PI3PD22919

Ultra Small, Low-Input Voltage, Low R_{ON} Load Switch

Features

- Integrated Load Switch
- Input Voltage: 0.75-V to 3.6-V
- Ultra-Low ON Resistance:
  - Max R_{ON} over temperature = 9.8mΩ at V_{IN} = 3.6V
- Ultra Small CSP-8 package
  - 0.95 mm x 1.95 mm, 0.5-mm Pitch
- 4-A Maximum Continuous Switch Current
- Shutdown Current 5.5-µA max
- Low Threshold Control Input
- Controlled Slew Rate to Avoid Inrush Currents
- Quick Output Discharge Transistor
- ESD Performance Tested Per JESD 22
  - 4000-V Human-Body Model (A114-B, Class II)
  - 1000-V Charged-Device Model (C101)

Applications

- Notebook / Netbook Computer
- Tablet PC
- PDAs / Smartphones
- GPS Navigation Devices
- MP3 Players

Description

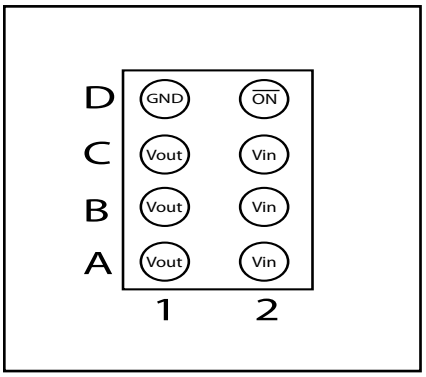
The PI3PD22919 is a small, ultra-low r_{ON} load switch with controlled turn on. The device contains a N-channel MOSFET that can operate over an input voltage range of 0.75 V to 3.6 V and switch currents up to 4-A. An integrated charge pump biases the NMOS switch in order to achieve a minimum switch ON resistance (r_{ON}). The switch is controlled by an on/off input ($\overline{ON}$), via an active low enable pin.

The PI3PD22919 has a 1250Ω on-chip load resistor for quick output discharge when the switch is turned off.

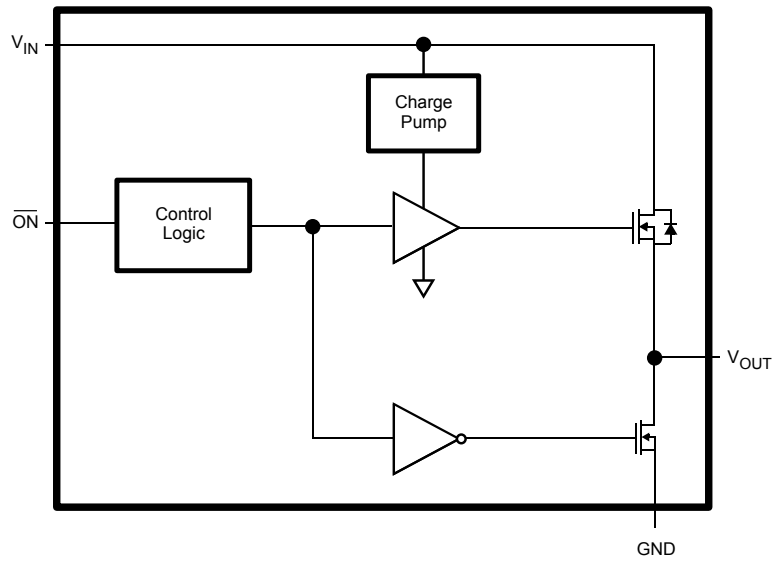
The PI3D22919 has an internally controlled rise time in order to reduce inrush current. The PI3D22919 features a rise time of 880µS at 3.6V.

The PI3D22919 is available in an ultra-small, space-saving 8-pin CSP package and is characterized for operation over the free-air temperature range of –40°C to 85°C.

Pin Configuration (Bottom View)



Functional Block Diagram



Function Table

$\overline{ON}$ (Control Input)	V_{IN} to V_{OUT}	V_{OUT} to GND
L	ON	OFF
H	OFF	ON

Pin Description

Terminal		Description
Ball No.	Name	
D1	GND	Ground
D2	$\overline{ON}$	Switch Control Input. Active low, do not leave floating.
A1, B1,C1	V_{OUT}	Switch Output
A2, B2,C2	V_{IN}	Switch Input. Bypass this input with a ceramic capacitor to ground.

