

ULTRA-SMALL, LOW-INPUT-VOLTAGE, LOW r_{ON} LOAD SWITCH

Check for Samples: [TPS22924B](#)

FEATURES

- Integrated Single Load Switch
- Input Voltage: 0.75 V to 3.6 V
- Ultra-Low ON Resistance
 - $r_{ON} = 18.3\text{ m}\Omega$ at $V_{IN} = 3.6\text{ V}$
 - $r_{ON} = 18.5\text{ m}\Omega$ at $V_{IN} = 2.5\text{ V}$
 - $r_{ON} = 19.6\text{ m}\Omega$ at $V_{IN} = 1.8\text{ V}$
 - $r_{ON} = 19.4\text{ m}\Omega$ at $V_{IN} = 1.2\text{ V}$
 - $r_{ON} = 20.3\text{ m}\Omega$ at $V_{IN} = 1.0\text{ V}$
 - $r_{ON} = 22.7\text{ m}\Omega$ at $V_{IN} = 0.75\text{ V}$
- Ultra Small CSP-6 package
0.9 mm x 1.4 mm, 0.5-mm Pitch
- 2-A Maximum Continuous Switch Current
- Low Shutdown Current
- Low Threshold Control Input
- Controlled Slew Rate to Avoid Inrush Currents
- Quick Output Discharge Transistor
- ESD Performance Tested Per JESD 22
 - 5000-V Human-Body Model (A114-B, Class II)
 - 1000-V Charged-Device Model (C101)

APPLICATIONS

- Battery Powered Equipment
- Portable Industrial Equipment
- Portable Medical Equipment
- Portable Media Players
- Point Of Sales Terminal
- GPS Devices
- Digital Cameras
- Notebooks / Tablet PCs / eReaders
- Smartphones

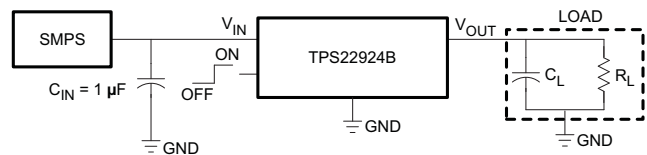
DESCRIPTION

The TPS22924B 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. An integrated charge pump biases the NMOS switch to achieve a minimum switch ON resistance. The switch is controlled by an on/off input (ON), which is capable of interfacing directly with low-voltage control signals.

A 1250- Ω on-chip load resistor is added for output quick discharge when the switch is turned off. The rise time of the device is internally controlled to avoid inrush current. The TPS22924B features a rise time of 100 μ s at 3.6 V.

The TPS22924B is available in an ultra-small space-saving 6-pin CSP package and is characterized for operation over the free-air temperature range of -40°C to 85°C .

Figure 1. TYPICAL APPLICATION



NOTE: SMPS = Switched-mode power supply

Table 1. FEATURE LIST

	r_{ON} (TYP) AT 3.6 V	SLEW RATE (TYP) AT 3.6 V	QUICK OUTPUT DISCHARGE ⁽¹⁾	MAXIMUM OUTPUT CURRENT	ENABLE
TPS22924B	18.3 m Ω	100 μ s	Yes	2 A	Active high

(1) This feature discharges the output of the switch to ground through a 1250- Ω resistor, preventing the output from floating. See the *Output Pulldown* section in Application Information.

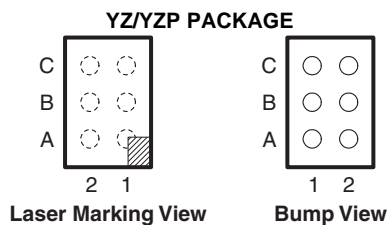


Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

ORDERING INFORMATION ⁽¹⁾

T _A	PACKAGE ⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING ⁽³⁾
–40°C to 85°C	DSBGA – YZ (0.5-mm pitch)	Tape and reel	TPS22924BYZR (without back side coating)	_ _ _ 5N _
–40°C to 85°C	DSBGA – YZP (0.5-mm pitch)	Tape and reel	TPS22924BYZPRB (with back side coating)	_ _ _ 5N _

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
- (2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.
- (3) The actual top-side marking has three preceding characters to denote year, month, and sequence code, and one following character to designate the wafer fab/assembly site. Pin 1 identifier indicates solder-bump composition (1 = SnPb, • = Pb-free).

