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

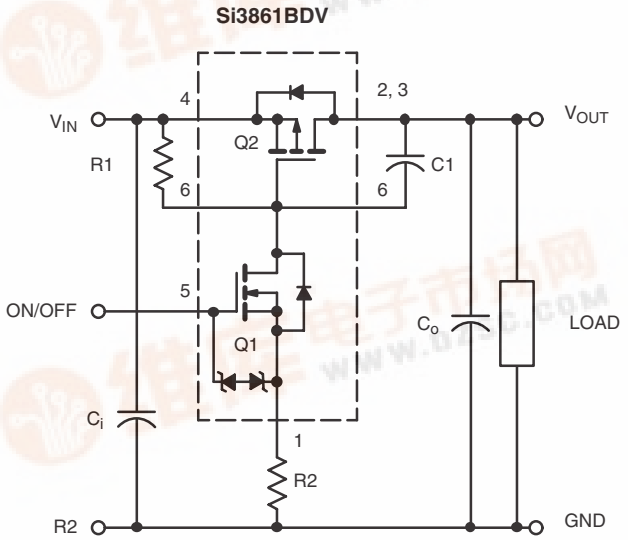
- **Halogen-free According to IEC 61249-2-21 Definition**
- 4.5 V Rated
- ESD Protected: 3000 V
- 105 mΩ Low $R_{DS(on)}$ TrenchFET®
- 4.5 V to 20 V Input
- 1.5 V to 8 V Logic Level Control
- Low Profile, Small Footprint TSOP-6 Package
- 3000 V ESD Protection On Input Switch, $V_{ON/OFF}$
- Adjustable Slew-Rate
- Compliant to RoHS Directive 2002/95/EC

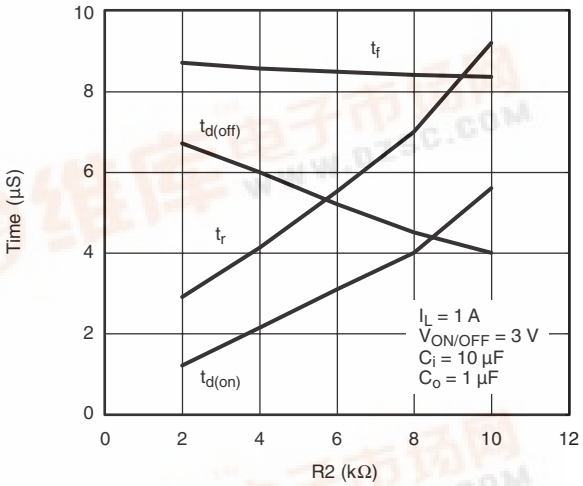
Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

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





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

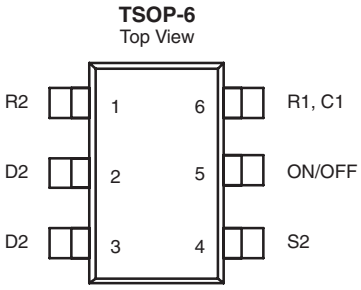
COMPONENTS		
R1	Pull-Up Resistor	Typical 10 kΩ to 1 mΩ*
R2	Optional Slew-Rate Control	Typical 0 to 100 kΩ*
C1	Optional Slew-Rate Control	Typical 1000 pF

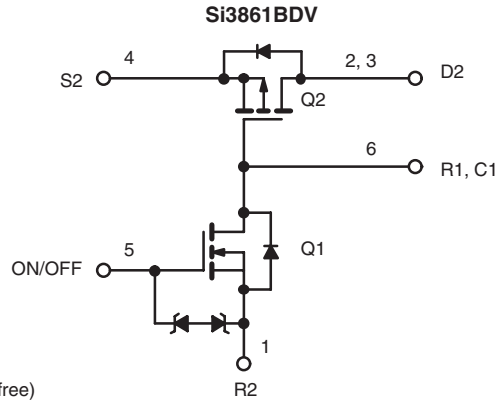
Note:
* Minimum R1 value should be at least 10 x R2 to ensure Q1 turn-on.

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.