Abosolute Maximum Ratings

V_{IN}, Input voltage range ..... –0.3V to 4V
V_{OUT}, Output voltage range ..... V_{IN}+0.3V
V_{ON} , Input voltage range ..... –0.3V to 4V
I_{MAX}, Maximum continuous switch current 4A
I_{PLS}, Maximum pulsed current (100-µs pulse, 2% duty cycle) 6A
T_A, Operating free-air temperature range ..... –40˚C to 85 °C
T_J, Maximum junction temperature ..... 125 °C
T_{STG}, Storage temperature range ..... –65˚C to 150 °C
T_{LEAD}, Maximum lead temperature(10-s soldering time) ..... 300 °C
ESD, Electrostatic discharge protection ,
Charged Device Model(CDM) 1000V
Human-Body Model(HBM) 4000V

Note:
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 under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Symbol	Parameter		Min.	Max.	Unit
V_{IN}	Input voltage range		0.75	3.6	V
V_{OUT}	Output voltage range			V_{IN}	V
V_{IH}	High-level input voltage range, ON	V_{IN} = 2.5 V to 3.6 V	1.2	3.6	V
		V_{IN} = 0.75 V to 2.5 V	0.9	3.6	V
V_{IL}	Low-level input voltage range, ON	V_{IN} = 2.5 V to 3.6 V		0.6	V
		V_{IN} = 0.75 V to 2.49 V		0.4	V
C_{IN}	Input capacitor		1(1)		µF

DC Electrical Characteristics Unless otherwise specified, V_{IN} = 0.75V to 3.6V

Parameter		Conditions		T_A[1]	Min.	Typ.	Max.	Unit
Power Switch								
I_{IN}	Quiescent current	I_{OUT} = 0, V_{ON} = GND	V_{IN} = 3.6V	Full		68	160	µA
			V_{IN} = 2.5V			40	70	
			V_{IN} = 1.8V			25	350	
			V_{IN} = 1.2V			103	200	
			V_{IN} = 1.0V			78	110	
			V_{IN} = 0.75V			37	70	
$I_{IN(LEAKAGE)}$	OFF-state supply current	V_{IN} = V_{ON} = 3.6V, V_{OUT} = 0		Full			5.5	µA
R_{ON}	ON-state resistance	I_{OUT} = -200 mA	V_{IN} = 3.6V	25°C		7.1	8.8	mΩ
				Full			9.8	
			V_{IN} = 2.5V	25°C		7.2	8.9	
				Full			9.9	
			V_{IN} = 1.8V	25°C		7.3	9.1	
				Full			10.1	
			V_{IN} = 1.2V	25°C		6.9	9.1	
				Full			10.4	
			V_{IN} = 1.05V	25°C		7	9.2	
				Full			10.6	
			V_{IN} = 0.75V	25°C		7.6	10.2	
				Full			11.6	
r_{PD}	Output pulldown resistance	V_{IN} = V_{ON} = 3.3V, I_{OUT} = 3mA		Full		1250	1500	Ω
I_{ON}	ON input leakage current	V_{ON} = 0.9V to 3.6 V or GND		Full			0.1	µA

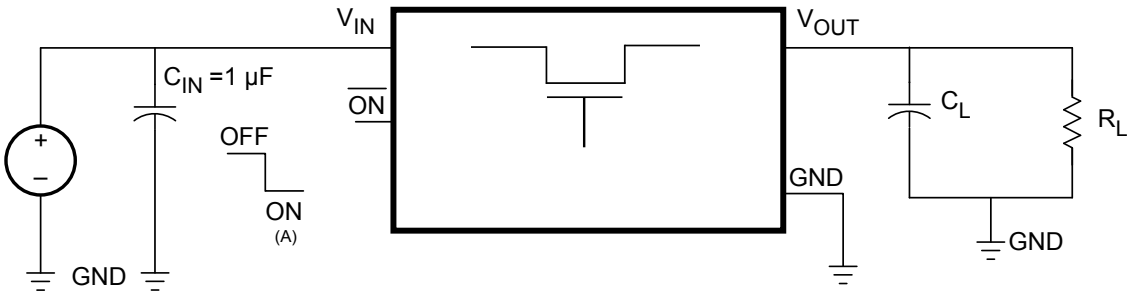
Note:

