

Load Switch with Level-Shift

PRODUCT SUMMARY		
V _{DS2} (V)	r _{DS(on)} (Ω)	I _D (A)
4.5 to 20	0.105 @ V _{IN} = 10 V	±2.3
	0.150 @ V _{IN} = 5.0 V	±1.9
	0.175 @ V _{IN} = 4.5 V	±1.7



ESD Protected
3000 V
4.5-V Rated

FEATURES

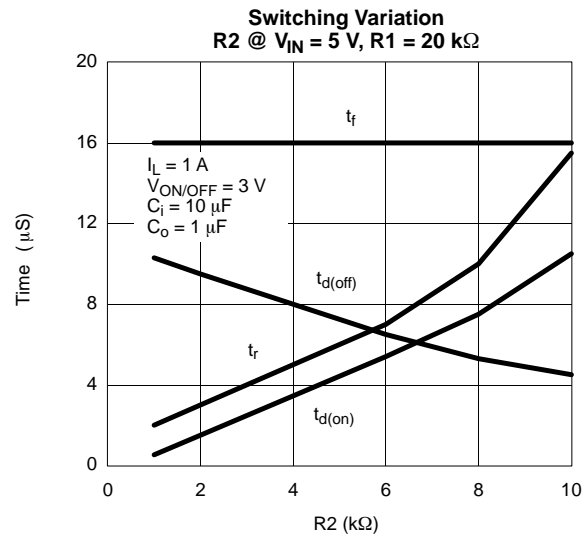
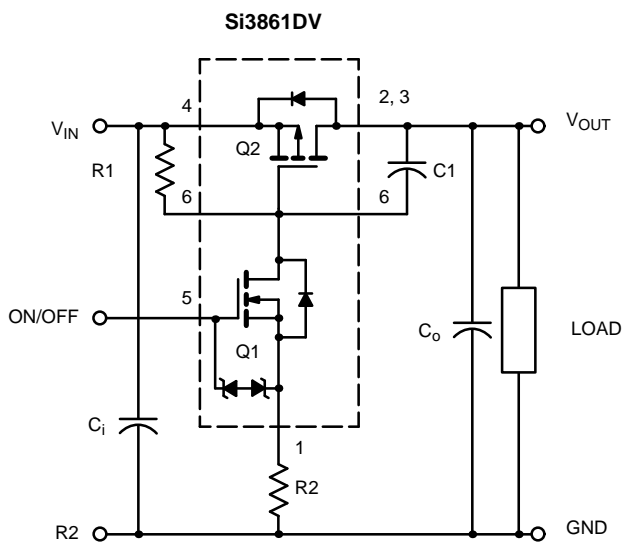
- 105-mΩ Low r_{DS(on)} TrenchFET™
- 4.5 to 20-V Input
- 1.5 to 8 -V Logic Level Control
- Low Profile, Small Footprint TSOP-6 Package
- 3000-V ESD Protection On Input Switch, V_{ON/OFF}
- Adjustable Slew-Rate

DESCRIPTION

The Si3861DV includes a p- and n-channel MOSFET in a single TSOP-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 Si3861DV operates on supply lines from 4.5 to 20-V, and can drive loads up to 2.3 A.

APPLICATION CIRCUITS

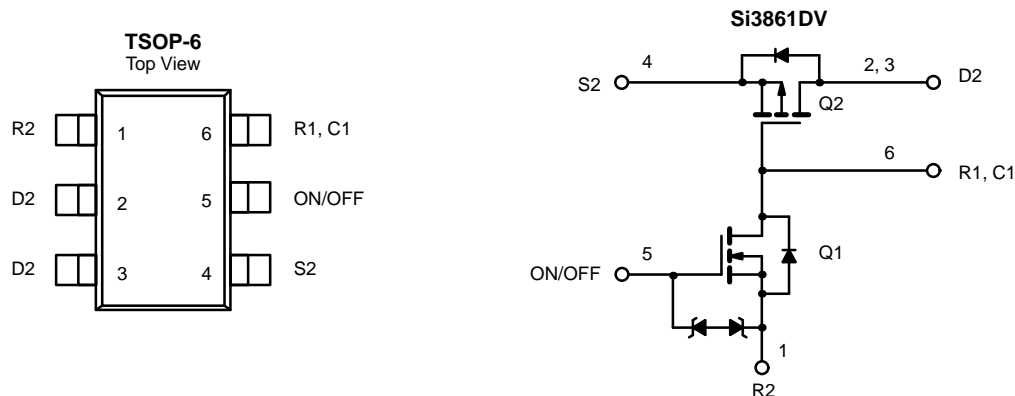


Note: For R2 switching variations with other V_{IN}/R1 combinations See Typical Characteristics

