

Load Switch with Level-Shift

PRODUCT SUMMARY

V_{DS2} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
1.8 to 8	0.600 @ $V_{IN} = 4.5$ V	± 0.6
	0.850 @ $V_{IN} = 2.5$ V	± 0.5
	1.200 @ $V_{IN} = 1.8$ V	± 0.4

FEATURES

- TrenchFET® Power MOSFET
- Lead Free
- 600-m Ω Low $r_{DS(on)}$
- 1.8- to 8-V Input
- 1.5- to 8-V Logic Level Control
- Lead Free

APPLICATIONS

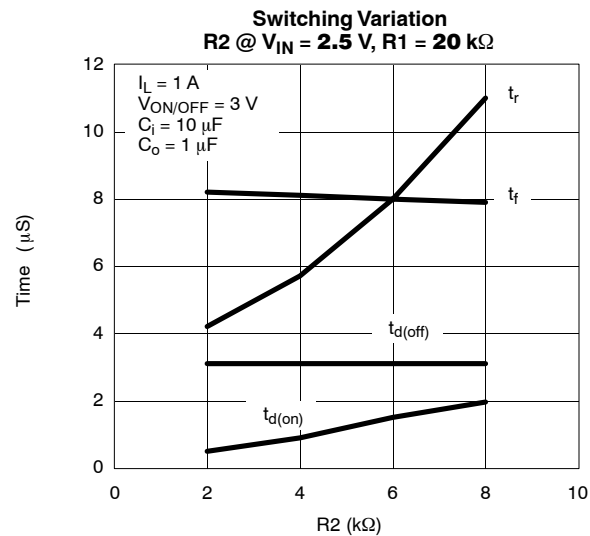
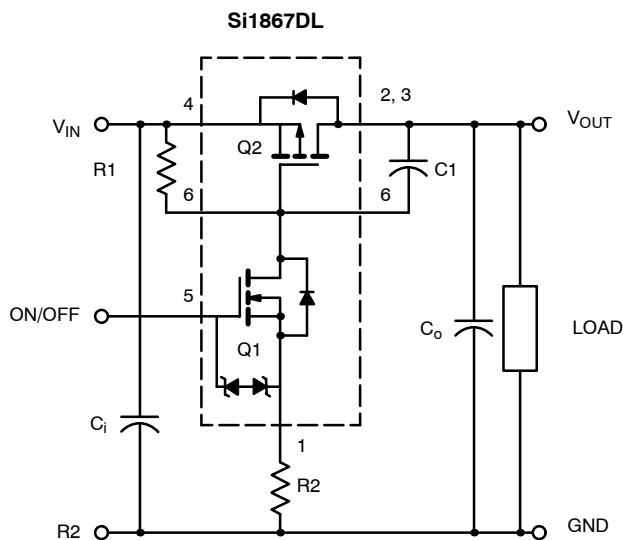
- Load Switch with Level-Shift for Portable Applications

DESCRIPTION

The Si1867DL 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 Si1867DL operates on supply lines from 1.8 to 8 V, and can drive loads up to 0.6 A.

APPLICATION CIRCUITS



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

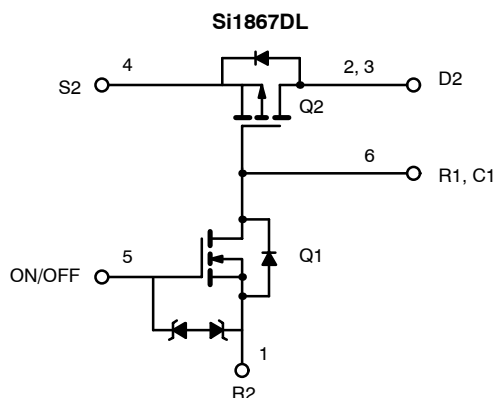
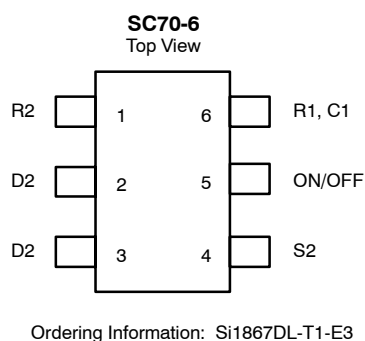
COMPONENTS

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

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

The Si1867DL 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 ($T_A = 25^\circ\text{C}$ 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}	± 0.6	A
	Pulsed ^{b, c}	± 3	
Continuous Intrinsic Diode Conduction ^a	I_S	-0.4	W
Maximum Power Dissipation ^a	P_D	0.4	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
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) ^a	R_{thJA}	260	320	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Q2)	R_{thJF}	190	230	

SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF Characteristics						
Reverse Leakage Current	I_{FL}	$V_{IN} = 8\text{ V}, V_{ON/OFF} = 0\text{ V}$			1	μA
Diode Forward Voltage	V_{SD}	$I_S = -0.4\text{ A}$		0.85	1.1	V
ON Characteristics						
Input Voltage Range	V_{IN}		1.8		8	V
On-Resistance (p-channel) @ 1 A	$r_{DS(on)}$	$V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 4.5\text{ V}, I_D = 0.6\text{ A}$		0.480	0.600	Ω
		$V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 2.5\text{ V}, I_D = 0.5\text{ A}$		0.690	0.850	
		$V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 1.8\text{ V}, I_D = 0.4\text{ A}$		0.950	1.200	
On-State (p-channel) Drain-Current	$I_{D(on)}$	$V_{IN-OUT} \leq 0.2\text{ V}, V_{IN} = 5\text{ V}, V_{ON/OFF} = 1.5\text{ V}$	1			A
		$V_{IN-OUT} \leq 0.3\text{ V}, V_{IN} = 3\text{ V}, V_{ON/OFF} = 1.5\text{ V}$	1			

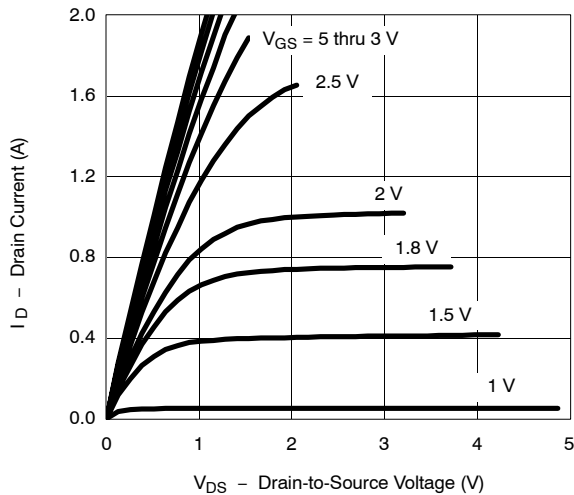
Notes

- Surface Mounted on FR4 Board.
- $V_{IN} = 8\text{ V}, V_{ON/OFF} = 8\text{ V}, T_A = 25^\circ\text{C}$.
- Pulse test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

