Load Switch with Level-Shift

PRODUCT SUMMARY		
V_{DS2} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
1.8 to 20	0.165 at V_{IN} = 4.5 V	± 1.2
	0.222 at V_{IN} = 2.5 V	± 1.0
	0.303 at V_{IN} = 1.8 V	± 0.7

DESCRIPTION

The Si1869DH 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 Si1869DH operates on supply lines from 1.8 V to 20 V, and can drive loads up to 1.2 A.

FEATURES

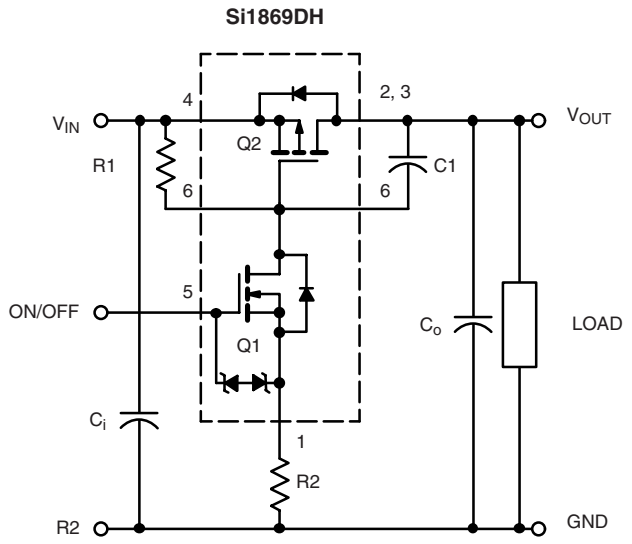
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFETs: 1.8 V Rated
- ESD Protected: 2000 V On Input Switch, $V_{ON/OFF}$
- 165 mΩ Low $R_{DS(on)}$
- 1.8 to 20 V Input
- 1.5 to 8 V Logic Level Control
- Low Profile, Small Footprint SC70-6 Package
- Adjustable Slew-Rate
- Compliant to RoHS Directive 2002/95/EC

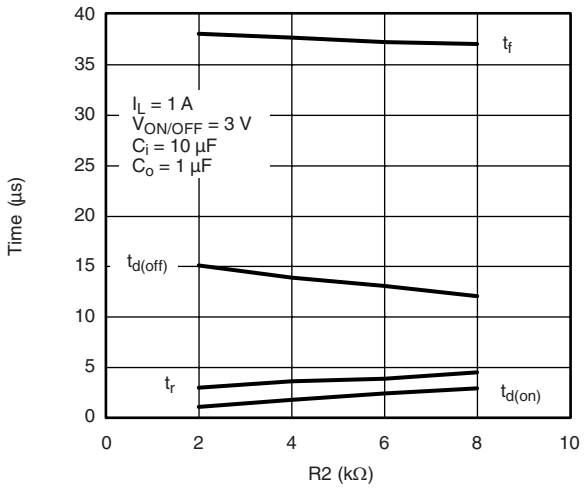
Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

- Level Shift for Portable Devices

APPLICATION CIRCUITS





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

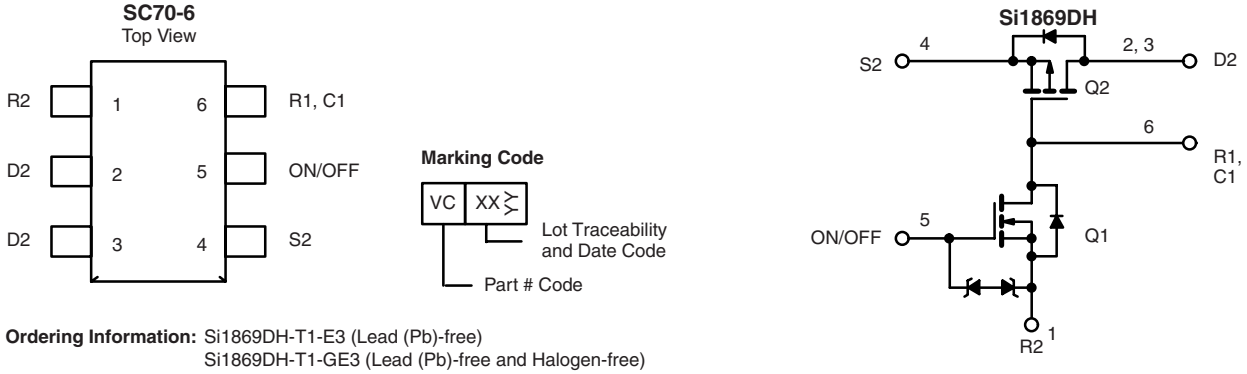
Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 20 kΩ

