Obsolete – Part Discontinued

A product Line of
Diodes Incorporated

PI3PD22920/PI3PD22920B

Ultra Small, Low-Input Voltage, Low RON Load Switch

Features

- Integrated Load Switch
- Input Voltage: 0.75-V to 3.6-V
- Intergrated Pass-FET r_{DSON}=2mΩ (typ) at 3.6-V
- Ultra-Low ON Resistance
  - r_{ON} = 5.3mΩ at V_{IN} = 3.6V
  - r_{ON} = 5.4mΩ at V_{IN} = 2.5 V
  - r_{ON} = 5.5mΩ at V_{IN} = 1.8 V
  - r_{ON} = 5.8mΩ at V_{IN} = 1.2 V
  - r_{ON} = 6.1mΩ at V_{IN} = 1.05 V
  - r_{ON} = 7.3mΩ at V_{IN} = 0.75 V
- Ultra Small CSP-8 package
  0.9 mm x 1.9 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
  - 8000-V Human-Body Model (A114-B, Class II)
  - 1000-V Charged-Device Model (C101)
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. “Green” Device (Note 3)

Description

The PI3PD22920/PI3PD22920B 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 (ON), which is capable of interfacing directly with low-voltage control signals.

The PI3PD22920/PI3PD22920B has a 1250Ω on-chip load resistor for quick output discharge when the switch is turned off.

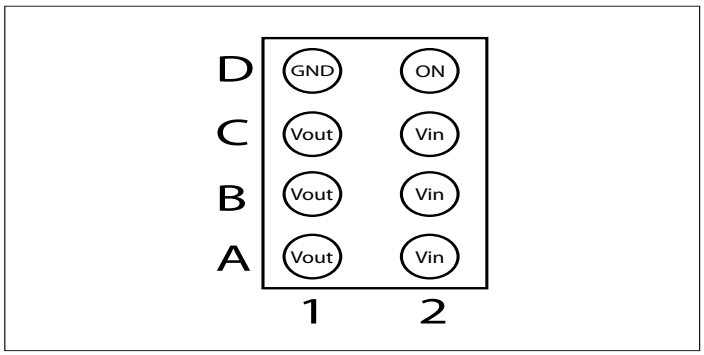
The PI3D22920/PI3PD22920B has an internally controlled rise time in order to reduce inrush current. The PI3D22920/PI3PD22920B features a rise time of 880µS at 3.6V.

The PI3D22920/PI3PD22920B 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.

Applications

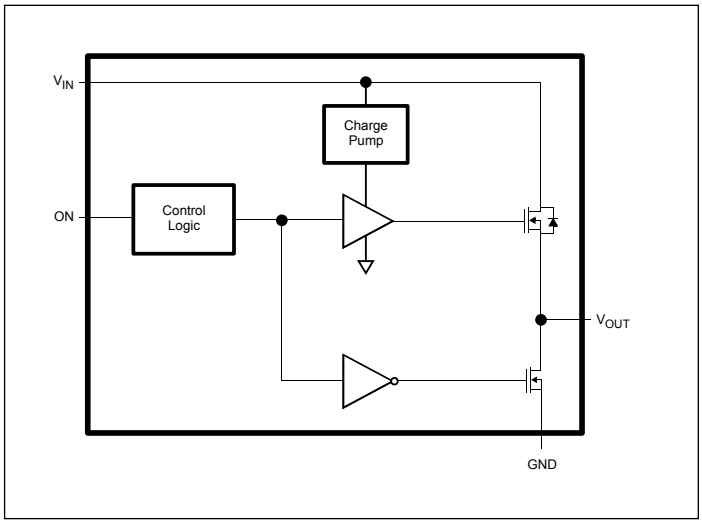
- Notebook / Netbook Computer
- Tablet PC
- PDAs / Smartphones
- GPS Navigation Devices
- MP3 Players

Pin Configuration (Bottom View)



Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated’s definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Functional Block Diagram



Function Table

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

Pin Description

Terminal		Description
Ball No.	Name	
D1	GND	Ground
D2	ON	Switch Control Input. Active high, 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 (300-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).....8000V

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		µF

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

Symbol	Parameter	Conditions		T_A[1]	Min.	Typ.	Max.	Unit
Power Switch								
PI3PD22920								
I_{IN}	Quiescent current	I_{OUT} = 0, V_{IN} = V_{ON}	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} = 1.05V		-	78	110	
			V_{IN} = 0.75V			37	70	
PI3PD22920B								
I_{IN}	Quiescent current	I_{OUT} = 0, V_{IN} = V_{ON}	V_{IN} = 3.6V	Full	-	35	80	µA
			V_{IN} = 2.5V			25	65	
			V_{IN} = 1.8V		-	20	180	
			V_{IN} = 1.2V			50	120	
			V_{IN} = 1.05V		-	40	78	
			V_{IN} = 0.75V			22	65	

Symbol	Parameter	Conditions		T_A[1]	Min.	Typ.	Max.	Unit
$I_{IN(LEAKAGE)}$	OFF-state supply current	V_{ON} = GND, V_{OUT} = 0		Full			5.5	µA
R_{ON}	ON-state resistance	I_{OUT} = -200 mA	V_{IN} = 3.6V	25°C		5.3	8.8	mΩ
				Full			9.8	
			V_{IN} = 2.5V	25°C		5.4	8.9	
				Full			9.9	
			V_{IN} = 1.8V	25°C		5.5	9.1	
				Full			10.1	
			V_{IN} = 1.2V	25°C		5.8	9.4	
				Full			10.4	
			V_{IN} = 1.05V	25°C		6.1	9.7	
				Full			10.8	
			V_{IN} = 0.75V	25°C		7.3	11.0	
				Full			12.4	
r_{PD}	Output pulldown resistance[2]	V_{IN} = 3.3 V, V_{ON} = 0, I_{OUT} = 3 mA		Full		1250	1500	Ω
I_{ON}	ON input leakage current	V_{ON} = 0.75V 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