1. Typical values are at V_{IN} = 3.3 V and T_A = 25°C.
2. See Output Pulldown in Application Information.

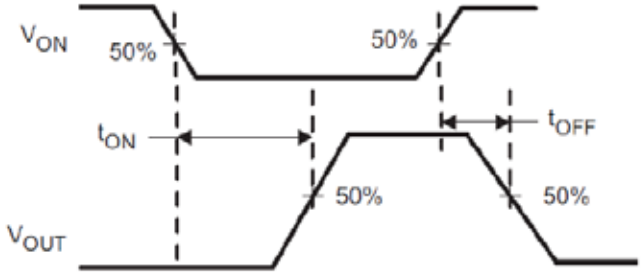
Switching Characteristics

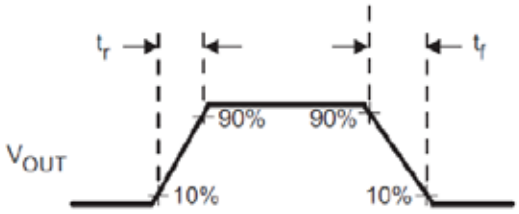
Symbol	Parameter	Conditions			Min.	Typ.	Max.	Units
V_{IN} = 3.6V, T_A = 25˚C (Unless otherwise specified)								
t_{ON}	Turn-ON time	R_L = 10Ω	C_L = 0.1µF	V_{IN} = 3.6V		970		µs
t_{OFF}	Turn-OFF time					3		µs
t_r	V_{OUT} rise time					880		µs
t_f	V_{OUT} fall time					2		µs
V_{IN} = 0.9V, T_A = 25˚C (Unless otherwise specified)								
t_{ON}	Turn-ON time	R_L = 10Ω	C_L = 0.1µF	V_{IN} = 0.9V		840		µs
t_{OFF}	Turn-OFF time					16		µs
t_r	V_{OUT} rise time					470		µs
t_f	V_{OUT} fall time					5		µs

Parameter Measurement Information



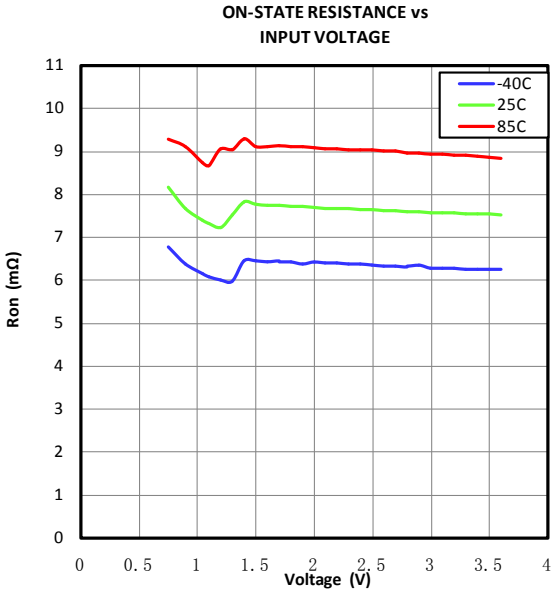
(A) Rise and fall time of the control signals 100ns.