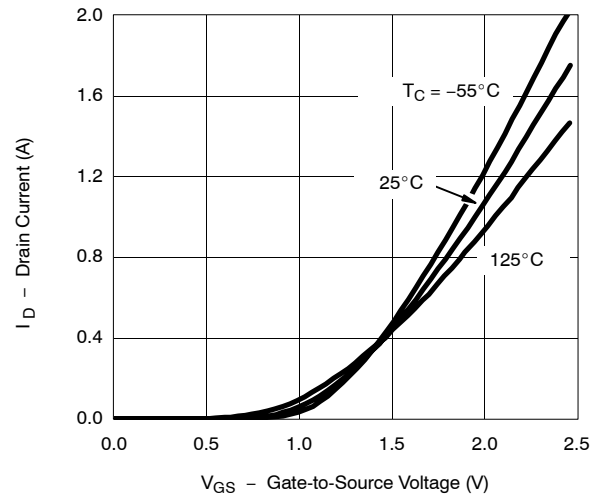


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

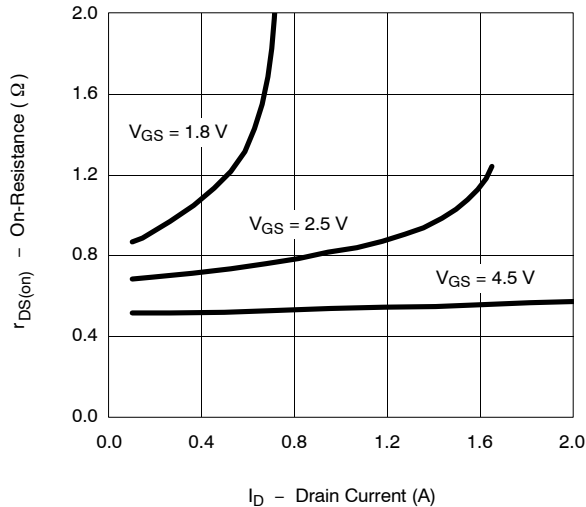
Output Characteristics



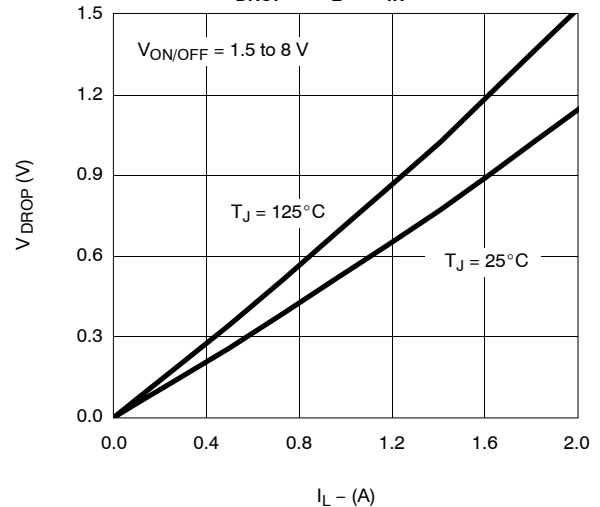
Transfer Characteristics



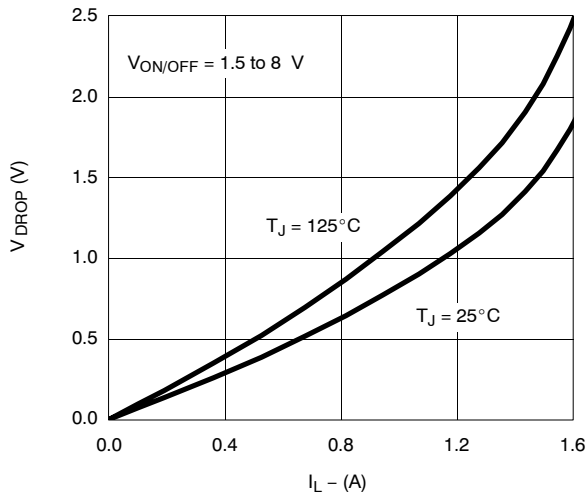
On-Resistance vs. Drain Current



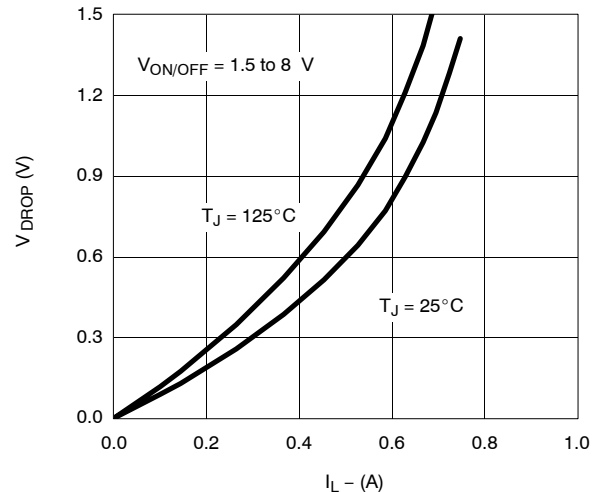
V_{DROP} vs. I_L @ $V_{IN} = 4.5$ V



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

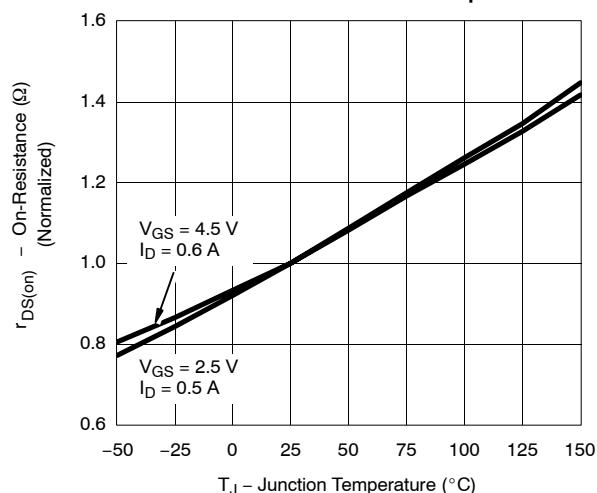


V_{DROP} vs. I_L @ $V_{IN} = 1.8$ V

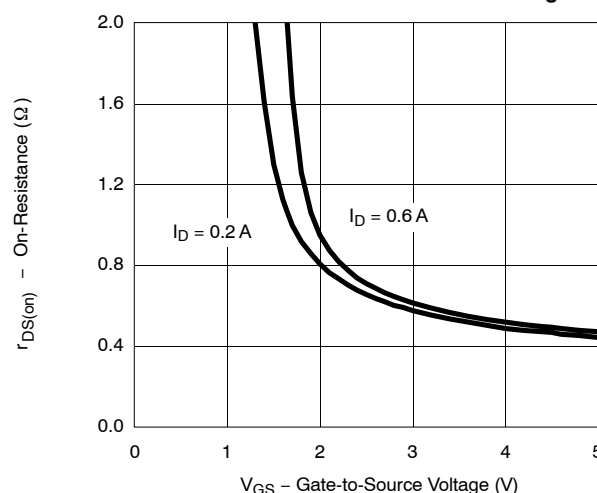