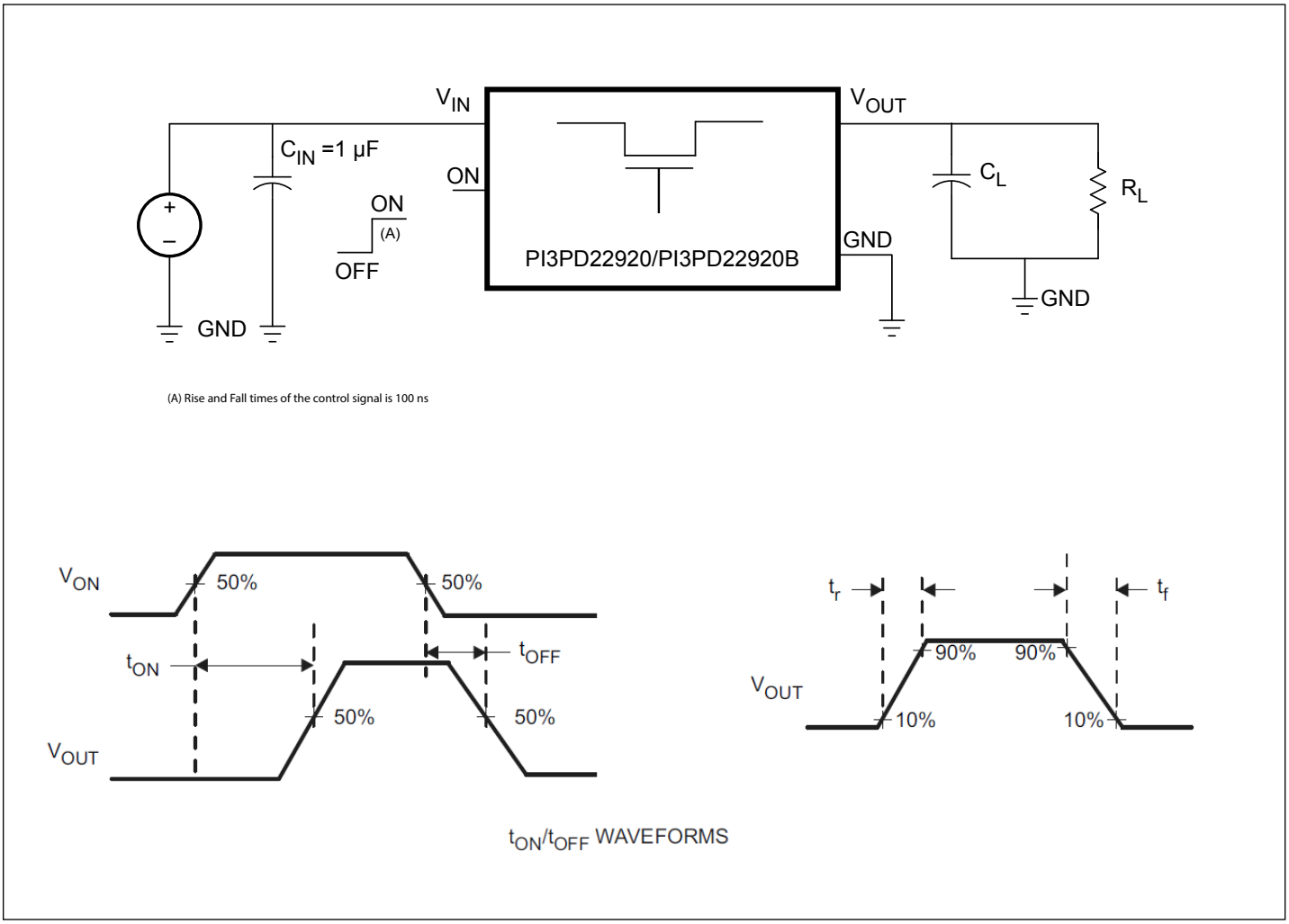


Figure 1. Test Circuit and tON/tOFF Waveforms

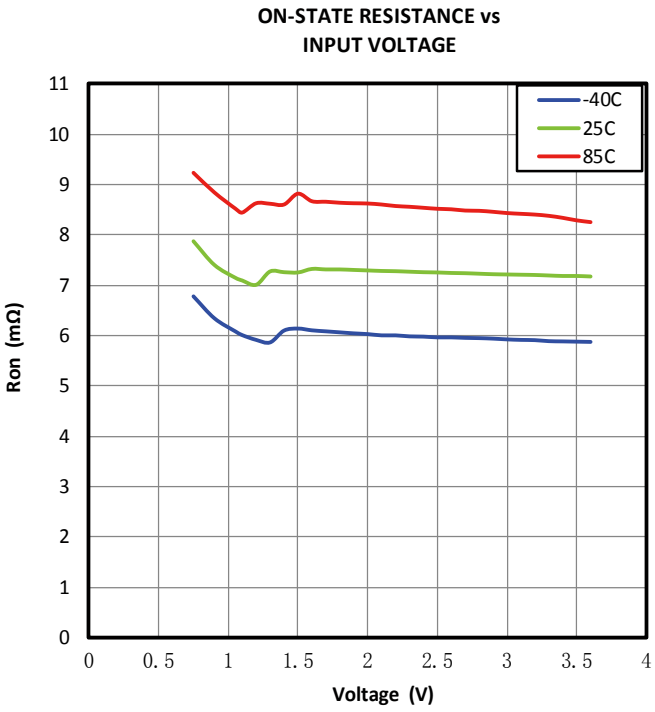
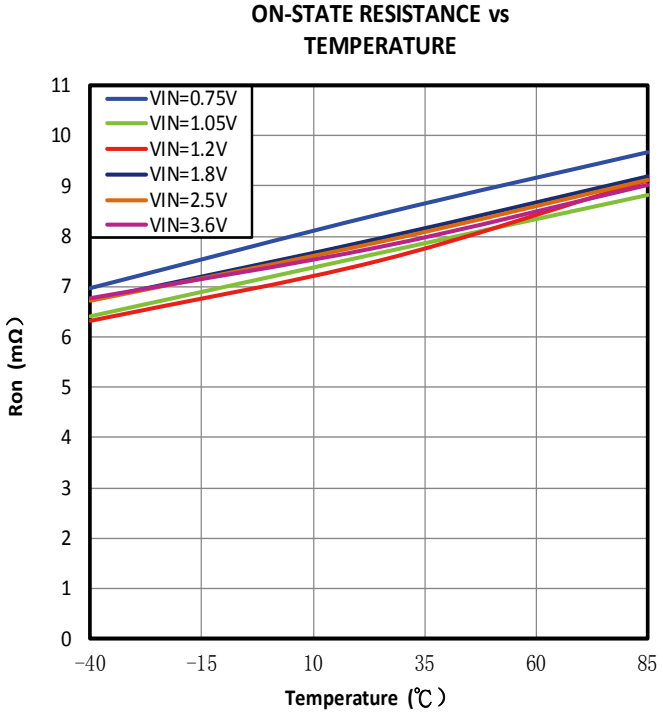


