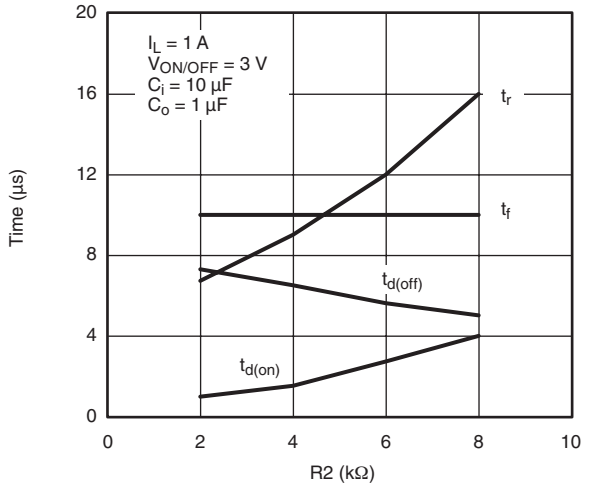
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



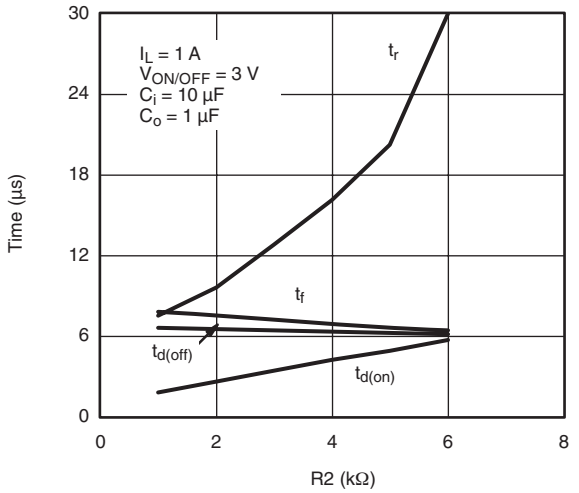
Normalized On-Resistance vs. Junction Temperature



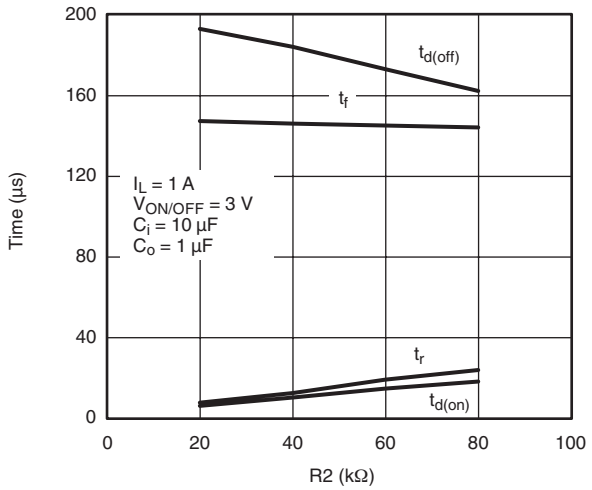
Switching Variation
R2 at V_{IN} = 1.8 V, R1 = 20 kΩ



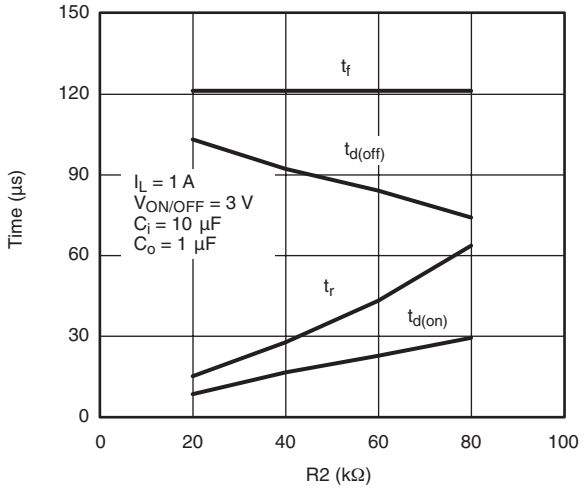
Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 20 kΩ



Switching Variation
R2 at V_{IN} = 1.8 V, R1 = 20 kΩ

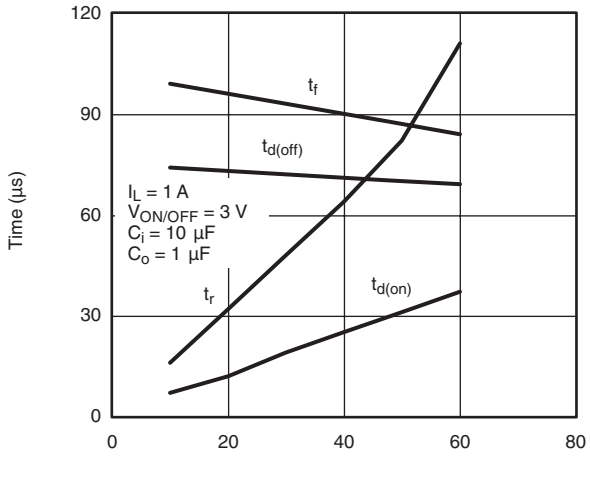


Switching Variation
R2 at V_{IN} = 4.5 V, R1 = 300 kΩ

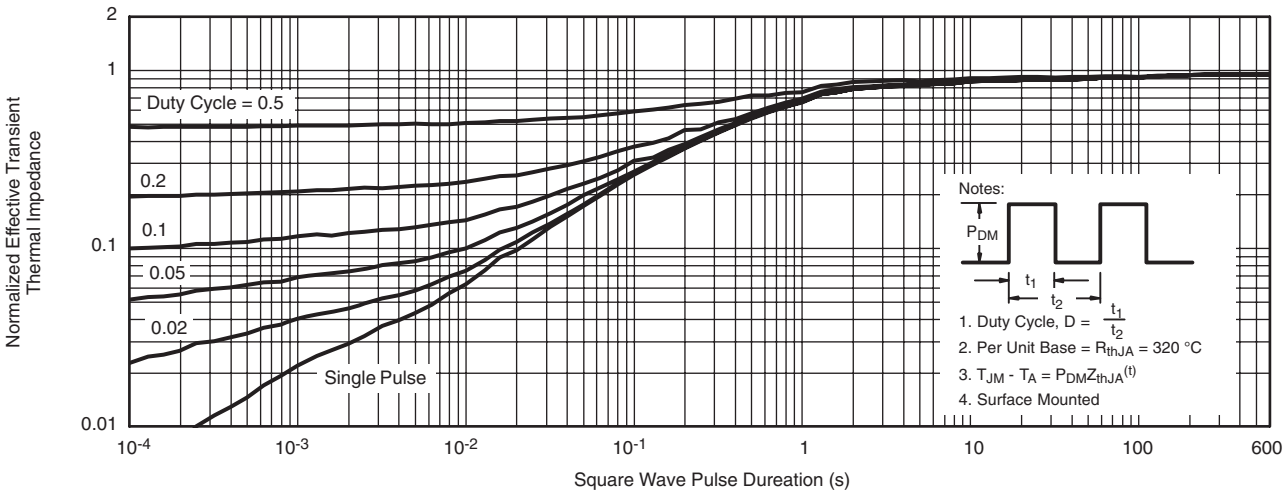


Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 300 kΩ

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Switching Variation
R2 at V_{IN} = 1.8 V, R1 = 300 kΩ



Normalized Thermal Transient Impedance, Junction-to-Ambient

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