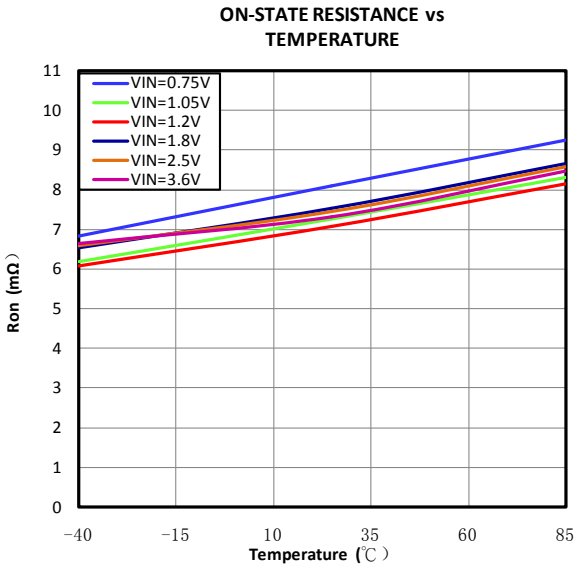


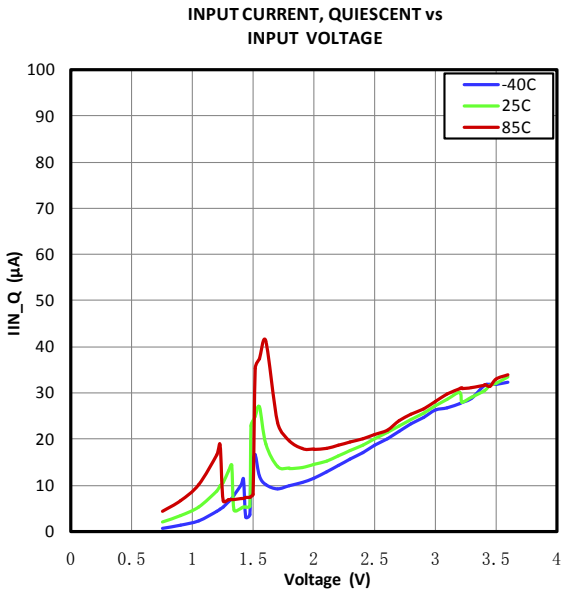


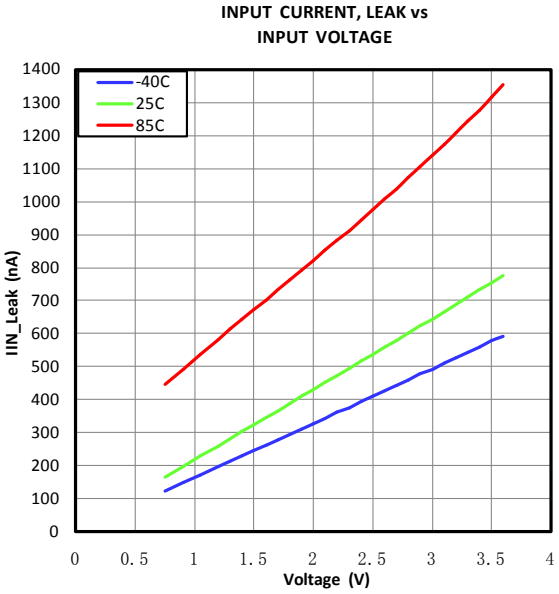
t_{ON}/t_{OFF} WAVEFORMS

Typical Characteristics

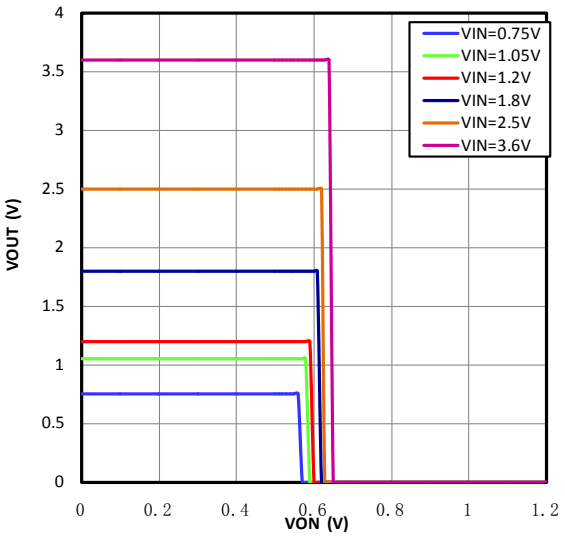




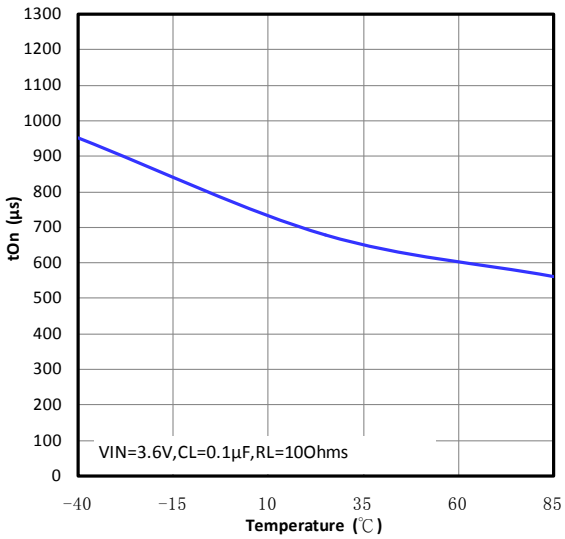




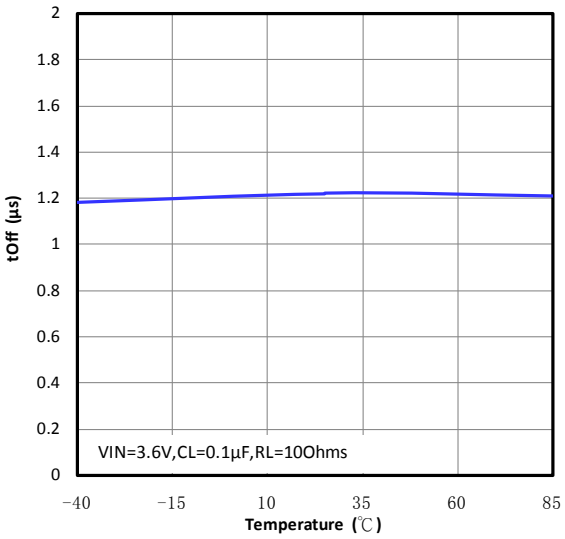
ON INPUT THRESHOLD