Figure 2.



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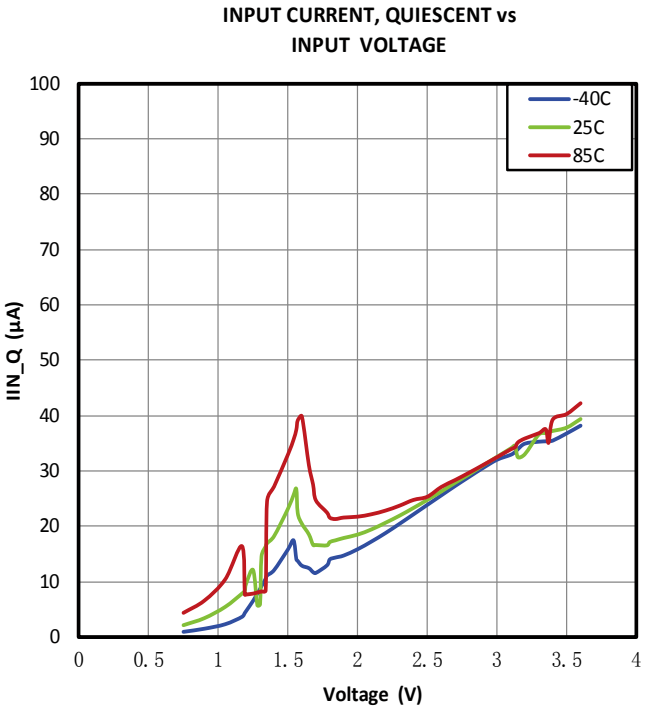

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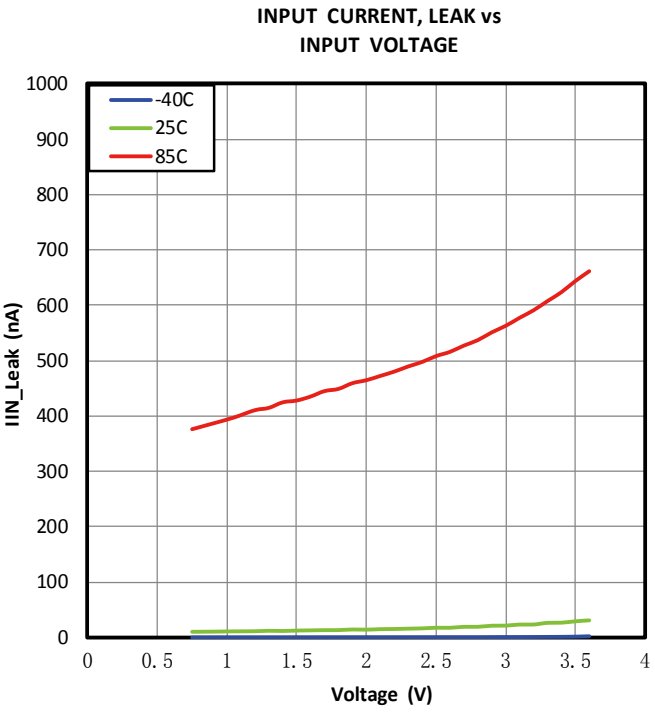

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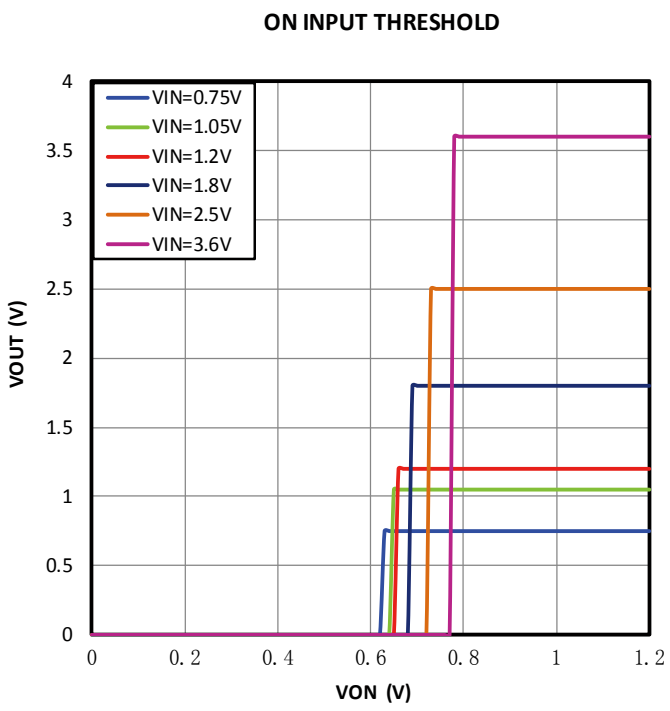

