

Load Switch with Level-Shift

PRODUCT SUMMARY

V_{DS2} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
4.5 to 20	0.075 at $V_{IN} = 10$ V	± 2.3
	0.120 at $V_{IN} = 5.0$ V	± 1.9
	0.145 at $V_{IN} = 4.5$ V	± 1.7

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- 4.5 V Rated
- ESD Protected: 3000 V
- 105 m Ω Low $R_{DS(on)}$ TrenchFET®
- 4.5 V to 20 V Input
- 1.5 V 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
- Compliant to RoHS Directive 2002/95/EC

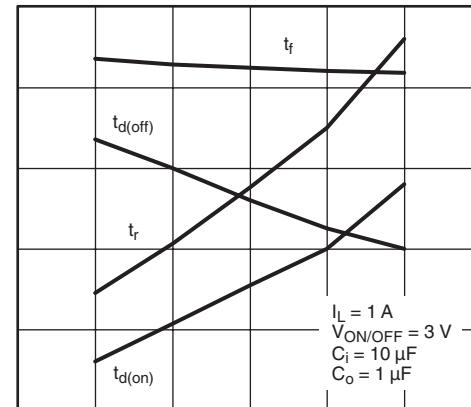
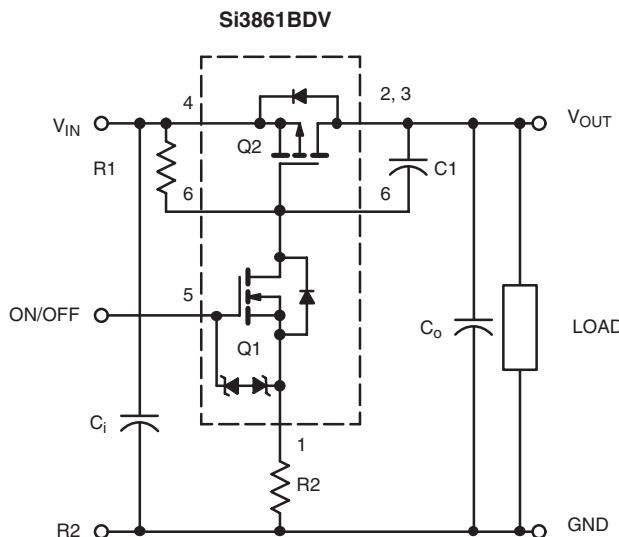


DESCRIPTION

The Si3861BDV 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



COMPONENTS

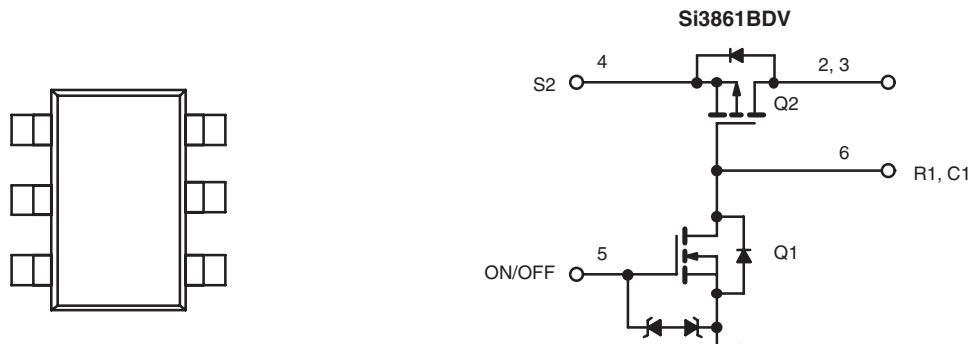
R1	Pull-Up Resistor	Typical 10 k Ω to 1 m Ω *
R2	Optional Slew-Rate Control	Typical 0 to 100 k Ω *
C1	Optional Slew-Rate Control	Typical 1000 pF

Note:

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

The Si3861BDV 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



Ordering Information: Si3861BDV-T1-E3 (Lead (Pb)-free)
Si3861BDV-T1-GE3 (Lead (Pb)-free and Halogen-free)