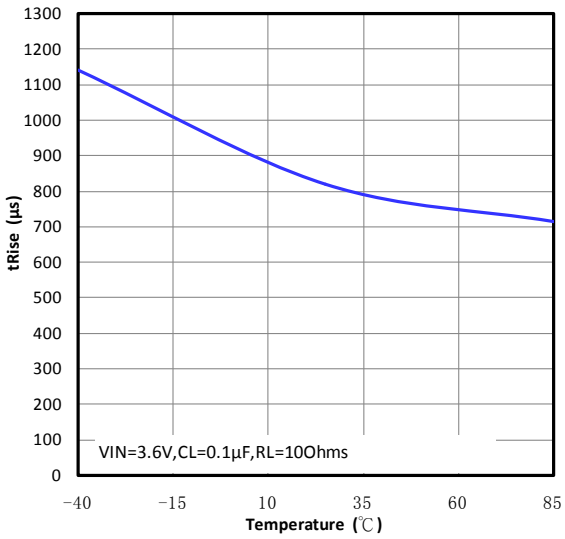
TURN-ON TIME vs TEMPERATURE



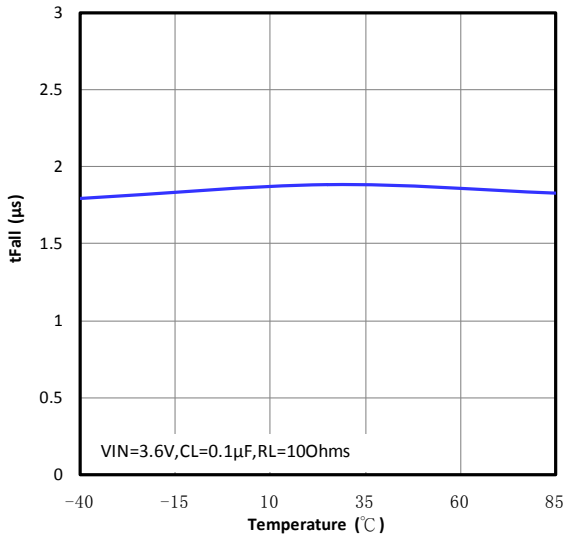
TURN-OFF TIME vs TEMPERATURE



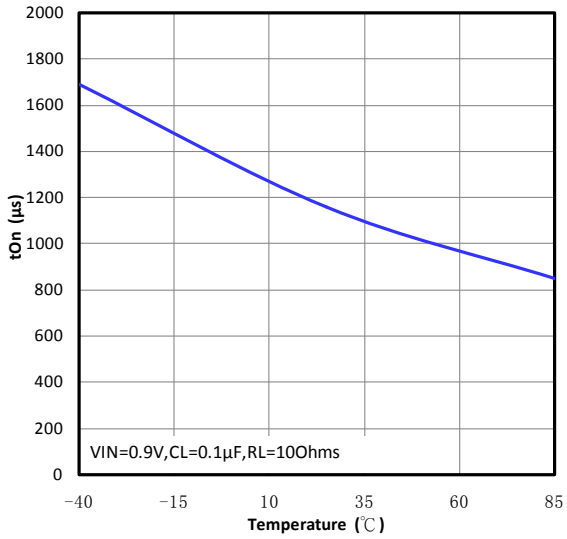
RISE TIME vs TEMPERATURE



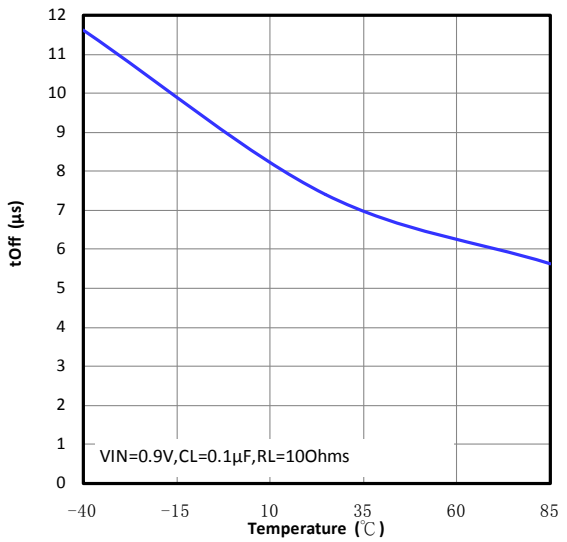
FALL TIME vs TEMPERATURE



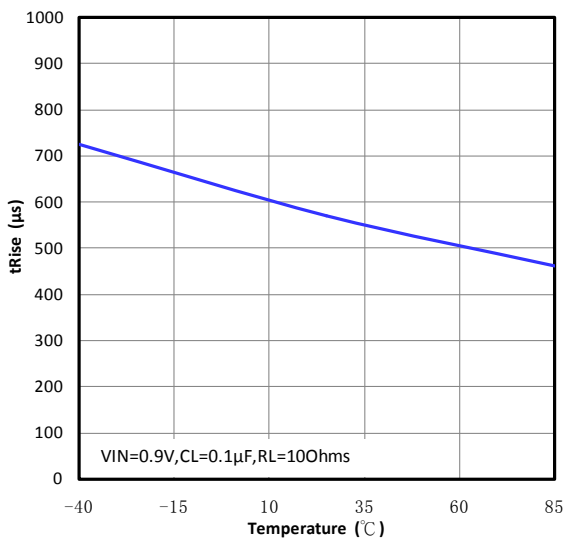