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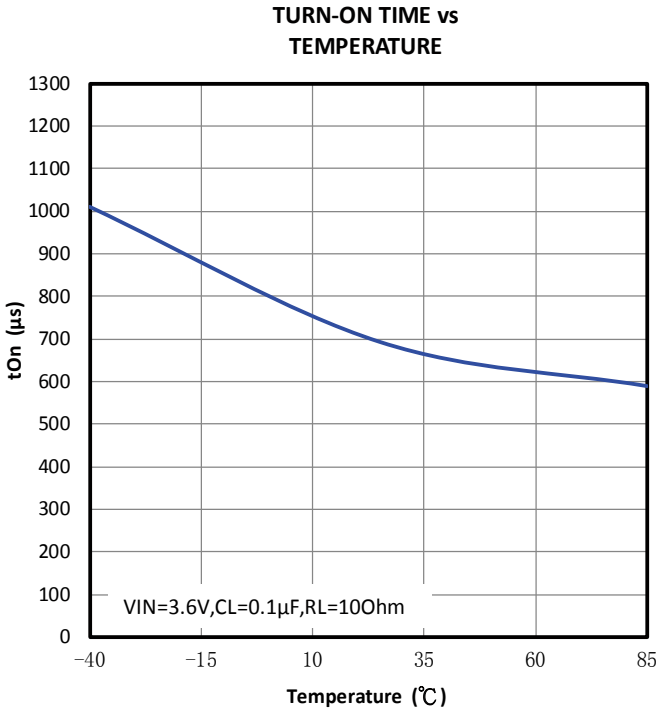

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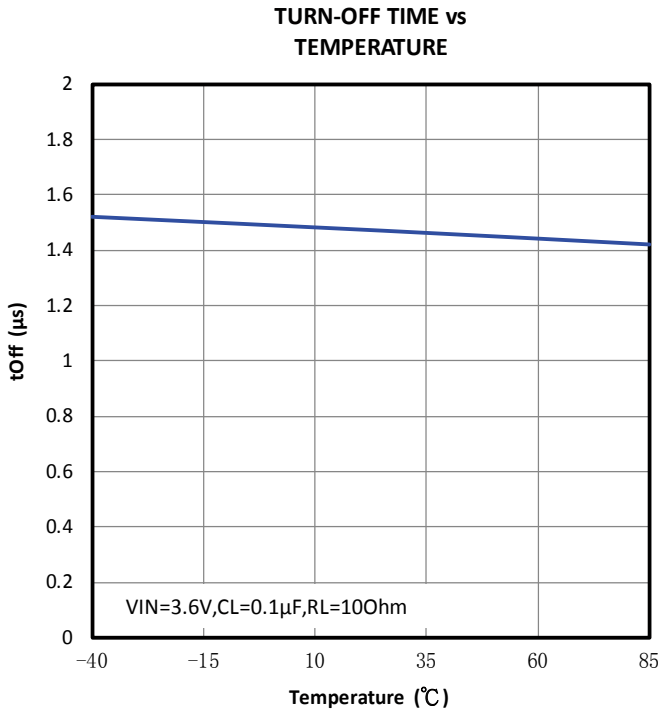
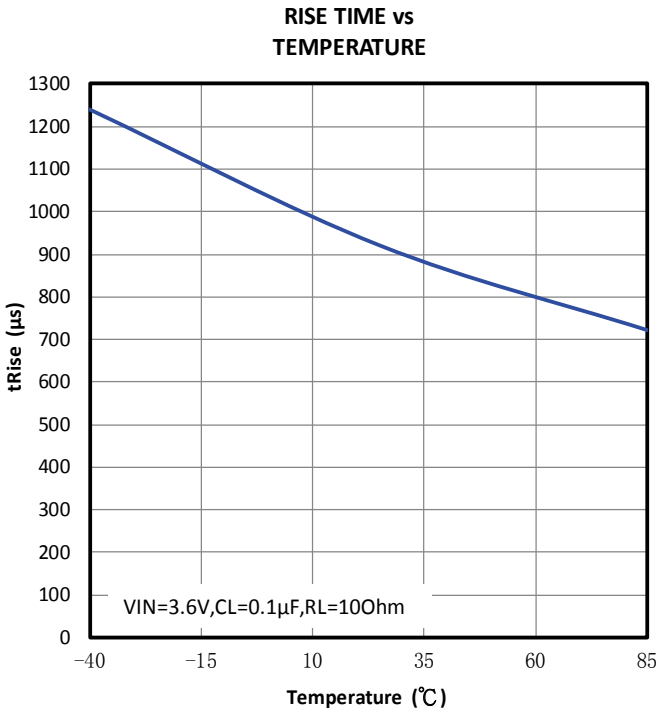


Figure 8.



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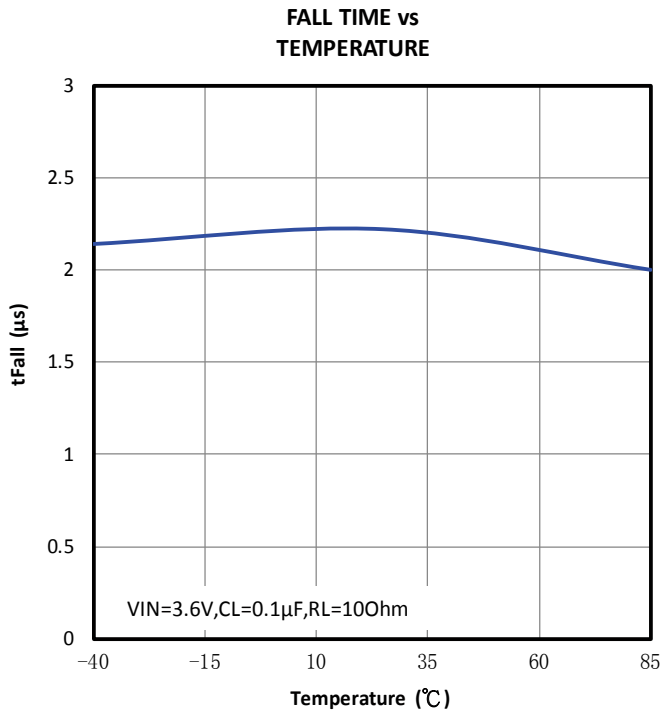