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	°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	°C/W
Maximum Junction-to-Foot (Q2)	R_{thJF}	60	80	

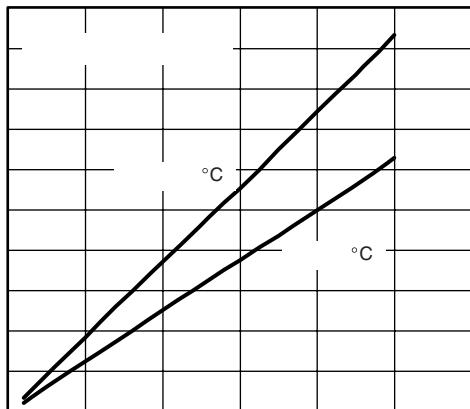
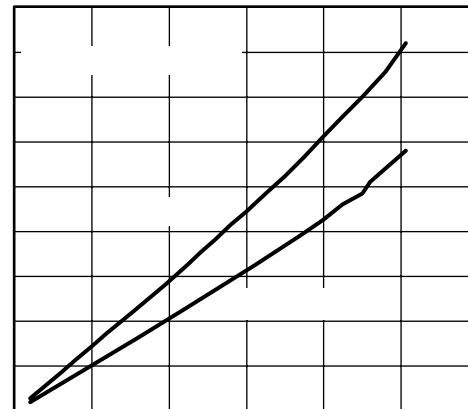
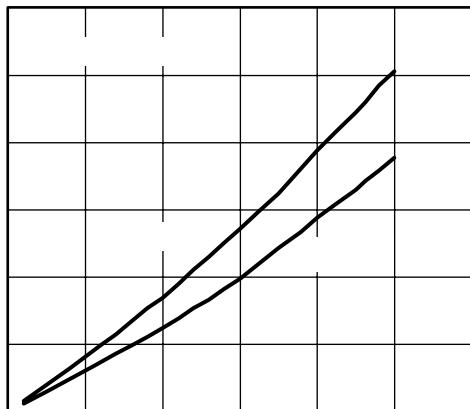
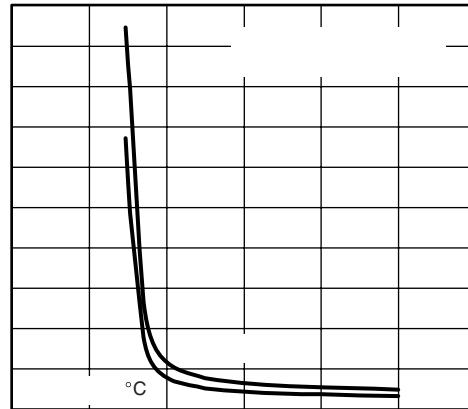
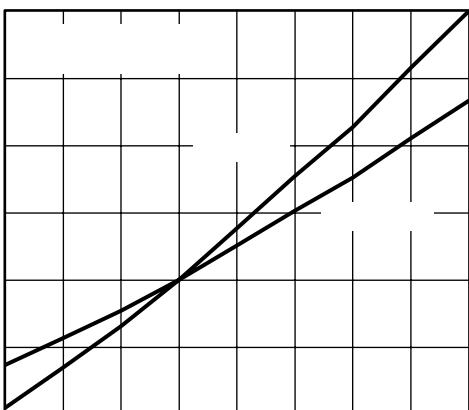
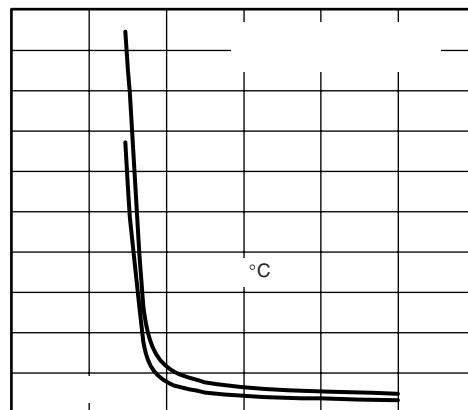
SPECIFICATIONS $T_1 = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions		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) at 1 A	$R_{DS(on)}$	$V_{ON/OFF} = 1.5 \text{ V}$, $I_D = 1 \text{ A}$	$V_{IN} = 10 \text{ V}$		0.060	0.075	Ω
			$V_{IN} = 5.0 \text{ V}$		0.096	0.120	
			$V_{IN} = 4.5 \text{ V}$		0.115	0.145	
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:

- a. Surface Mounted on FR4 board.
- b. $V_{IN} = 12$ V, $V_{ON/OFF} = 8$ V, $T_A = 25$ °C.
- c. Pulse test: pulse width ≤ 300 μ s, duty cycle ≤ 2 %.

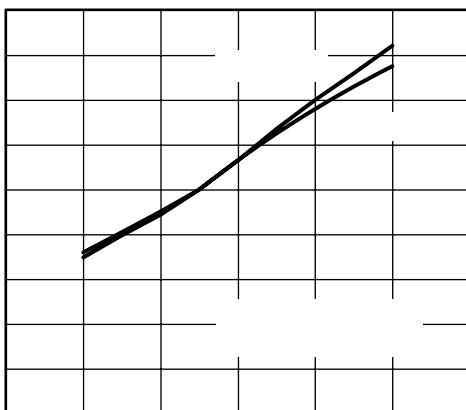
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure 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 $V_{IN} = 10$ V V_{DROP} vs. I_L at $V_{IN} = 5$ V V_{DROP} vs. I_L at $V_{IN} = 4.5$ V V_{DROP} vs. V_{IN} at $I_L = 1$ A V_{DROP} Variance vs. Junction Temperature

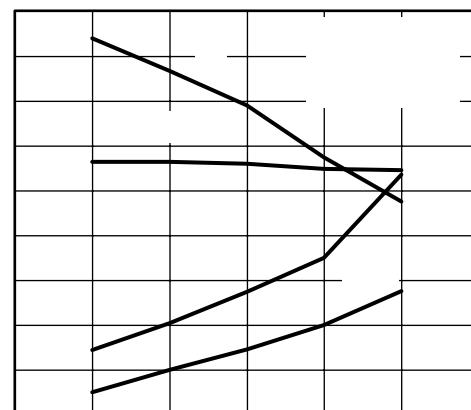
On-Resistance vs. Input Voltage

Si3861BDV

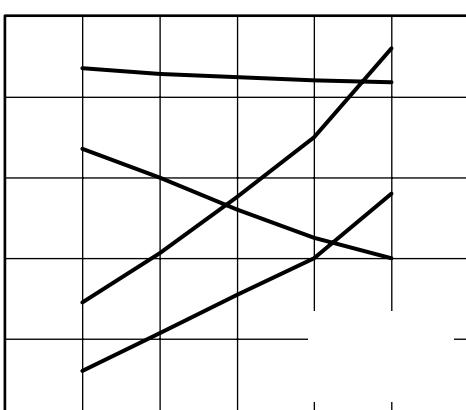
Vishay Siliconix

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

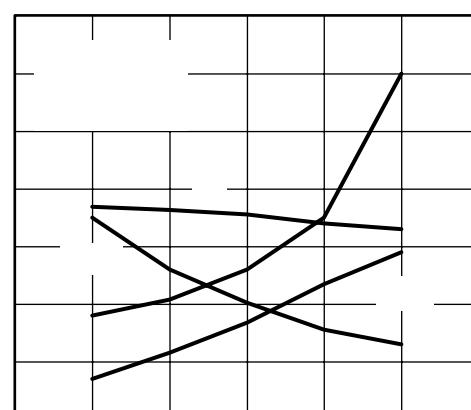
Normalized On-Resistance
vs. Junction Temperature