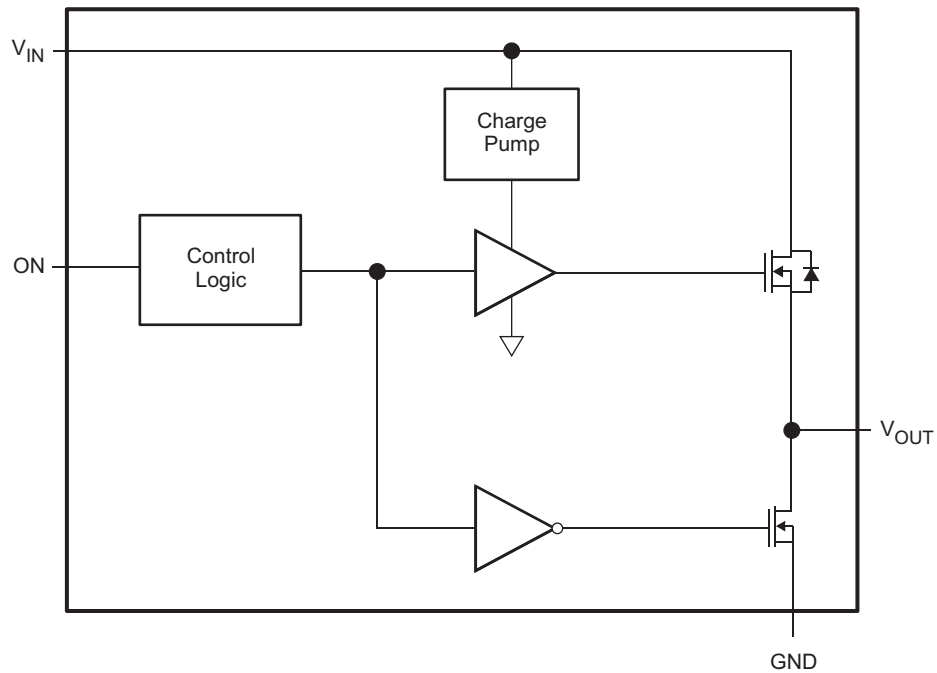
**TERMINALS ASSIGNMENTS (YZ/YZP PACKAGE)**

C	GND	ON
B	VOUT	VIN
A	VOUT	VIN
	1	2

TERMINAL FUNCTIONS

NO.	NAME	DESCRIPTION
C1	GND	Ground
C2	ON	Switch control input, active high. Do not leave floating
A1, B1	VOUT	Switch output
A2, B2	VIN	Switch input, bypass this input with a ceramic capacitor to ground

BLOCK DIAGRAM



FUNCTION TABLE

ON (Control Signal)	VIN to VOUT	VOUT to GND ⁽¹⁾
L	OFF	ON
H	ON	OFF

(1) See application section *Output Pulldown*.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

		MIN	MAX	UNIT
V_{IN}	Input voltage range	-0.3	4	V
V_{OUT}	Output voltage range		$V_{IN} + 0.3$	V
V_{ON}	Input voltage range	-0.3	4	V
I_{MAX}	Maximum continuous switch current, $T_A = -40^{\circ}\text{C}$ to 85°C		2	A
I_{PLS}	Maximum pulsed switch current, 100- μs pulse, 2% duty cycle, $T_A = -40^{\circ}\text{C}$ to 85°C		4	A
T_A	Operating free-air temperature range	-40	85	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-65	150	$^{\circ}\text{C}$
ESD	Electrostatic discharge protection	Human-Body Model (HBM)		5000
		Charged-Device Model (CDM)		1000
				V

- (1) 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.

DISSIPATION RATINGS

BOARD	PACKAGE	$R_{\theta JC}$	$R_{\theta JA}$	DERATING FACTOR ABOVE $T_A = 25^{\circ}\text{C}$	$T_A < 25^{\circ}\text{C}$	$T_A = 70^{\circ}\text{C}$	$T_A = 85^{\circ}\text{C}$
High-K ⁽¹⁾	YZ	17.6 $^{\circ}\text{C}/\text{W}$	123.36 $^{\circ}\text{C}/\text{W}$	- 8.1063 mW/ $^{\circ}\text{C}$	810.63 mW	445.84 mW	324.25 mW
High-K ⁽¹⁾	YZP	17.6 $^{\circ}\text{C}/\text{W}$	123.36 $^{\circ}\text{C}/\text{W}$	- 8.1063 mW/ $^{\circ}\text{C}$	810.63 mW	445.84 mW	324.25 mW

- (1) The JEDEC high-K (2s2p) board used to derive this data was a 3- x 3-inch, multilayer board with 1-ounce internal power and ground planes and 2-ounce copper traces on top and bottom of the board.

RECOMMENDED OPERATING CONDITIONS

			MIN	MAX	UNIT
V _{IN}	Input voltage		0.75	3.6	V
V _{OUT}	Output voltage			V _{IN}	V
V _{IH}	High-level input voltage, 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 _{IL}	Low-level input voltage, ON	V _{IN} = 2.5 V to 3.6 V		0.6	V
		V _{IN} = 0.75 V to 2.49 V		0.4	
C _{IN}	Input capacitance		1 ⁽¹⁾		μF

- (1) See the *Input Capacitor* section in Application Information.