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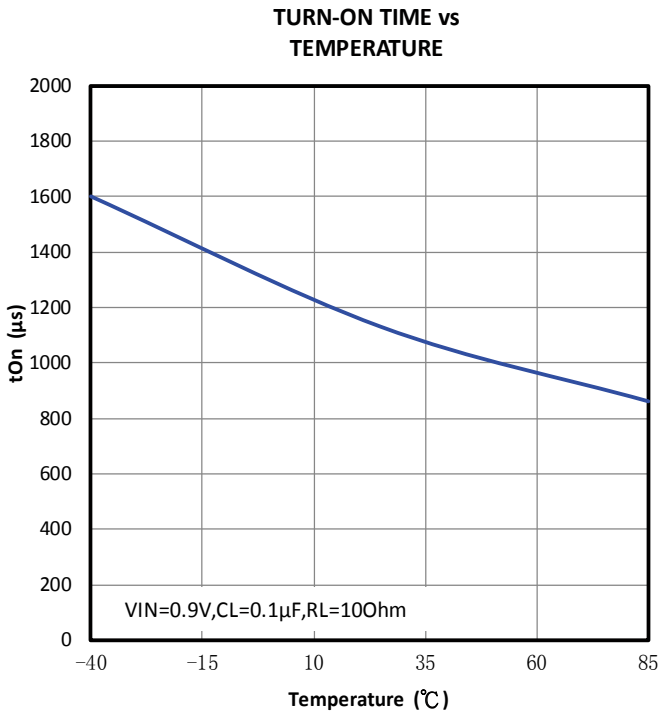

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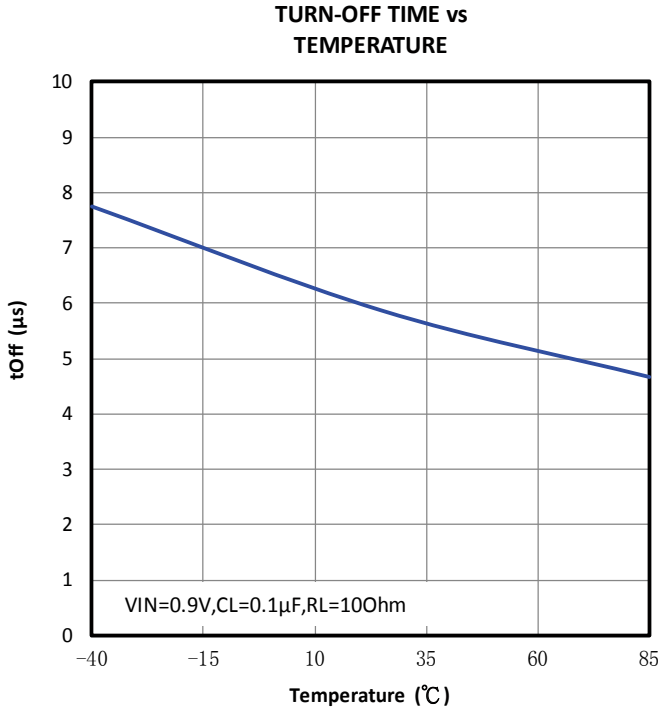

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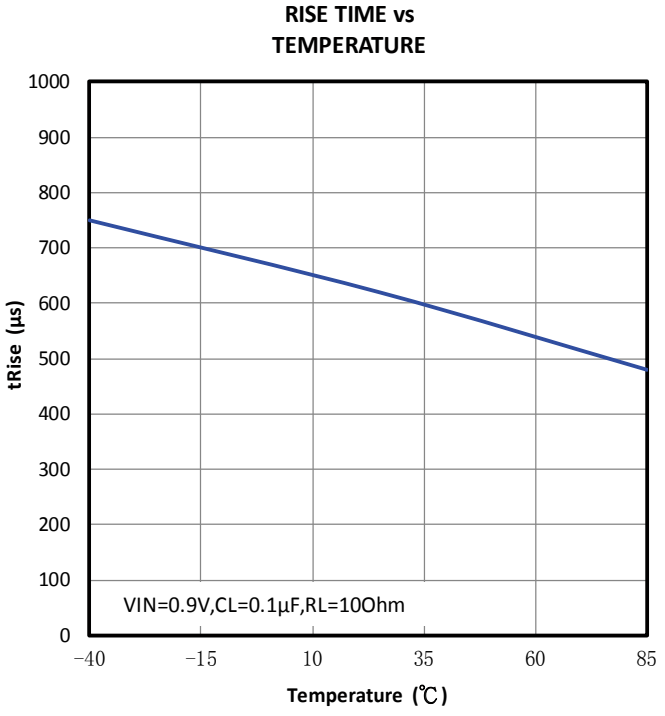