COMPONENTS		
R1	Pull-Up Resistor	Typical 10 kΩ to 1 MΩ*
R2	Optional Slew-Rate Control	Typical 0 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 Si1869DH 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: Si1869DH-T1-E3 (Lead (Pb)-free)
Si1869DH-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage (D2-S2)		V_{DS}	- 20	V
Input Voltage		V_{IN}	20	
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	1.0	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	2	kV

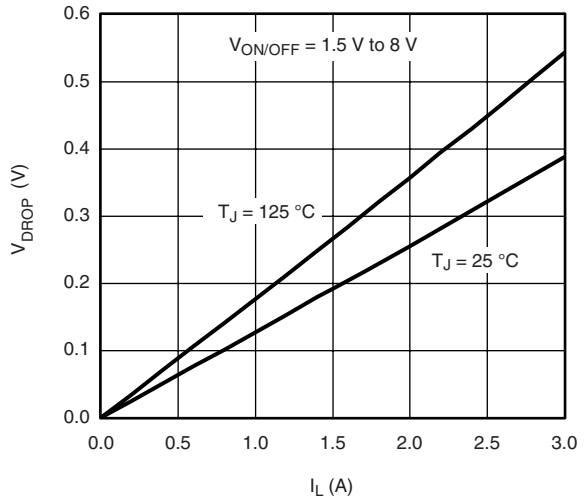
THERMAL RESISTANCE RATINGS				
Parameter	**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient (Continuous Current)[a]	R_{thJA}	100	125	°C/W
Maximum Junction-to-Foot (Q2)	R_{thJF}	44	55	

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} = 8 V, $V_{ON/OFF}$ = 0 V			1	µA
Diode Forward Voltage	V_{SD}	I_S = - 0.4 A	0.4	0.6	1.1	V
ON Characteristics						
Input Voltage Range	V_{IN}		1.8		20	V
Drain to Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 20			
On-Resistance (P-Channel) at 1 A	$R_{DS(on)}$	$V_{ON/OFF}$ = 1.5 V, V_{IN} = 4.5 V, I_D = 1.2 A		0.132	0.165	Ω
		$V_{ON/OFF}$ = 1.5 V, V_{IN} = 2.5 V, I_D = 1.0 A		0.177	0.222	
		$V_{ON/OFF}$ = 1.5 V, V_{IN} = 1.8 V, I_D = 0.7 A		0.242	0.303	
On-State (P-Channel) Drain-Current	$I_{D(on)}$	V_{IN-OUT} ≤ 0.2 V, V_{IN} = 5 V, $V_{ON/OFF}$ = 1.5 V	1			A
		V_{IN-OUT} ≤ 0.3 V, V_{IN} = 3 V, $V_{ON/OFF}$ = 1.5 V	1			

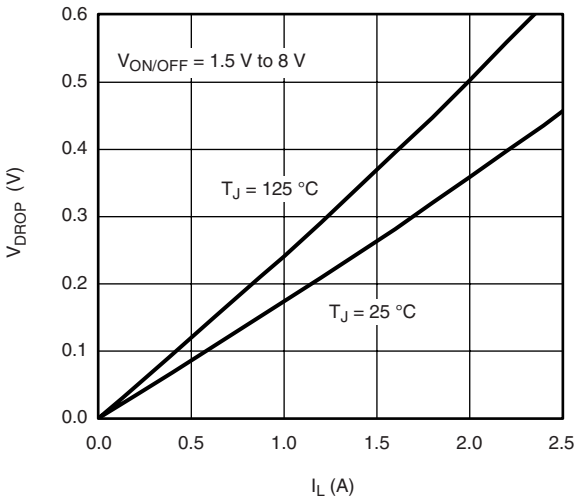
Notes:
a. Surface mounted on FR4 board.
b. V_{IN} = 20 V, $V_{ON/OFF}$ = 8 V, T_A = 25 °C.
c. Pulse test: pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