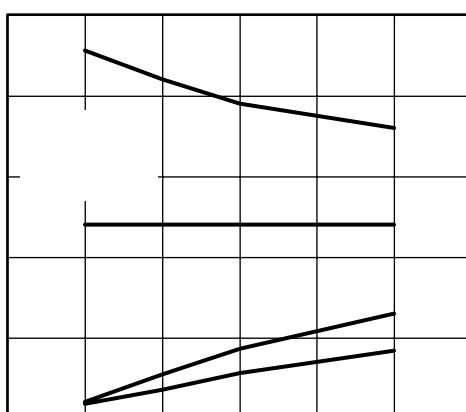
Switching Variation
R2 at V_{IN} = 10 V, R1 = 20 kΩ



Switching Variation
R2 at V_{IN} = 5 V, R1 = 20 kΩ

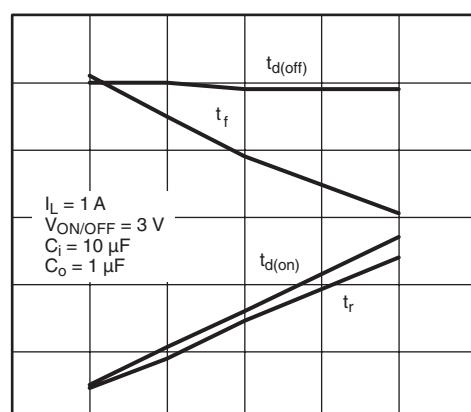


Switching Variation
R2 at V_{IN} = 4.5 V, R1 = 20 kΩ

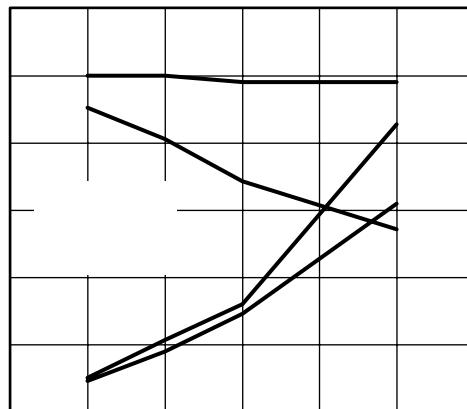


Switching Variation
R2 at V_{IN} = 10 V, R1 = 300 kΩ

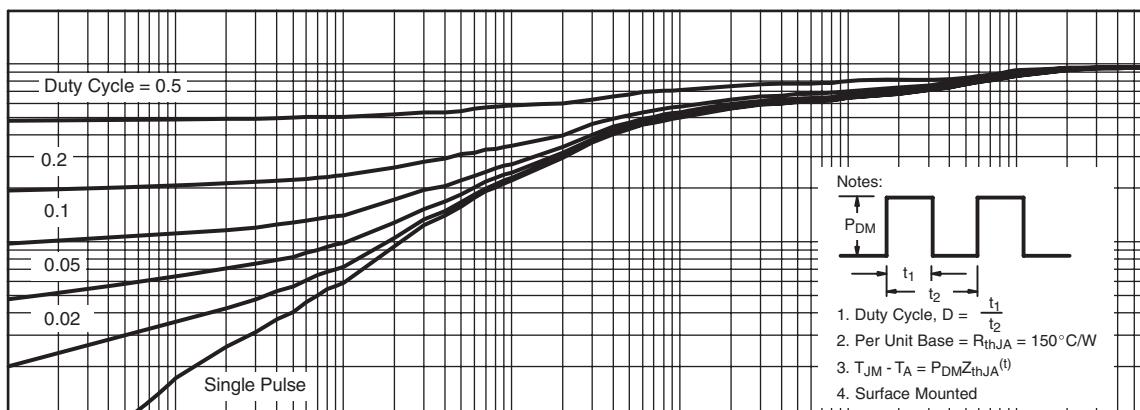
Time (μs)



Switching Variation
R2 at V_{IN} = 5 V, R1 = 300 kΩ

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

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



Normalized Thermal Transient Impedance, Junction-to-Ambient

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