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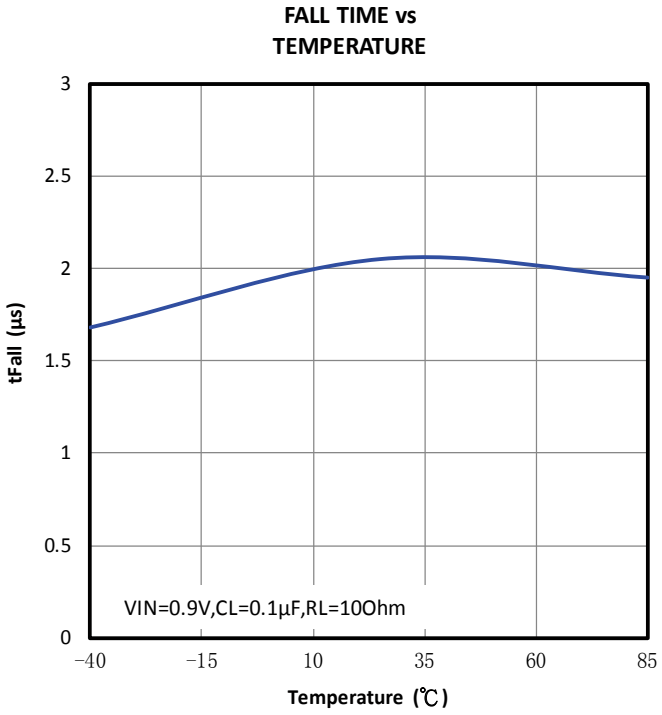

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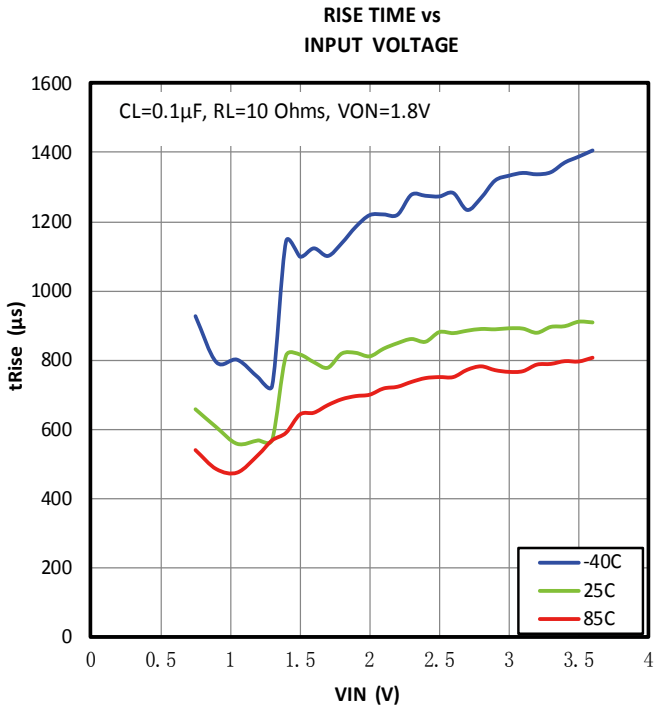

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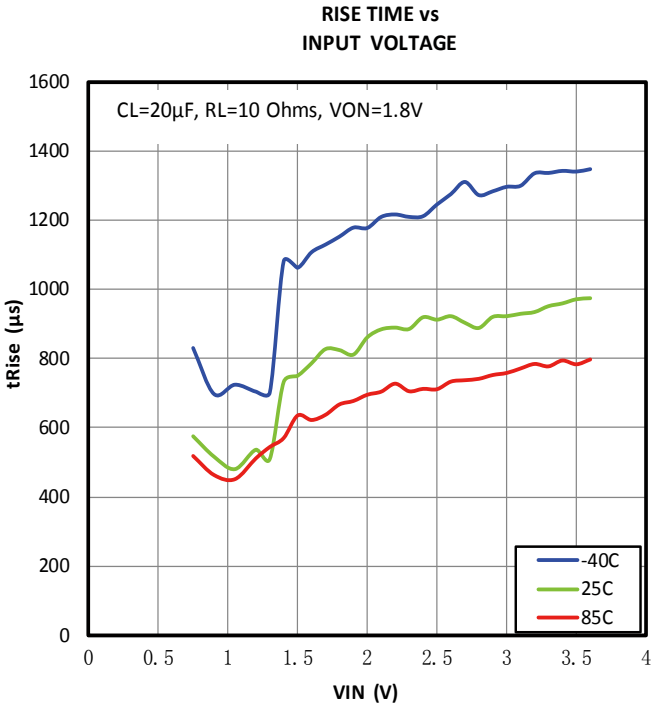


Figure 16.

TURN-ON RESPONSE

V_{in}=0.9V, T_A=25C, C_{IN}=1uF, C_L=0.1uF, R_L=10Ω

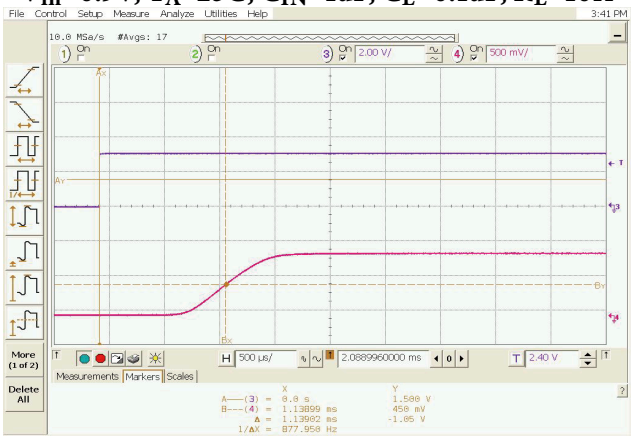


Figure 17.