Si3861BDV

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 °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]	I_L	± 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

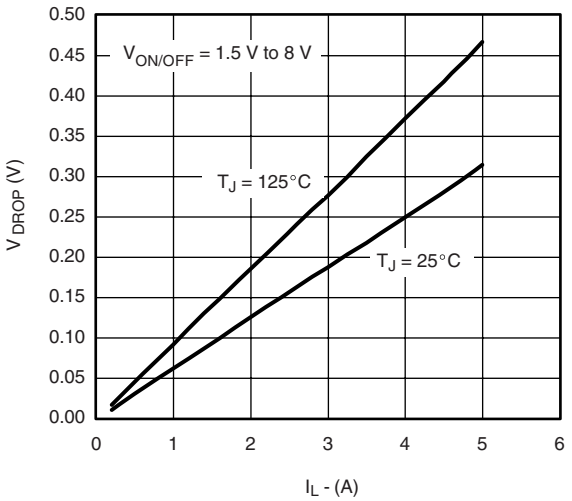
THERMAL RESISTANCE RATINGS				
Parameter	**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient (Continuous Current)[a]	R_{thJA}	120	150	°C/W
Maximum Junction-to-Foot (Q2)	R_{thJF}	60	80	

SPECIFICATIONS T_J = 25 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.**	**Max.**	**Unit**
OFF Characteristics							
Reverse Leakage Current	I_{FL}	V_{IN} = 30 V, $V_{ON/OFF}$ = 0 V				1	µA
Diode Forward Voltage	V_{SD}	I_S = - 1 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 V, I_D = 1 A	V_{IN} = 10 V		0.060	0.075	Ω
			V_{IN} = 5.0 V		0.096	0.120	
			V_{IN} = 4.5 V		0.115	0.145	
On-State (P-Channel) Drain-Current	$I_{D(on)}$	$V_{IN-OUT} \leq$ 0.2 V, V_{IN} = 10 V, $V_{ON/OFF}$ = 1.5 V		1			A
		$V_{IN-OUT} \leq$ 0.3 V, V_{IN} = 5 V, $V_{ON/OFF}$ = 1.5 V		1			

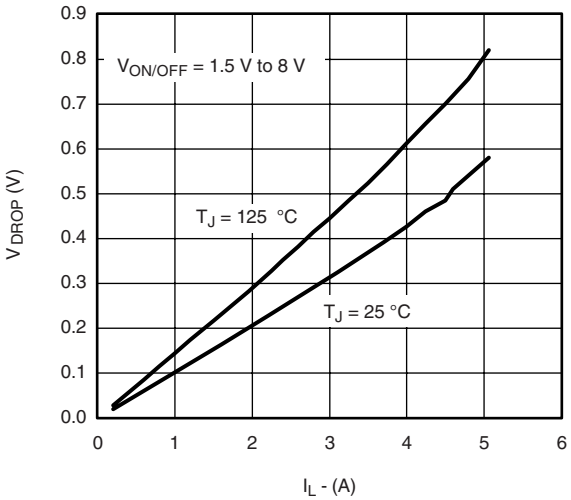
Notes:
a. Surface Mounted on FR4 board.
b. V_{IN} = 12 V, $V_{ON/OFF}$ = 8 V, T_A = 25 °C.
c. Pulse test: pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

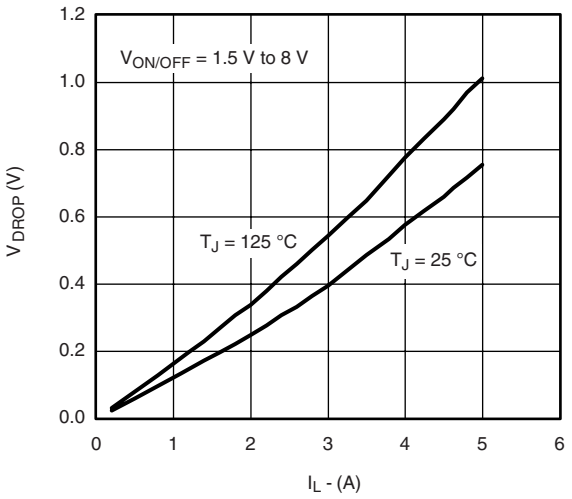
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