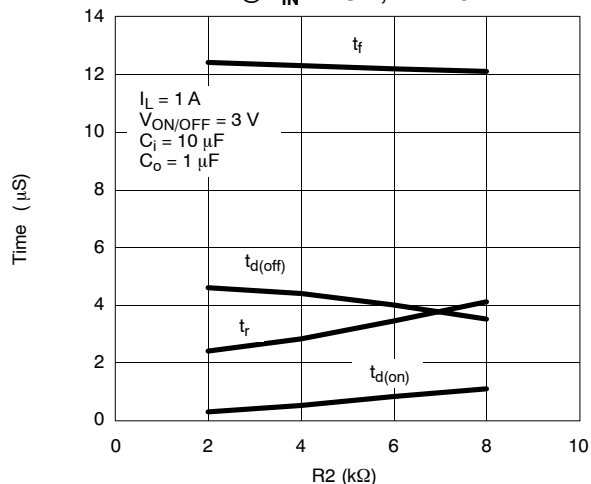
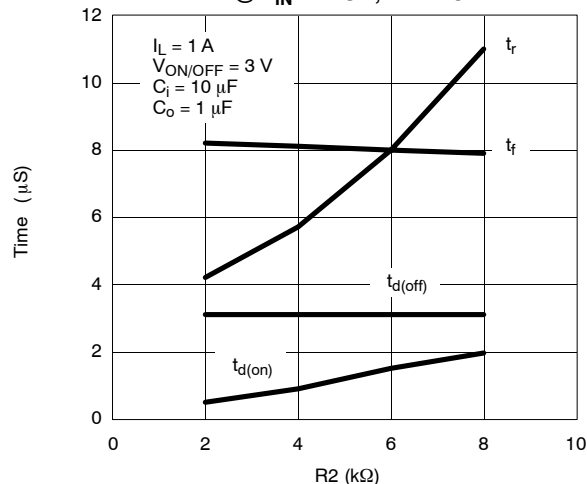
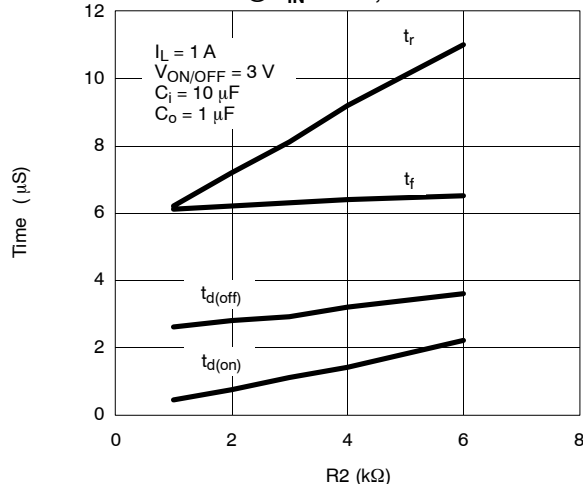
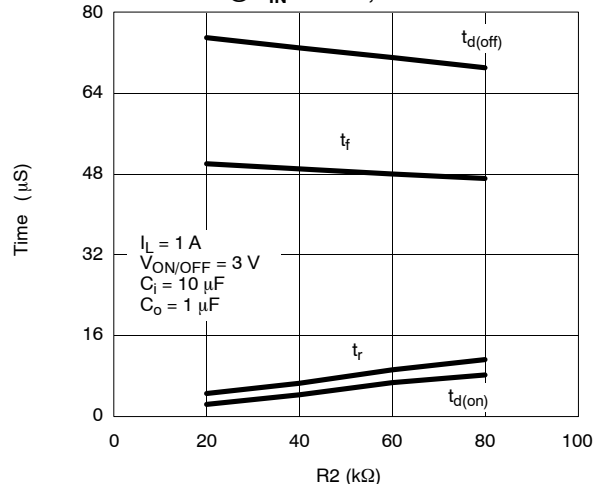


TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)

On-Resistance vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage

Switching Variation
R2 @ $V_{IN} = 4.5 V$, R1 = 20 k Ω Switching Variation
R2 @ $V_{IN} = 2.5 V$, R1 = 20 k Ω Switching Variation
R2 @ $V_{IN} = 1.8 V$, R1 = 20 k Ω Switching Variation
R2 @ $V_{IN} = 4.5 V$, R1 = 300 k Ω 

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