TURN-OFF RESPONSE

V_{in}=0.9V, T_A=25C, C_{IN}=1uF, C_L=0.1uF, R_L=10Ω

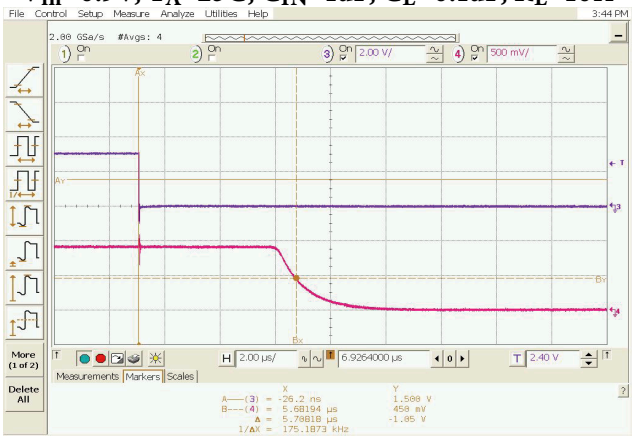


Figure 18.

TURN-ON RESPONSE

V_{in}=0.9V, T_A=25C, C_{IN}=47uF, C_L=20uF, R_L=10Ω

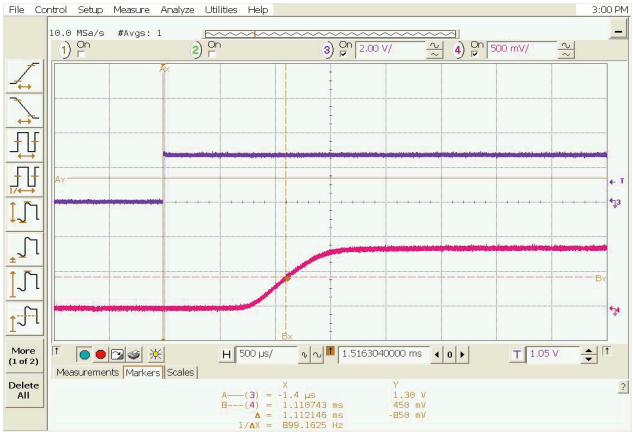


Figure 19.

TURN-OFF RESPONSE

V_{in}=0.9V, T_A=25C, C_{IN}=47uF, C_L=20uF, R_L=10Ω

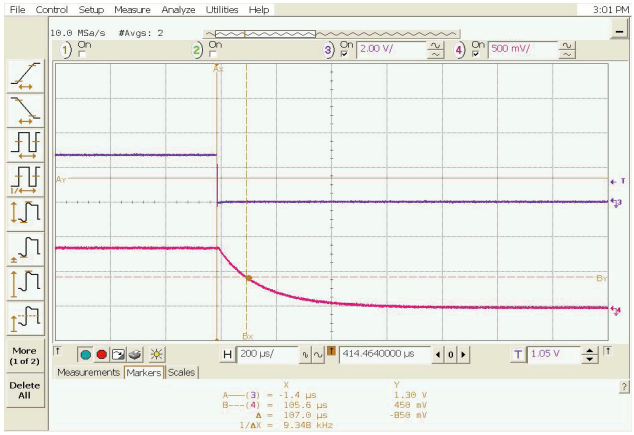


Figure 20.

TURN-ON RESPONSE

V_{in}=3.6V, T_A=25C, C_{IN}=1uF, C_L=0.1uF, R_L=10Ω

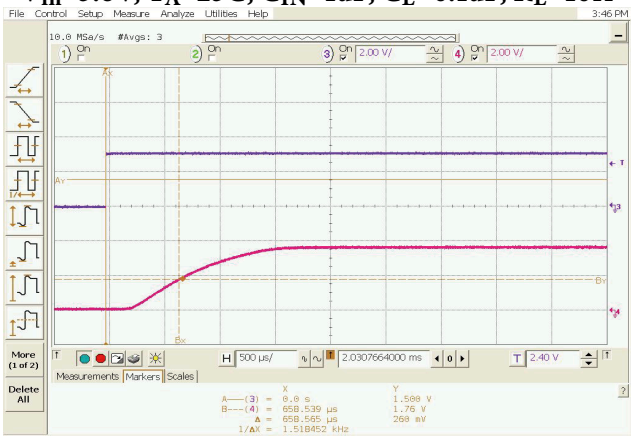


Figure 21.

TURN-OFF RESPONSE

V_{in}=3.6V, T_A=25C, C_{IN}=1uF, C_L=0.1uF, R_L=10Ω

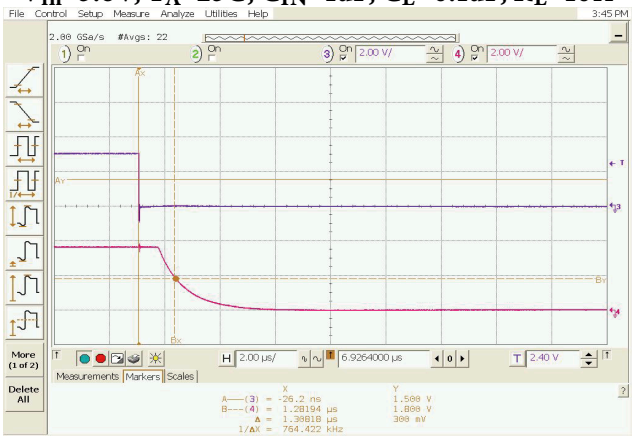


Figure 22.

TURN-ON RESPONSE

V_{in}=3.6V, T_A=25C, C_{IN}=47uF, C_L=20uF, R_L=10Ω

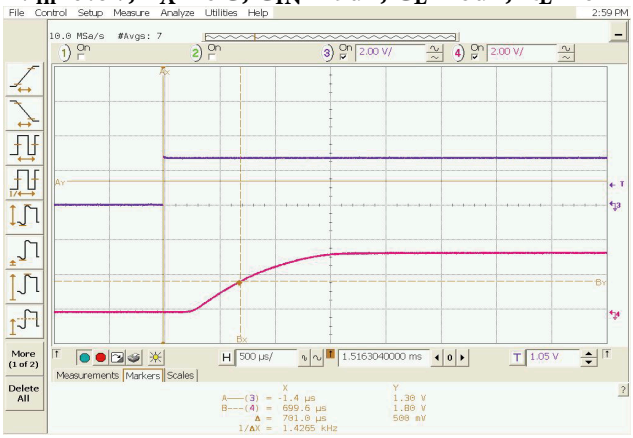


Figure 23.