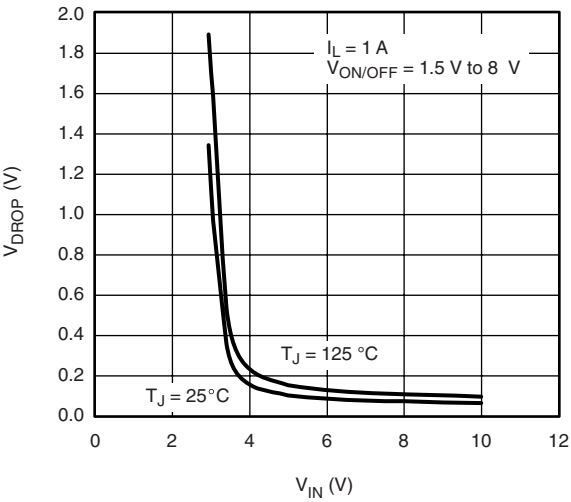
V_{DROP} vs. I_L at V_{IN} = 10 V



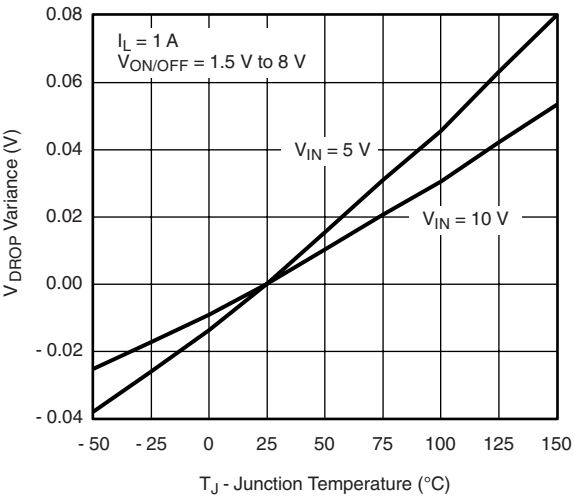
V_{DROP} vs. I_L at V_{IN} = 5 V



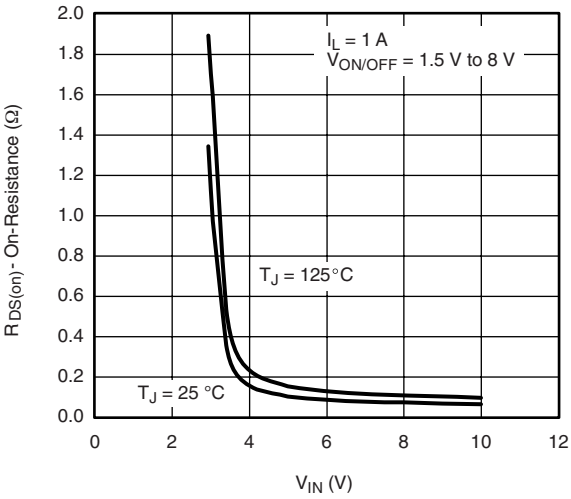
V_{DROP} vs. I_L at V_{IN} = 4.5 V



V_{DROP} vs. V_{IN} at = 1 A

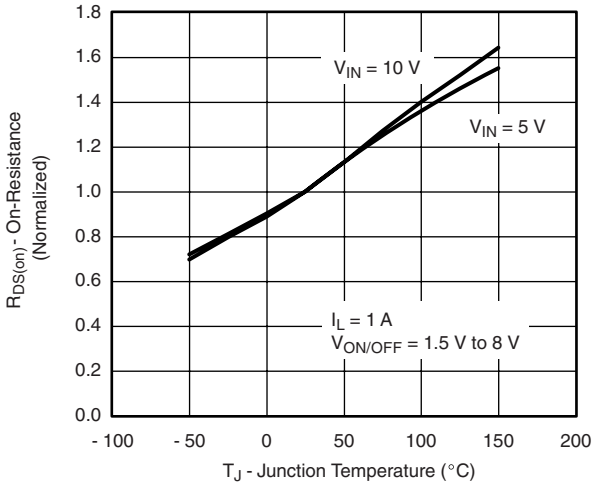


V_{DROP} Variance vs. Junction Temperature