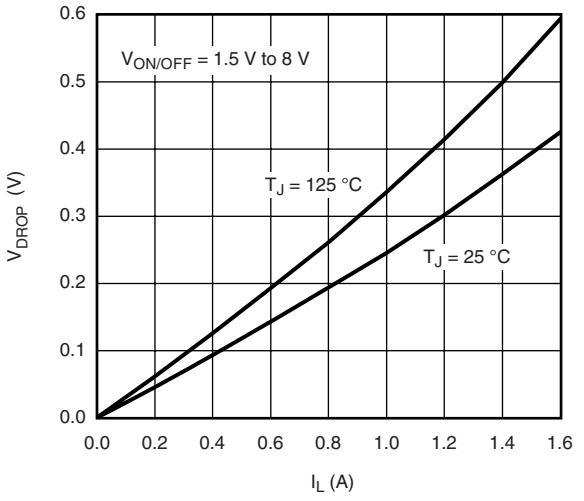
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



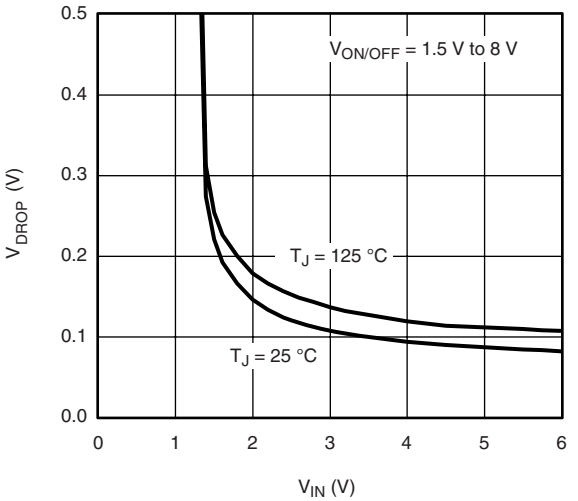
V_{DROP} vs. I_L at V_{IN} = 4.5 V



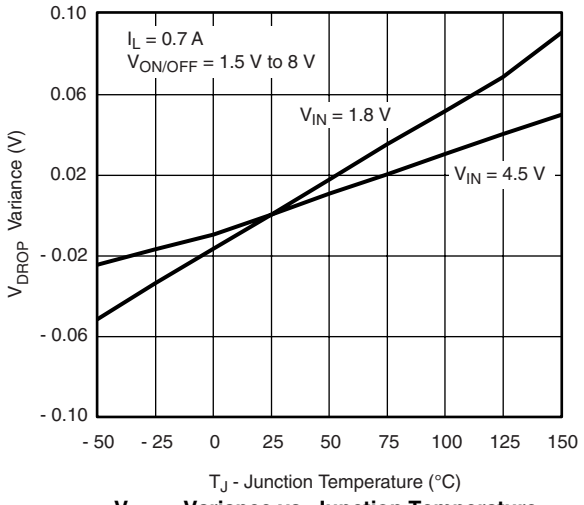
V_{DROP} vs. I_L at V_{IN} = 2.5 V



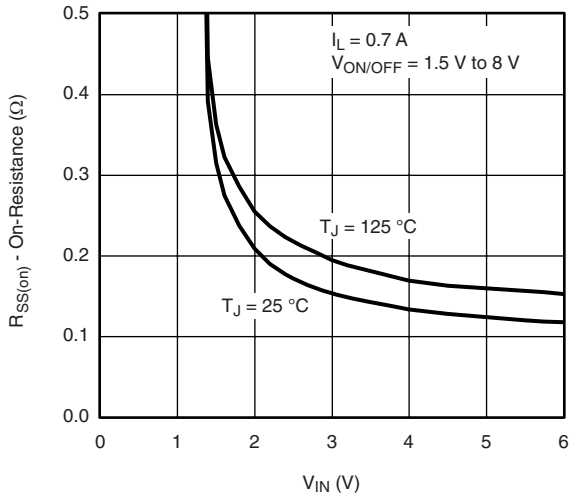