ELECTRICAL CHARACTERISTICS

 $V_{IN} = 0.75\text{ V to }3.6\text{ V}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_A	MIN	TYP ⁽¹⁾	MAX	UNIT
I_{IN} Quiescent current	$I_{OUT} = 0, V_{IN} = V_{ON}$	$V_{IN} = 3.6\text{ V}$	Full	75	160	μA
		$V_{IN} = 2.5\text{ V}$		42	70	
		$V_{IN} = 1.8\text{ V}$		50	350	
		$V_{IN} = 1.2\text{ V}$		95	200	
		$V_{IN} = 1.0\text{ V}$		65	110	
		$V_{IN} = 0.75\text{ V}$		35	70	
$I_{IN(LEAK)}$ OFF-state supply current	$V_{ON} = \text{GND}, \text{OUT} = 0\text{V}$	Full			3.5	μA
r_{ON} ON-state resistance	$I_{OUT} = -200\text{ mA}$	$V_{IN} = 3.6\text{ V}$	25°C	18.3	19.7	$\text{m}\Omega$
			Full		26.0	
		$V_{IN} = 2.5\text{ V}$	25°C	18.5	19.5	
			Full		25.8	
		$V_{IN} = 1.8\text{ V}$	25°C	19.6	21.8	
			Full		27.4	
		$V_{IN} = 1.2\text{ V}$	25°C	19.4	21.8	
			Full		28.0	
		$V_{IN} = 1.0\text{ V}$	25°C	20.3	21.2	
			Full		28.6	
		$V_{IN} = 0.75\text{ V}$	25°C	22.7	25.3	
			Full		34.8	
r_{PD} Output pulldown resistance ⁽²⁾	$V_{IN} = 3.3\text{ V}, V_{ON} = 0, I_{OUT} = 3\text{ mA}$	25°C		1250	1500	Ω
I_{ON} ON-state input leakage current	$V_{ON} = 0.9\text{ V to }3.6\text{ V or GND}$	Full			0.1	μA

(1) Typical values are at $V_{IN} = 3.3\text{ V}$ and $T_A = 25^\circ\text{C}$.