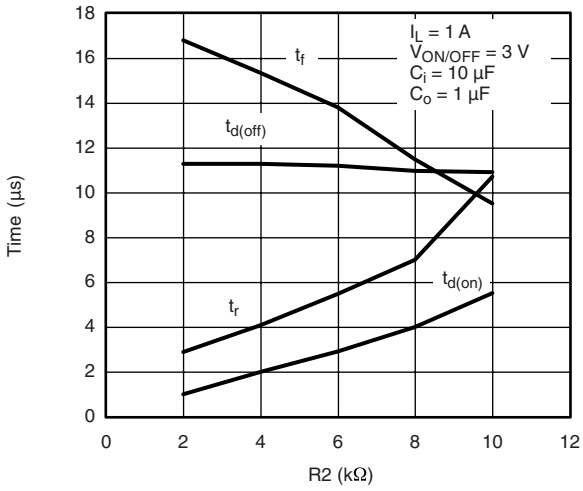


On-Resistance vs. Input Voltage

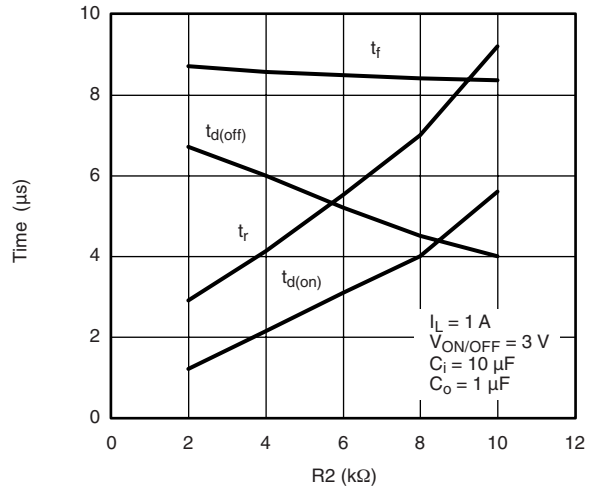
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



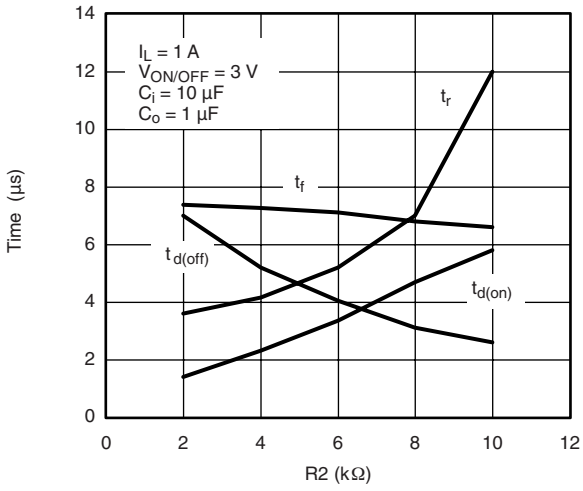
Normalized On-Resistance vs. Junction Temperature



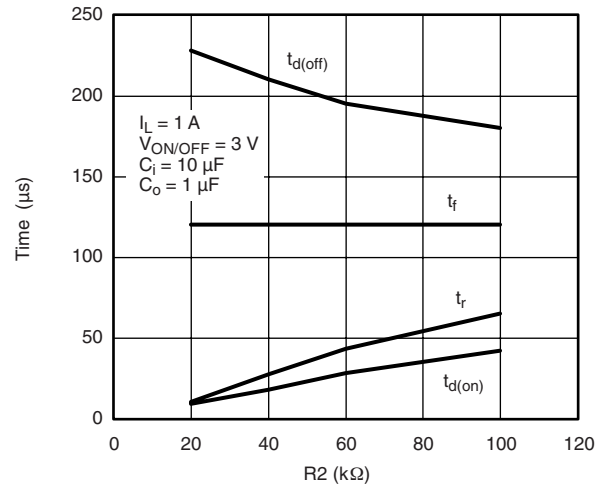
Switching Variation
R2 at V_{IN} = 10 V, R1 = 20 kΩ