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 Si3861DV 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}	20	V
ON/OFF Voltage	$V_{ON/OFF}$	8	
Load Current	Continuous ^{a, b}	± 2.3	A
	Pulsed ^{b, c}	± 4	
Continuous Intrinsic Diode Conduction ^a	I_S	-1	
Maximum Power Dissipation ^a	P_D	0.83	W
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	3	kV

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (continuous current) ^a	R_{thJA}	120	150	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Foot (Q2)	R_{thJC}	35	50	

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

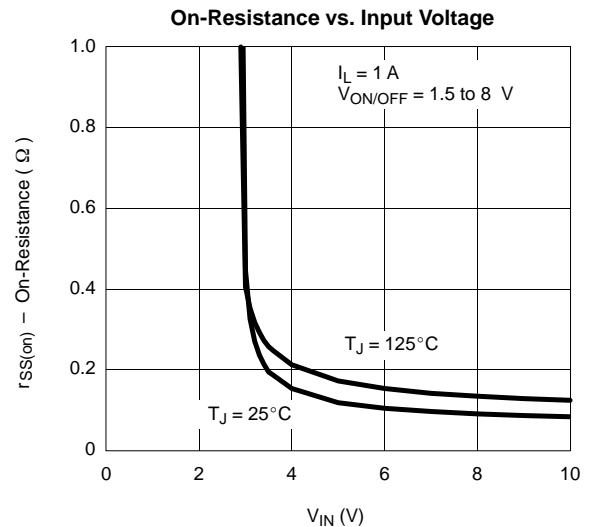
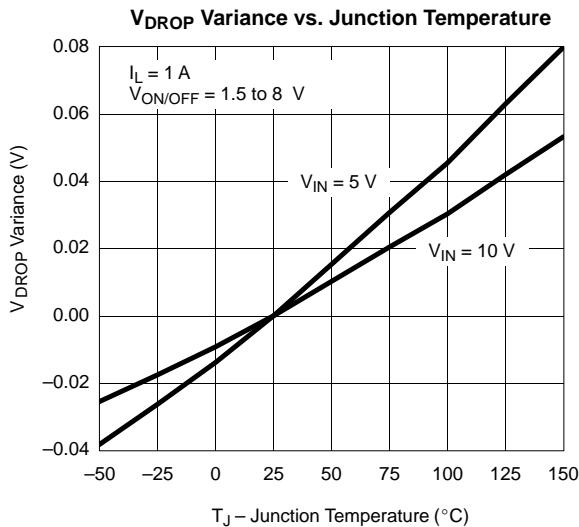
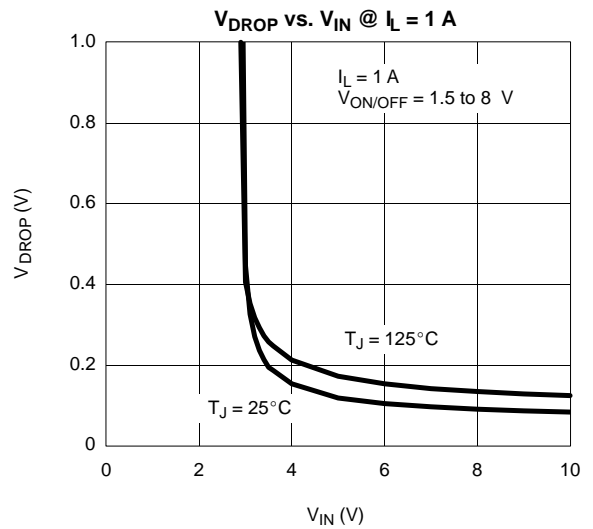
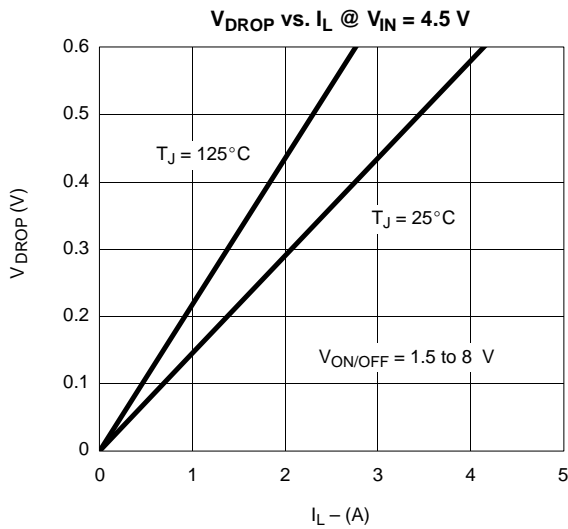
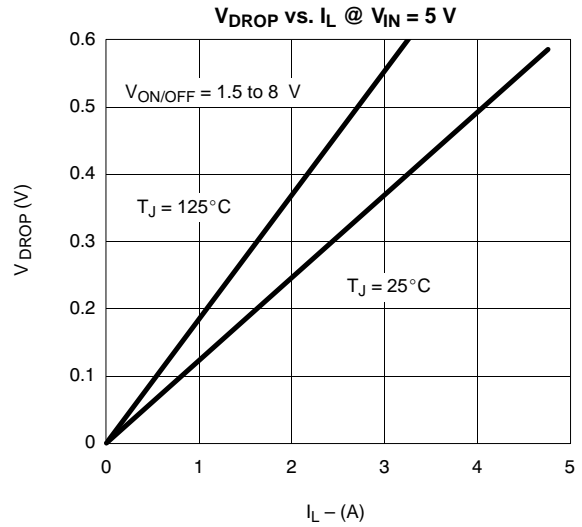