(2) See [Output Pulldown](#) in *Application Information*.

SWITCHING CHARACTERISTICS

 $V_{IN} = 3.6\text{ V}, T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{ON} Turn-ON time	$R_L = 10\ \Omega, C_L = 0.1\ \mu\text{F}, V_{IN} = 3.6\text{V}$		111		μs
t_{OFF} Turn-OFF time	$R_L = 10\ \Omega, C_L = 0.1\ \mu\text{F}, V_{IN} = 3.6\text{V}$		3		μs
t_r V_{OUT} rise time	$R_L = 10\ \Omega, C_L = 0.1\ \mu\text{F}, V_{IN} = 3.6\text{V}$		96		μs
t_f V_{OUT} fall time	$R_L = 10\ \Omega, C_L = 0.1\ \mu\text{F}, V_{IN} = 3.6\text{V}$		2.5		μs

SWITCHING CHARACTERISTICS

 $V_{IN} = 0.9\text{ V}, T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{ON} Turn-ON time	$R_L = 10\ \Omega, C_L = 0.1\ \mu\text{F}, V_{IN} = 0.9\text{V}$		160		μs
t_{OFF} Turn-OFF time	$R_L = 10\ \Omega, C_L = 0.1\ \mu\text{F}, V_{IN} = 0.9\text{V}$		20		μs
t_r V_{OUT} rise time	$R_L = 10\ \Omega, C_L = 0.1\ \mu\text{F}, V_{IN} = 0.9\text{V}$		81		μs
t_f V_{OUT} fall time	$R_L = 10\ \Omega, C_L = 0.1\ \mu\text{F}, V_{IN} = 0.9\text{V}$		5		μs

PARAMETER MEASUREMENT INFORMATION

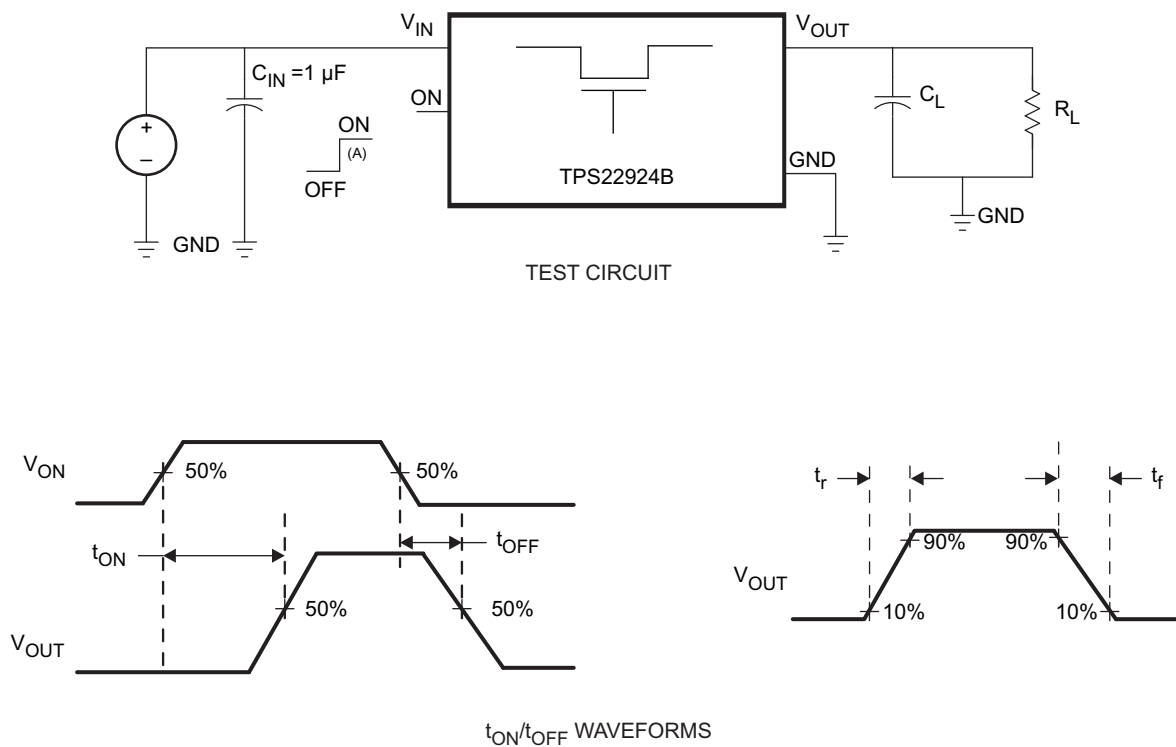
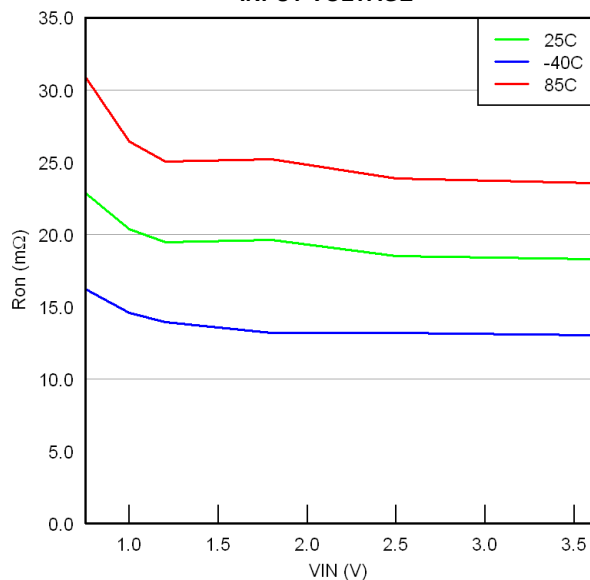