V_{DROP} vs. I_L at V_{IN} = 1.8 V



V_{DROP} vs. V_{IN} at I_L = 0.7 A

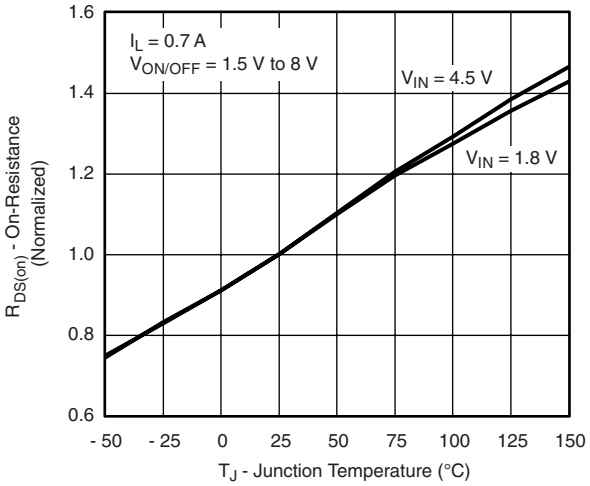


V_{DROP} Variance vs. Junction Temperature

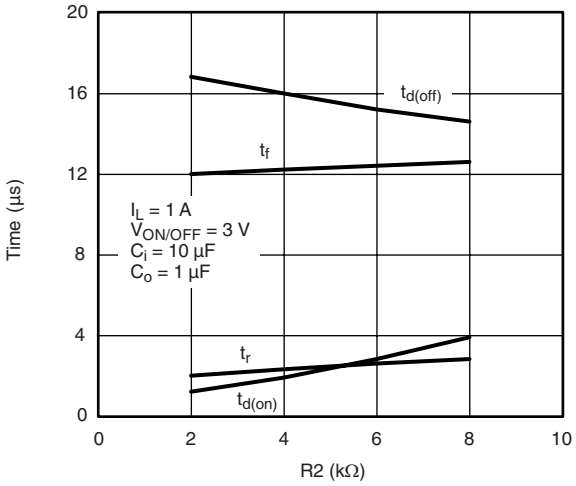


On-Resistance vs. Input Voltage

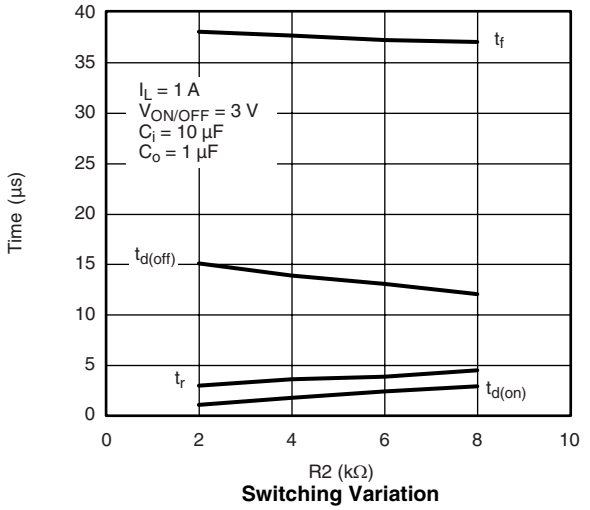
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