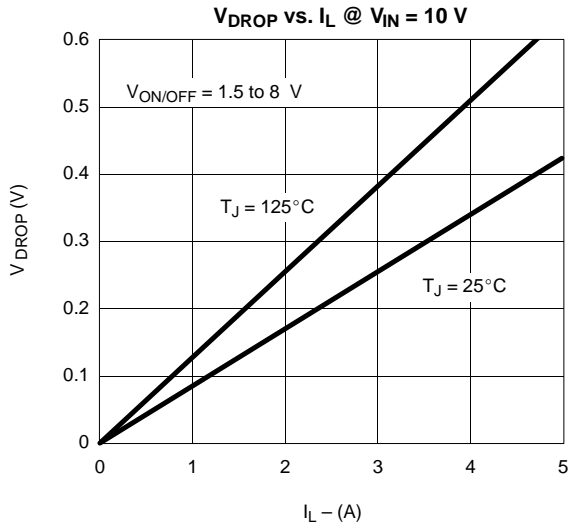
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
OFF Characteristics							
Reverse Leakage Current	I_{FL}	$V_{IN} = 30\text{ V}, V_{ON/OFF} = 0\text{ V}$			1	μA	
Diode Forward Voltage	V_{SD}	$I_S = -1\text{ A}$		-0.8	-1	V	
ON Characteristics							
Input Voltage Range	V_{IN}		4.5		20	V	
On-Resistance (p-channel) @ 1 A	$r_{DS(on)}$	$V_{ON/OFF} = 1.5\text{ V}$ $I_D = 1\text{ A}$	$V_{IN} = 10\text{ V}$		0.085	0.105	Ω
			$V_{IN} = 5.0\text{ V}$		0.123	0.150	
			$V_{IN} = 4.5\text{ V}$		0.145	0.175	
On-State (p-channel) Drain-Current	$I_{D(on)}$	$V_{IN-OUT} \leq 0.2\text{ V}, V_{IN} = 10\text{ V}, V_{ON/OFF} = 1.5\text{ V}$	1			A	
		$V_{IN-OUT} \leq 0.3\text{ V}, V_{IN} = 5\text{ V}, V_{ON/OFF} = 1.5\text{ V}$	1				