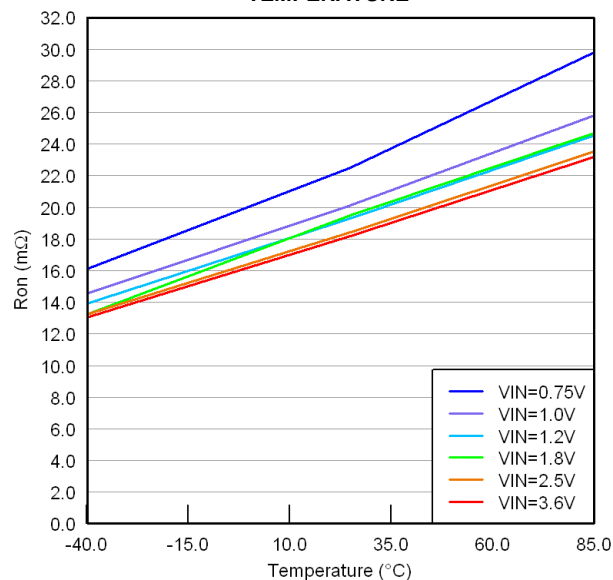
Figure 2. Test Circuit and t_{ON}/t_{OFF} Waveforms

TYPICAL CHARACTERISTICS

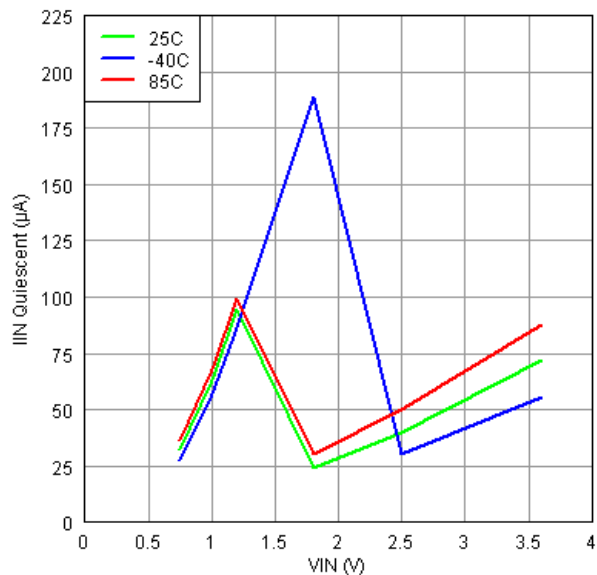
ON-STATE RESISTANCE
vs
INPUT VOLTAGE



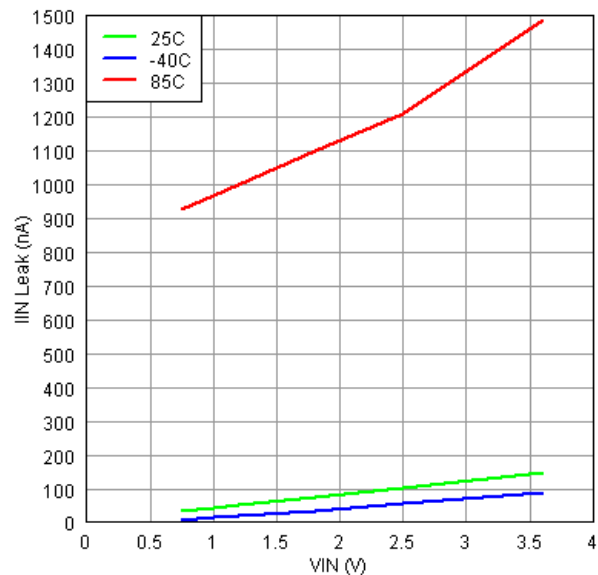
ON-STATE RESISTANCE
vs
TEMPERATURE



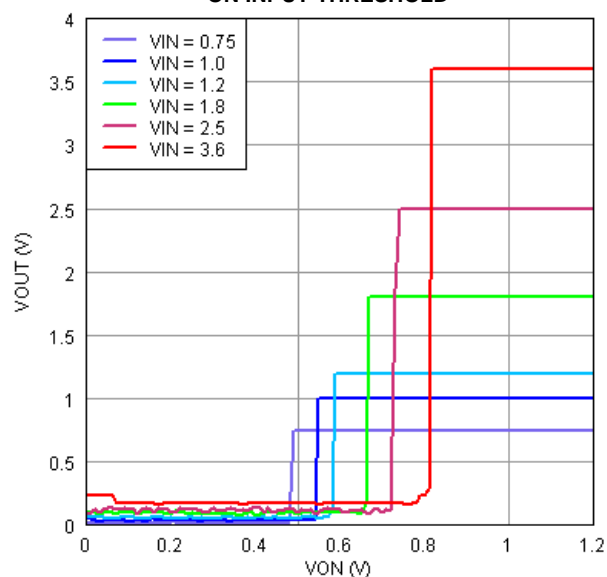
INPUT CURRENT, QUIESCENT
vs
INPUT VOLTAGE



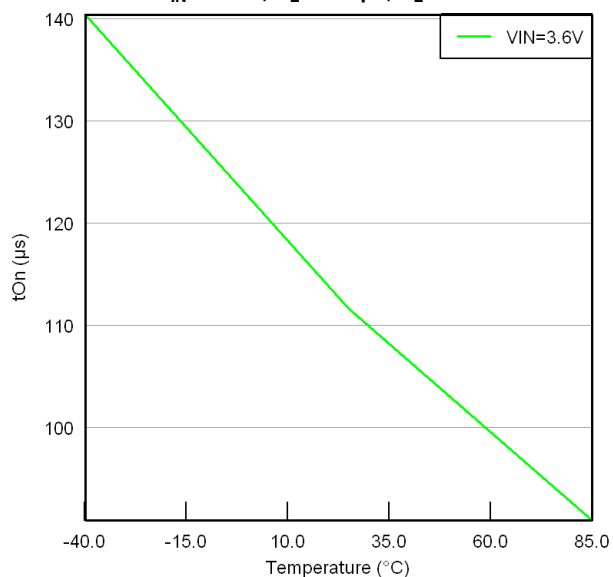
INPUT CURRENT, LEAK
vs
INPUT VOLTAGE



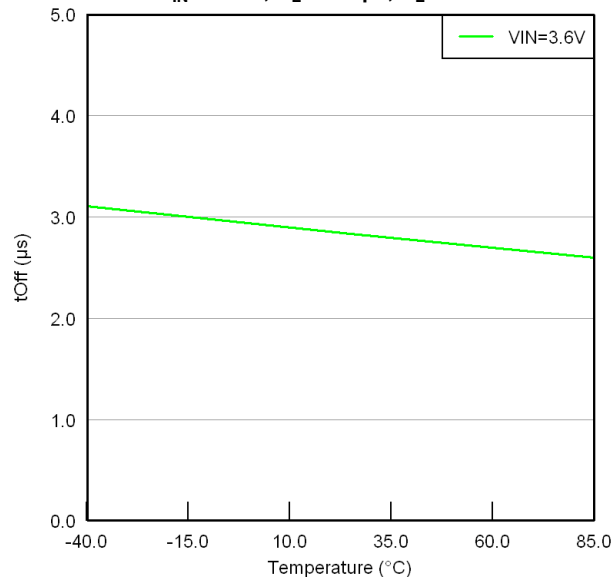
TYPICAL CHARACTERISTICS (continued) ON INPUT THRESHOLD