TURN-OFF RESPONSE

V_{in}=3.6V, T_A=25C, C_{IN}=47uF, C_L=20uF, R_L=10Ω

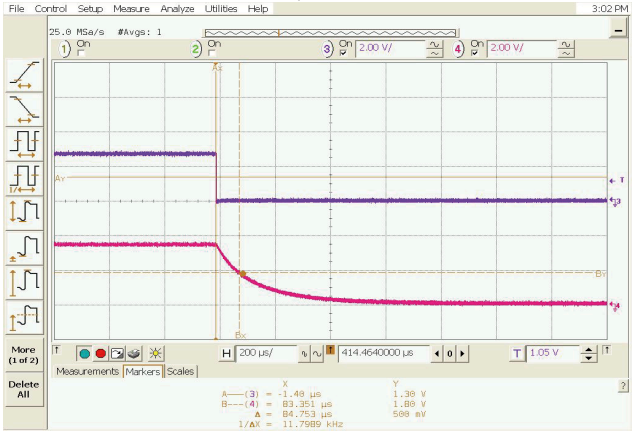
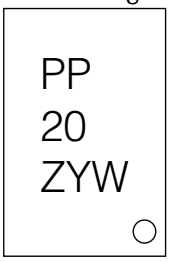


Figure 24.

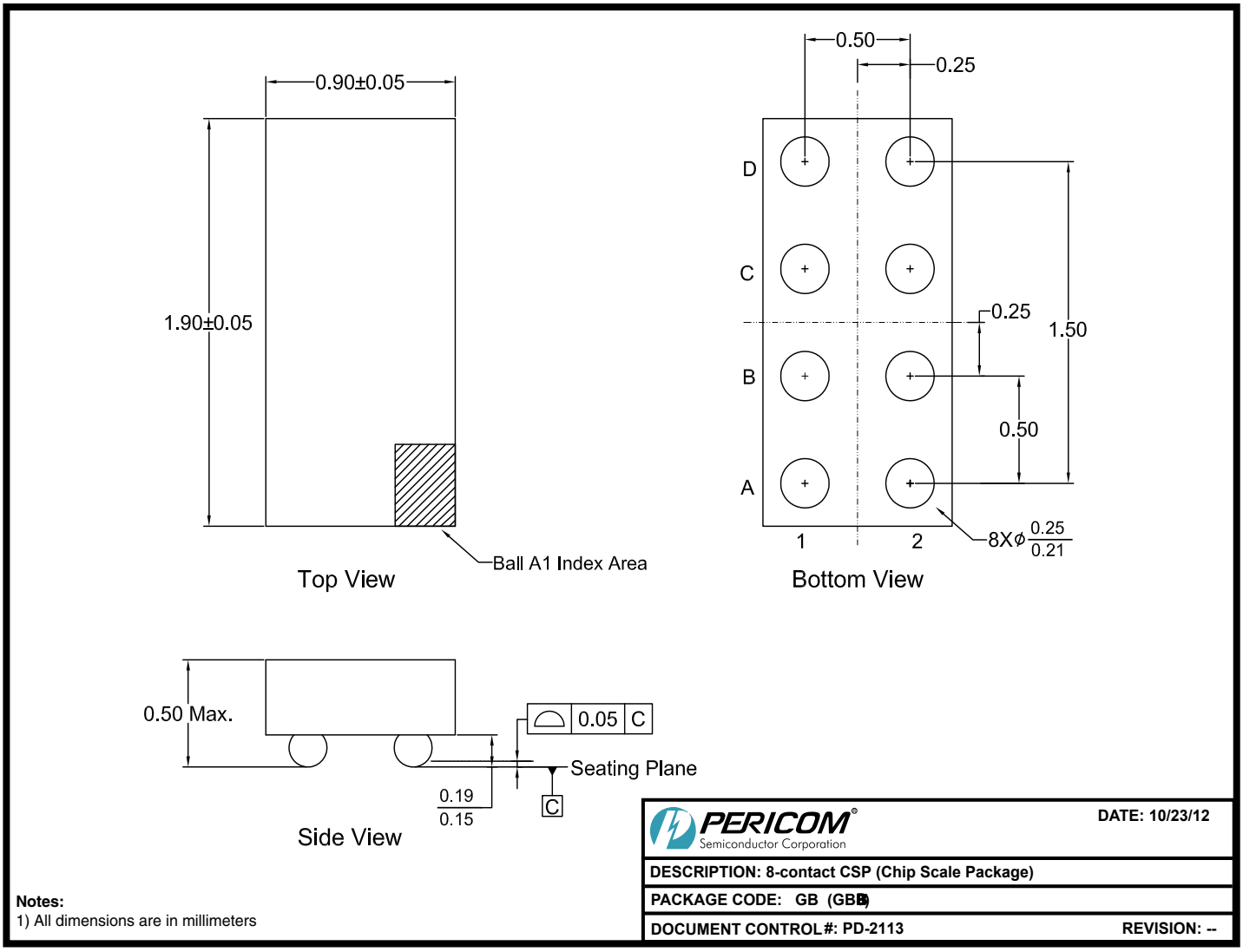
Part Marking

GB Package



Z: Die Rev
Y: Year
W: Workweek

Packaging Mechanicals: 8-CSP (GB)



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For latest package info.

please check: http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/

Ordering Information

Ordering Code	Package Code	Package Description
PI3PD22920GBEX	GB	8-contact Chip Scale Package (CSP)
PI3PD22920BGBEX	GB	8-contact Chip Scale Package (CSP)

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4. E = Pb-free and Green
5. X suffix = Tape/Reel

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A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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