Notes

- Surface Mounted on FR4 Board.
- $V_{IN} = 12\text{ V}, V_{ON/OFF} = 8\text{ V}, T_A = 25^\circ\text{C}$.
- Pulse test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.



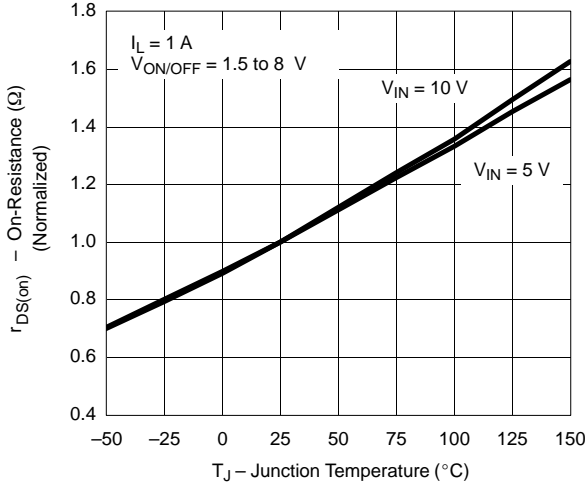
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



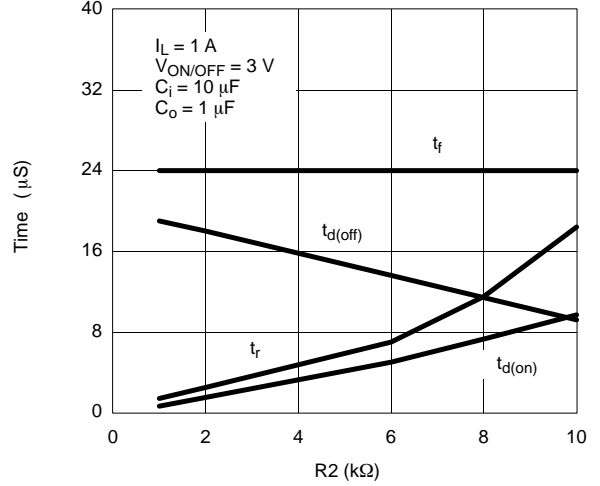


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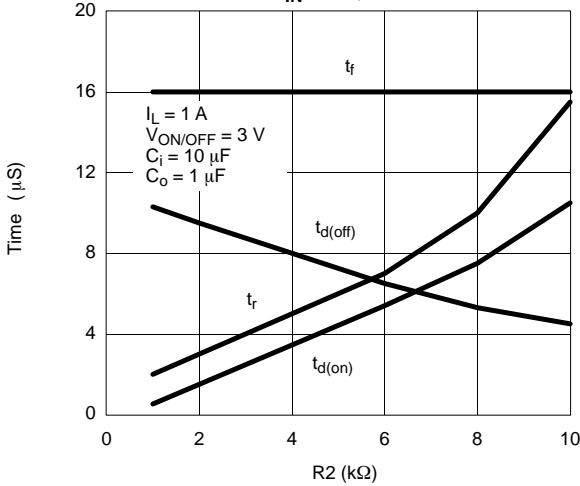
Normalized On-Resistance vs. Junction Temperature



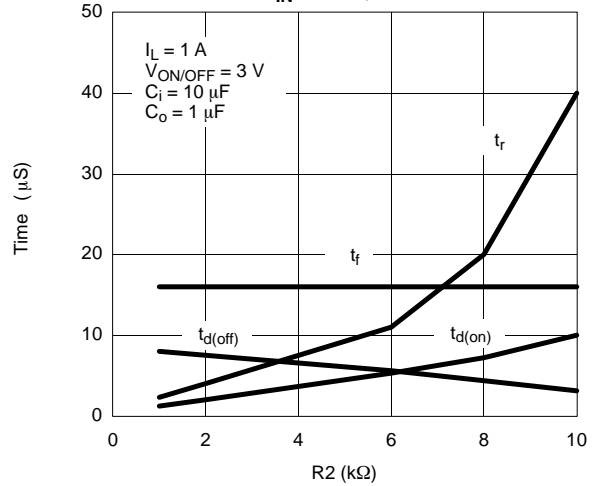
Switching Variation R2 @ V_IN = 10 V, R1 = 20 kΩ



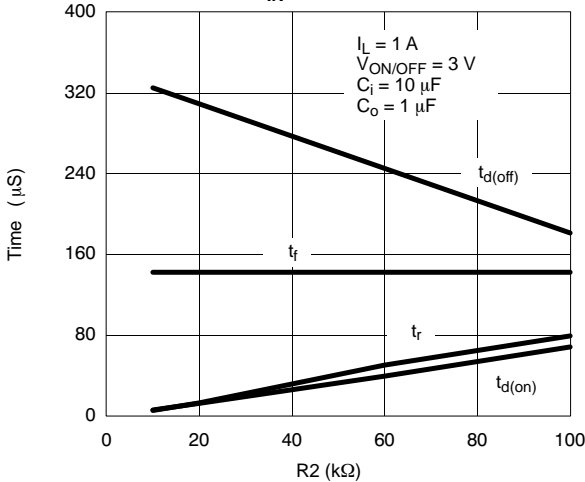
Switching Variation R2 @ V_IN = 5 V, R1 = 20 kΩ