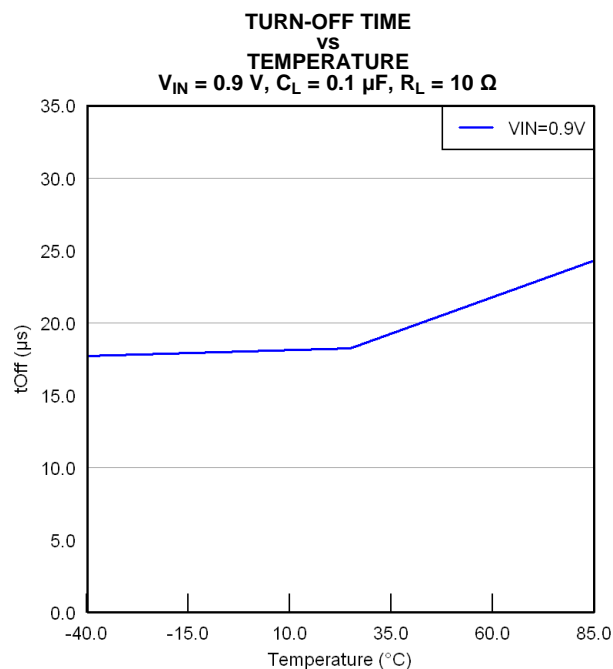
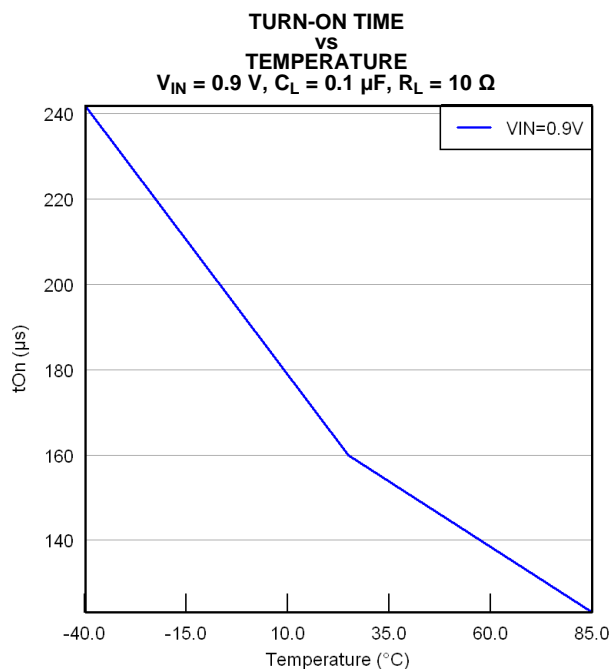
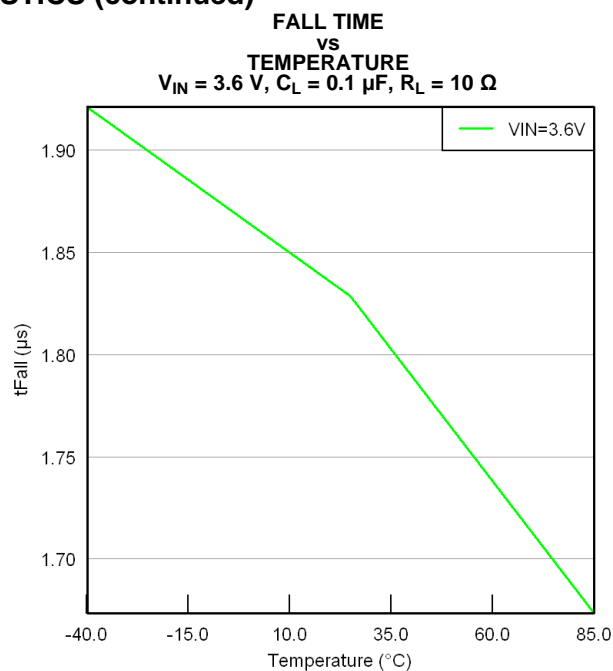
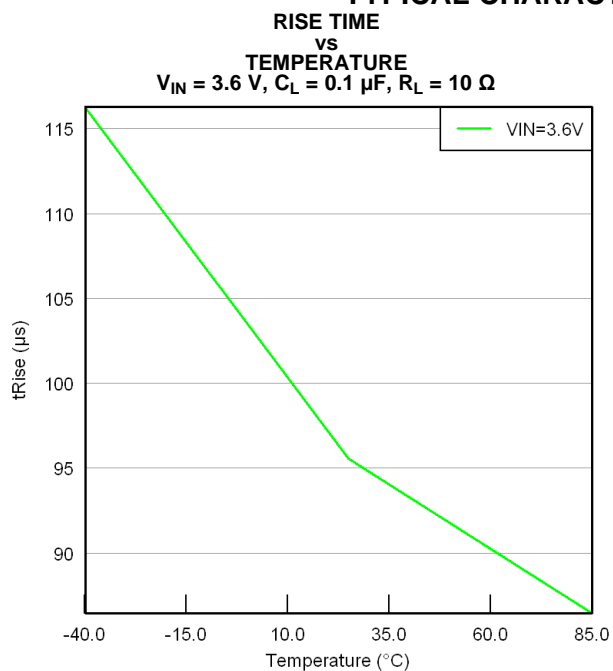
**TURN-ON TIME
vs
TEMPERATURE**
VIN = 3.6 V, CL = 0.1 μ F, RL = 10 Ω