TURN-ON TIME vs TEMPERATURE



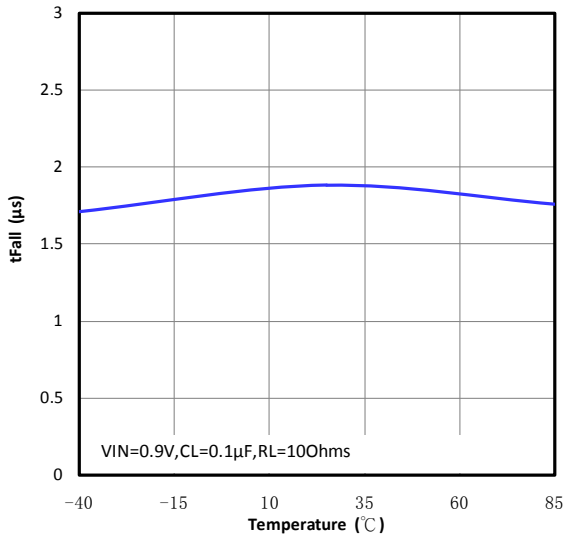
TURN-OFF TIME vs TEMPERATURE



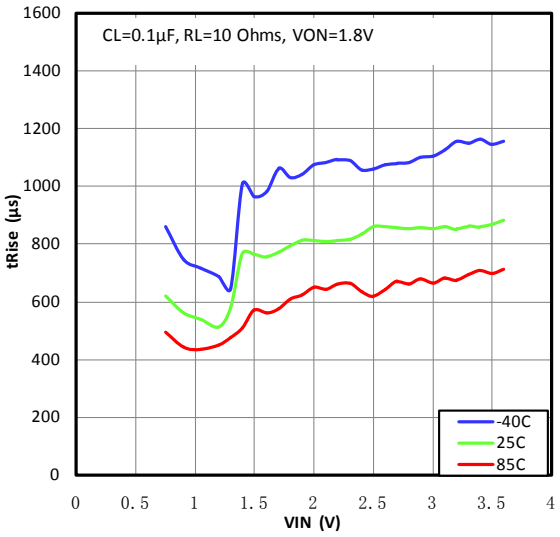
RISE TIME vs TEMPERATURE



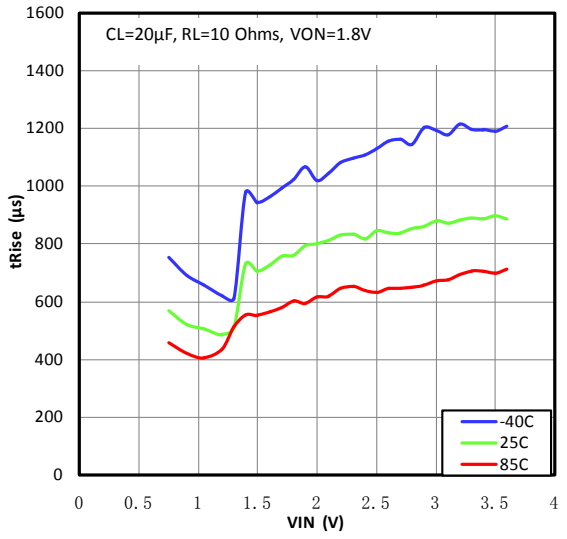
FALL TIME vs TEMPERATURE



RISE TIME vs INPUT VOLTAGE

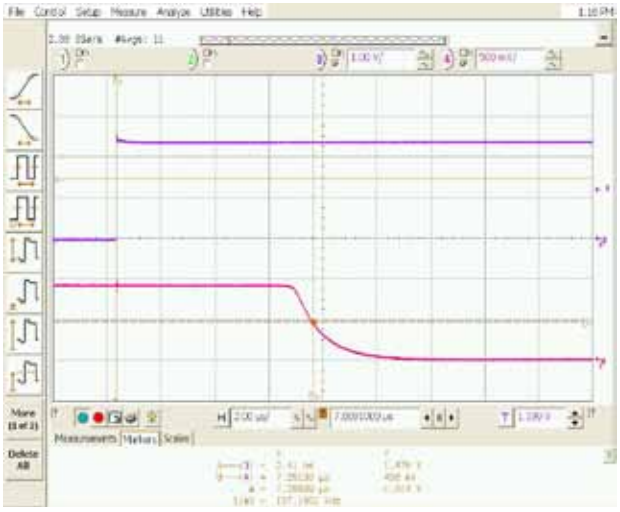