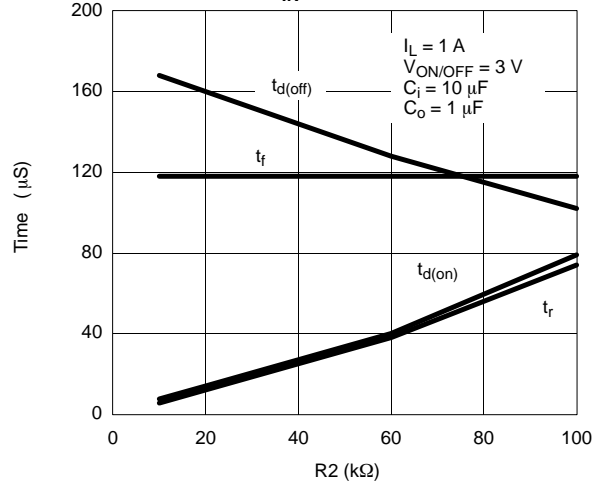
Switching Variation R2 @ V_IN = 4.5 V, R1 = 20 kΩ



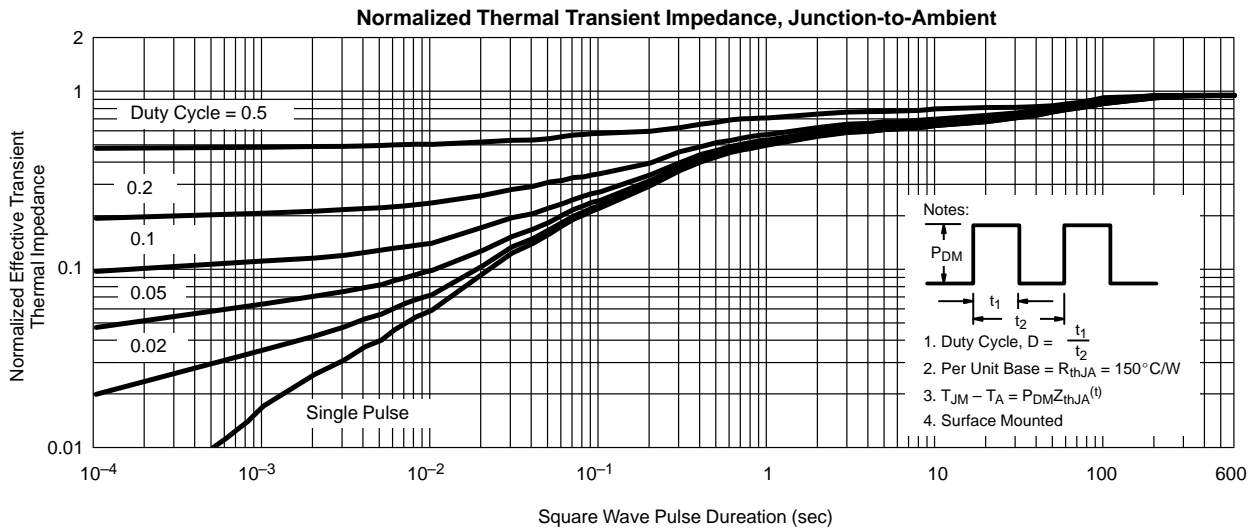
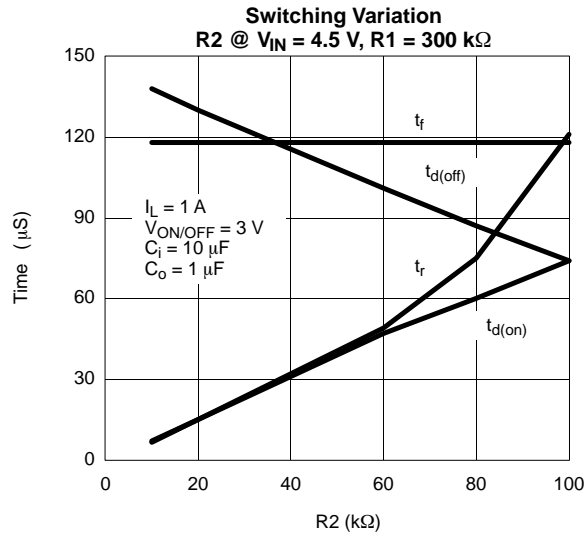
Switching Variation R2 @ V_IN = 10 V, R1 = 300 kΩ



Switching Variation R2 @ V_IN = 5 V, R1 = 300 kΩ



TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)





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