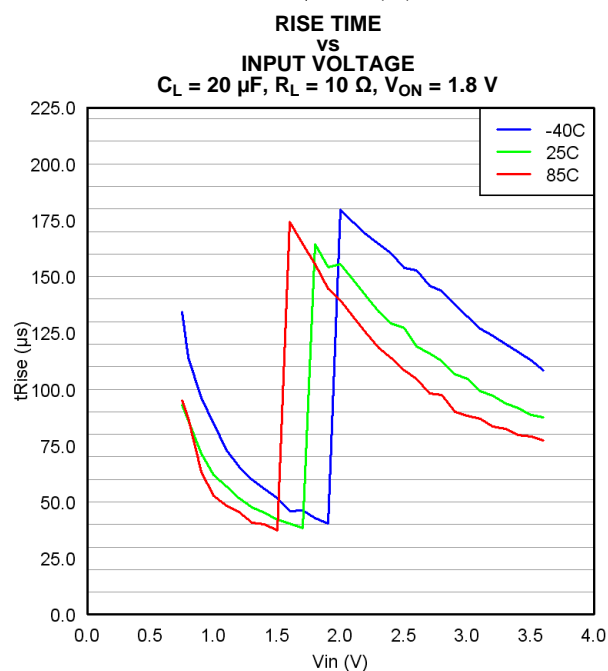
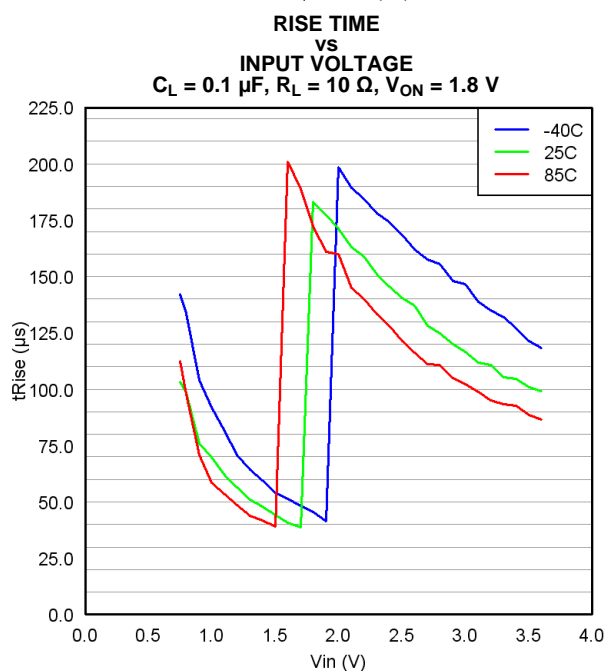
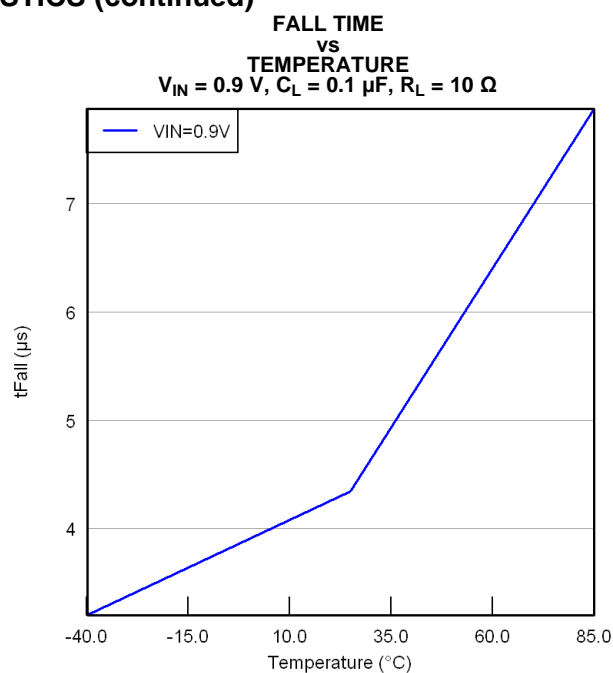
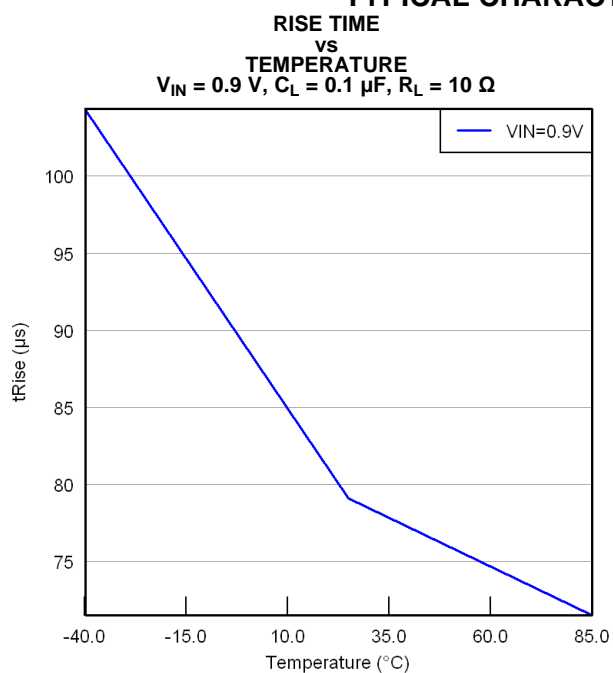


**TURN-OFF TIME
vs
TEMPERATURE**
VIN = 3.6 V, CL = 0.1 μ F, RL = 10 Ω



TYPICAL CHARACTERISTICS (continued)