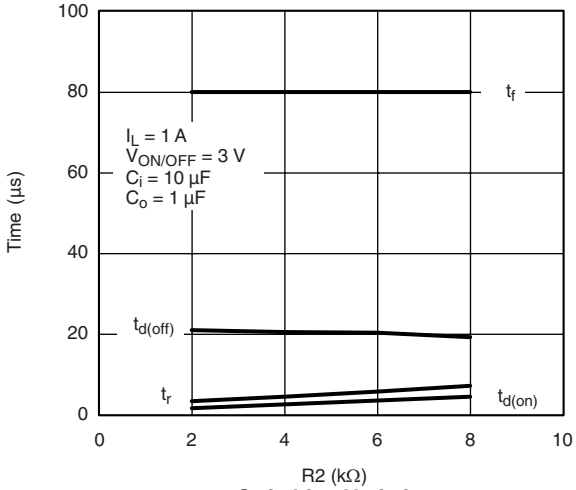
Normalized On-Resistance vs. Junction Temperature



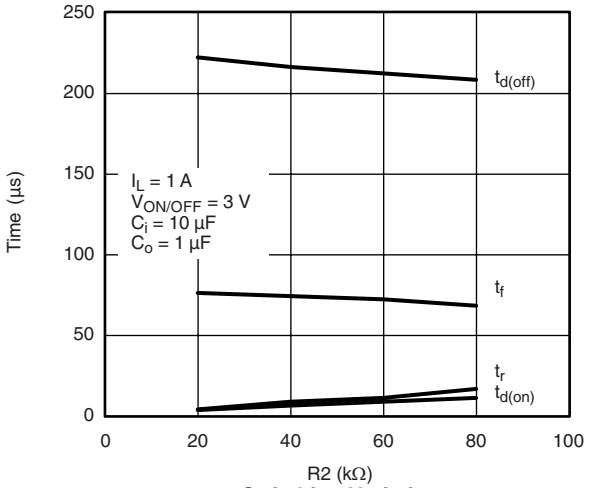
Switching Variation
R2 at V_{IN} = 4.5 V, R1 = 20 kΩ



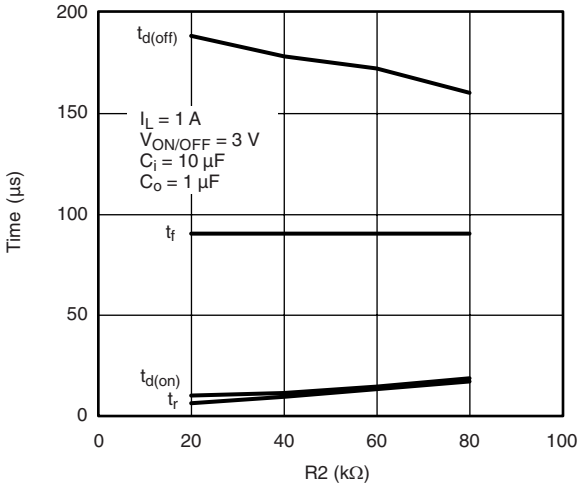
Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 20 kΩ