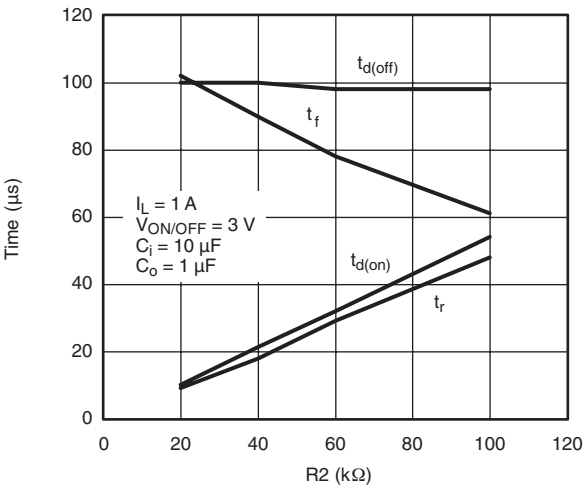
Switching Variation
R2 at V_{IN} = 5 V, R1 = 20 kΩ



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

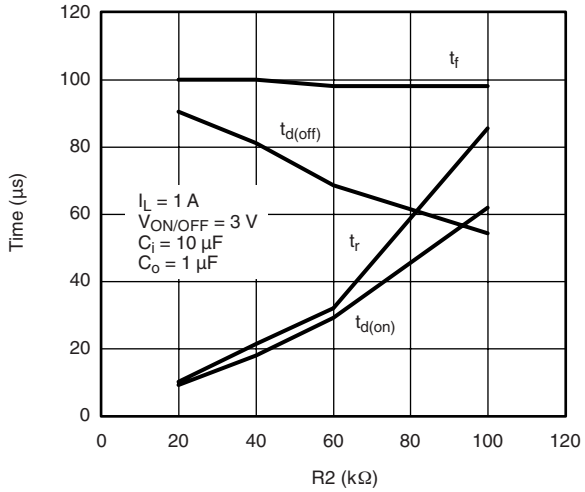


Switching Variation
R2 at V_{IN} = 10 V, R1 = 300 kΩ

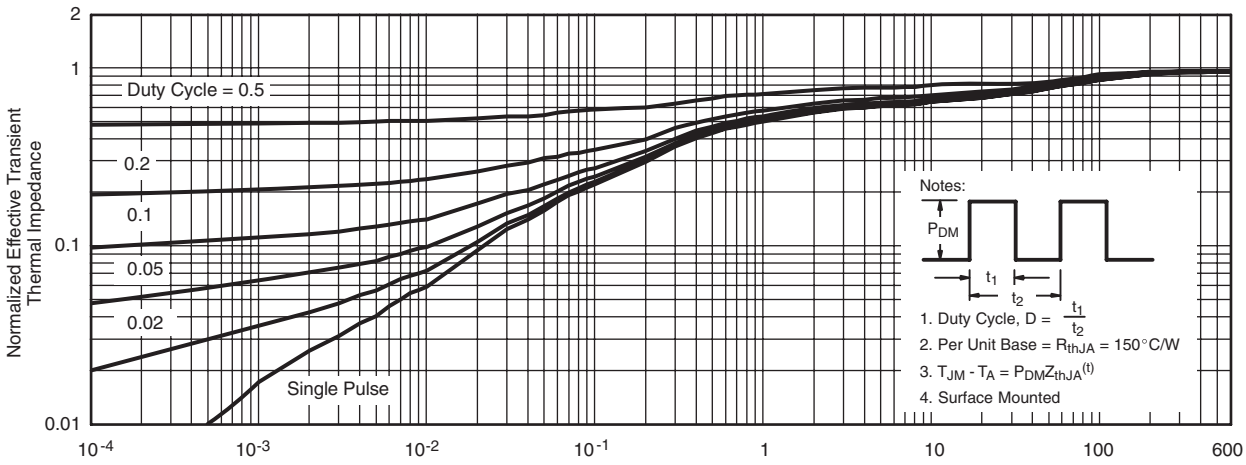


Switching Variation
R2 at V_{IN} = 5 V, R1 = 300 kΩ

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

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?73343.

Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.