RISE TIME vs INPUT VOLTAGE



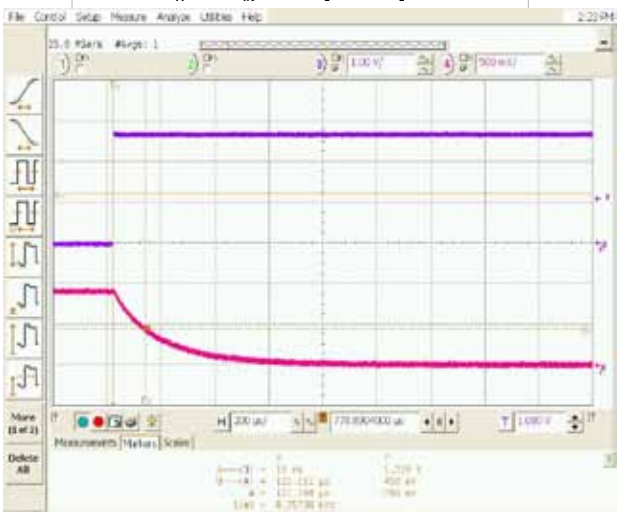
TURN-ON RESPONSE
Vin=0.9V, T_A=25C, C_{IN}=1uF, C_L=0.1uF, R_L=10Ω

TURN-OFF RESPONSE
Vin=0.9V, T_A=25C, C_{IN}=1uF, C_L=0.1uF, R_L=10Ω



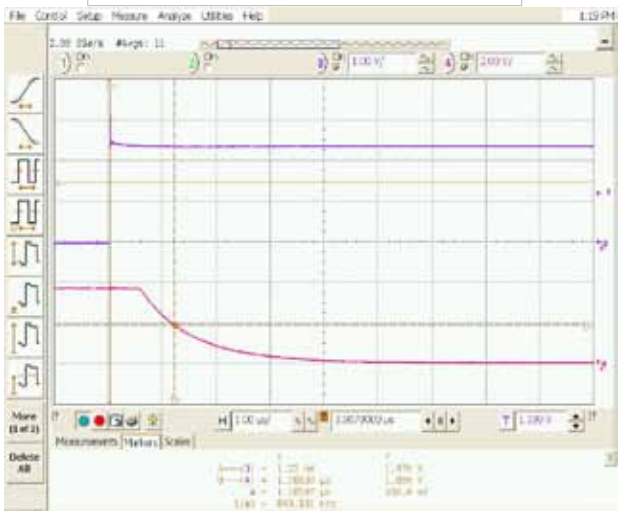
TURN-ON RESPONSE
Vin=0.9V, T_A=25C, C_{IN}=47uF, C_L=20uF, R_L=10Ω