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

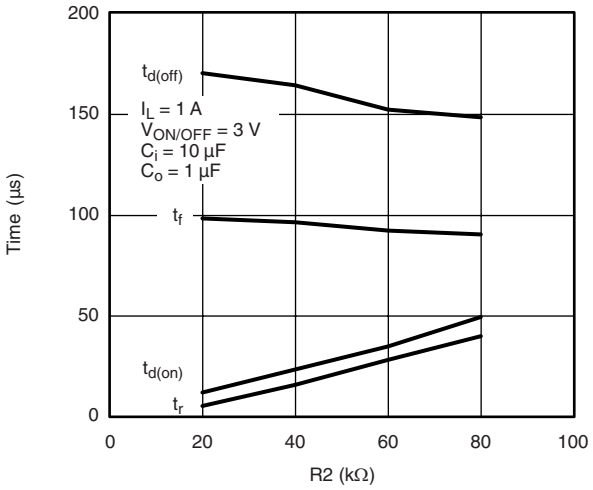


Switching Variation
R2 at V_{IN} = 4.5 V, R1 = 300 kΩ

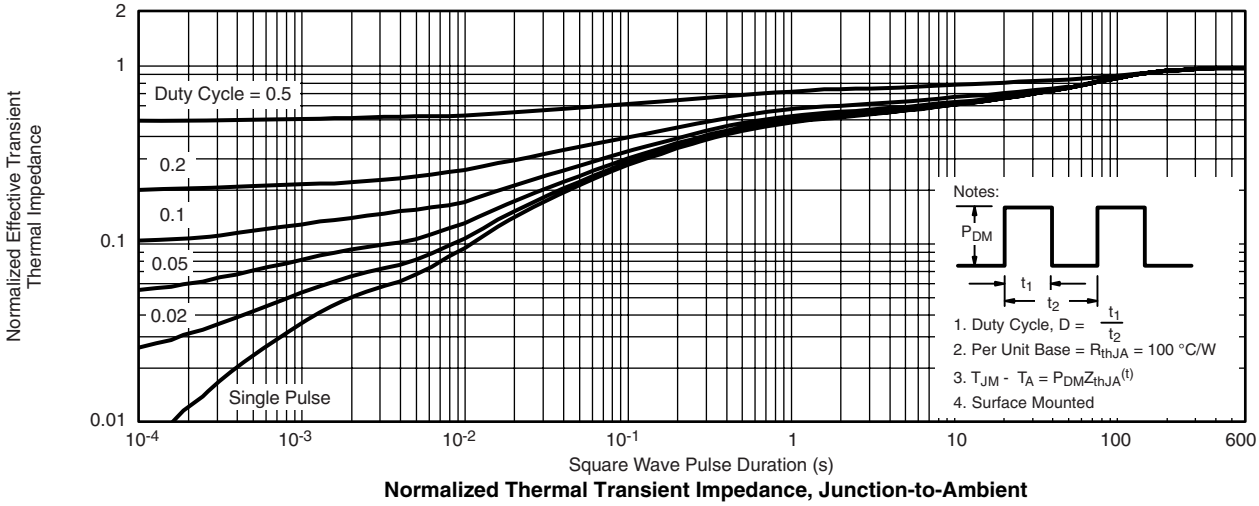


Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 300 kΩ

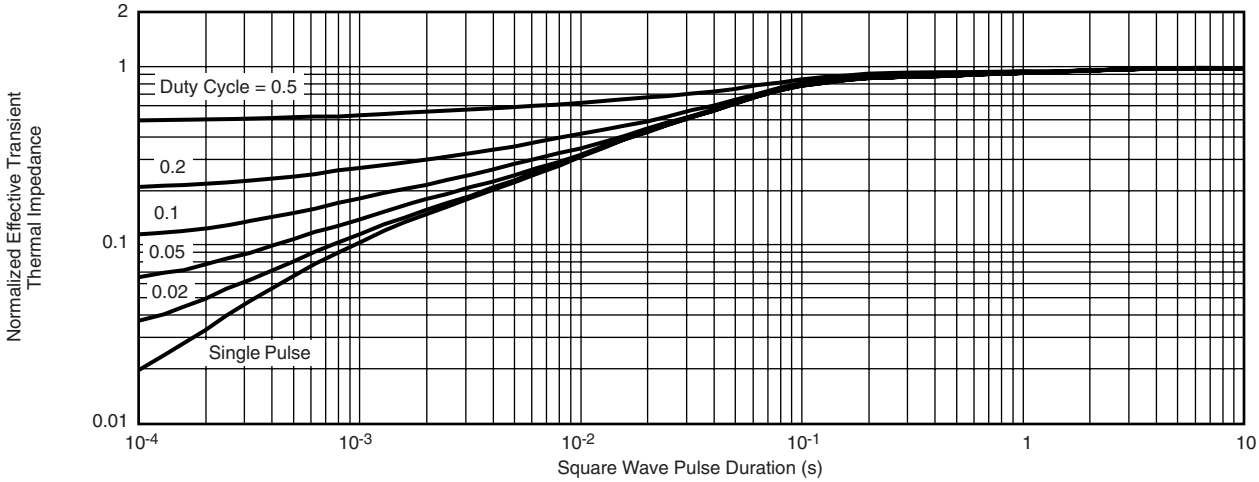
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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