TURN-OFF RESPONSE
Vin=0.9V, T_A=25C, C_{IN}=47uF, C_L=20uF, R_L=10Ω



TURN-ON RESPONSE
Vin=3.6V, T_A=25C, C_{IN}=1uF, C_L=0.1uF, R_L=10Ω

TURN-OFF RESPONSE
Vin=3.6V, T_A=25C, C_{IN}=1uF, C_L=0.1uF, R_L=10Ω



TURN-ON RESPONSE
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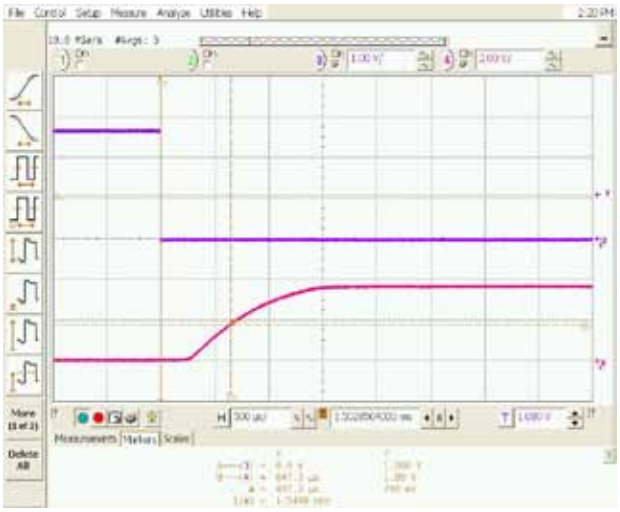
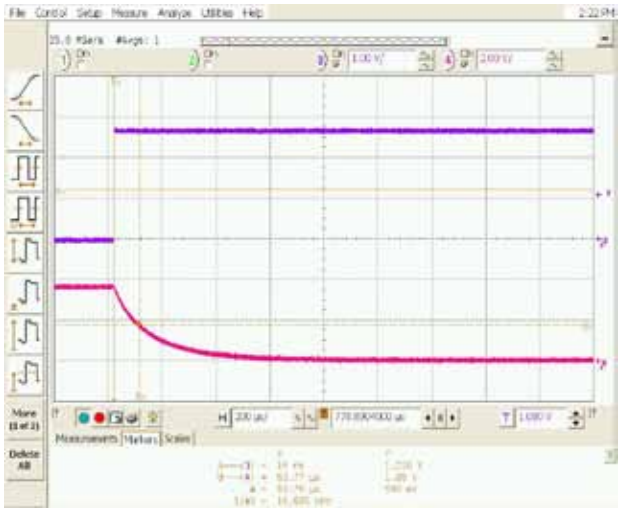
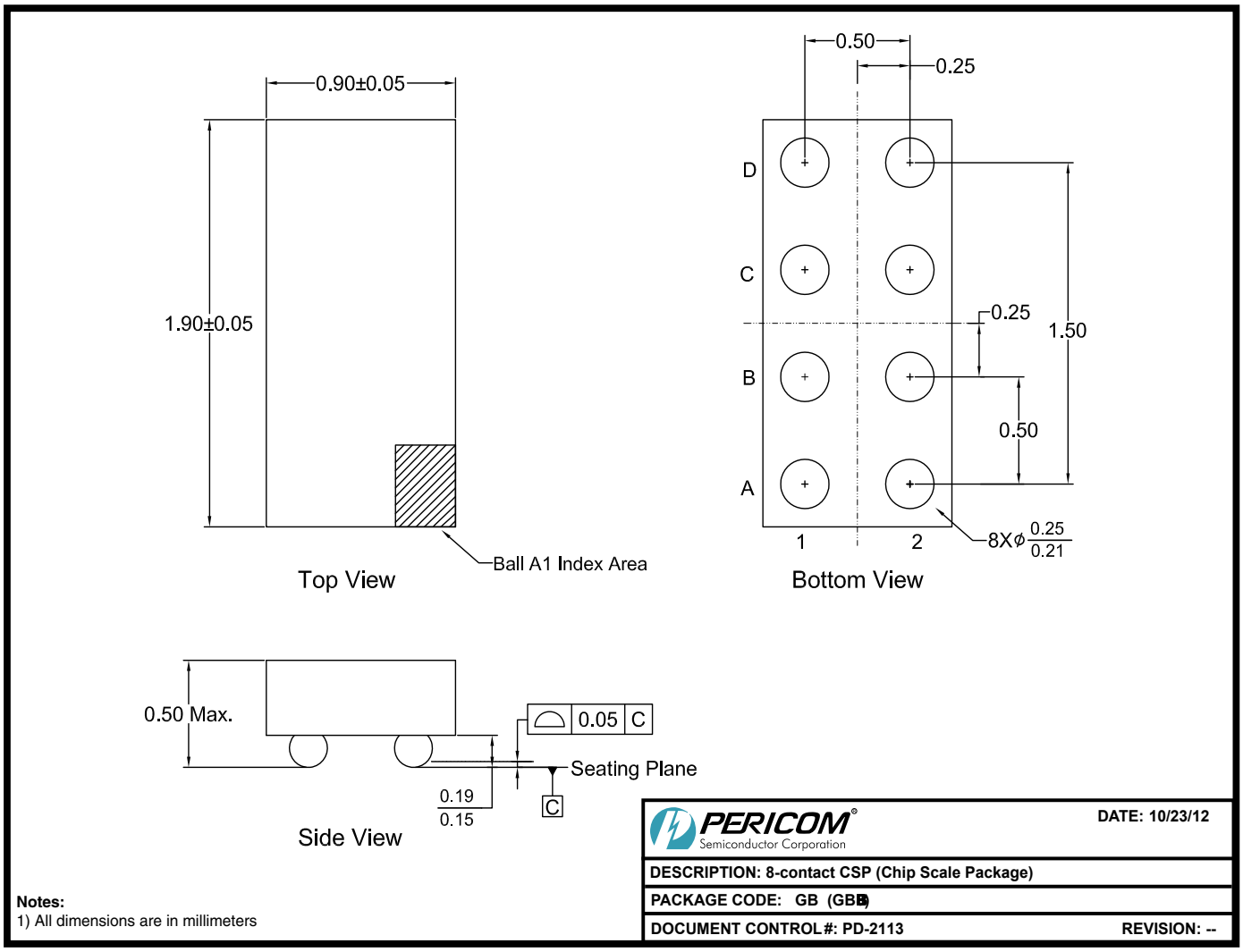


TURN-OFF RESPONSE
Vin=3.6V, T_A=25C, C_{IN}=47uF, C_L=20uF, R_L=10Ω



Packaging Mechanicals: 8-contact CSP (GB)



Ordering Information[1-3]

Ordering Code	Package Code	Package Description
PI3PD22919GBE	GB	8-contact Chip Scale Package (CSP), Pb-free & Green

Notes:

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
2. E = Pb-free and Green
3. Adding an X suffix = Tape/Reel