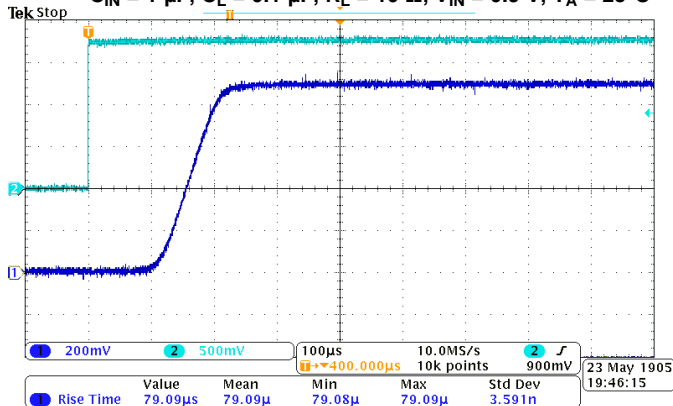


TYPICAL CHARACTERISTICS (continued)

TYPICAL CHARACTERISTICS (continued)

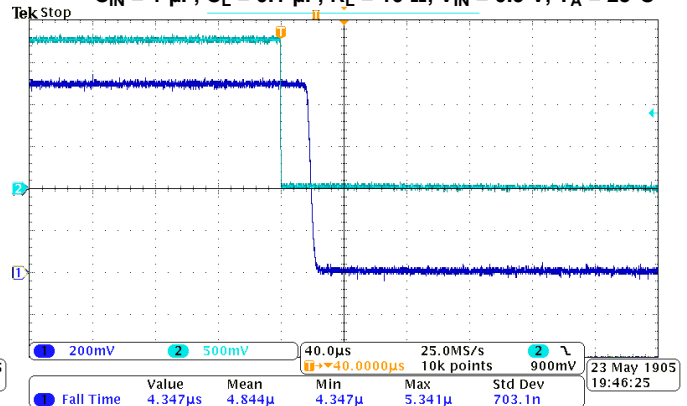
TURN-ON RESPONSE

$C_{IN} = 1 \mu F$, $C_L = 0.1 \mu F$, $R_L = 10 \Omega$, $V_{IN} = 0.9 V$, $T_A = 25^\circ C$



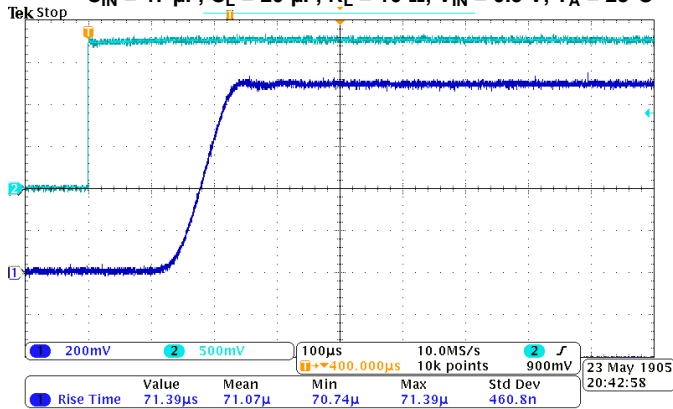
TURN-OFF RESPONSE

$C_{IN} = 1 \mu F$, $C_L = 0.1 \mu F$, $R_L = 10 \Omega$, $V_{IN} = 0.9 V$, $T_A = 25^\circ C$



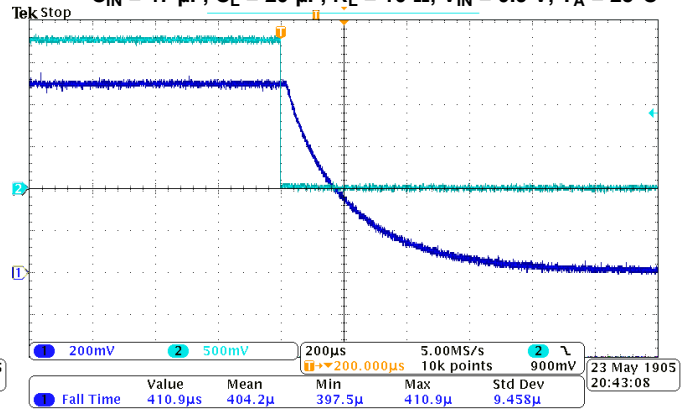
TURN-ON RESPONSE

$C_{IN} = 47 \mu F$, $C_L = 20 \mu F$, $R_L = 10 \Omega$, $V_{IN} = 0.9 V$, $T_A = 25^\circ C$



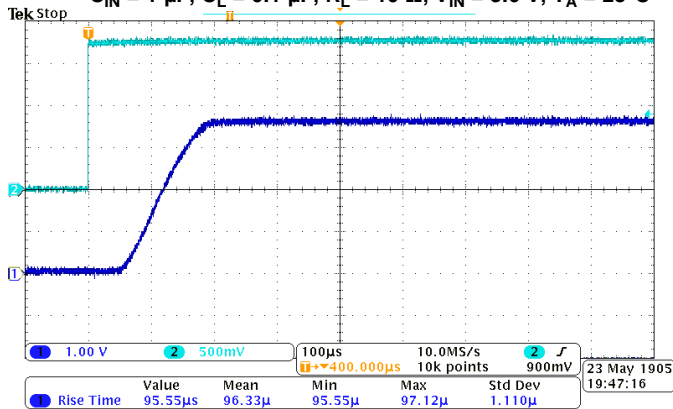
TURN-OFF RESPONSE

$C_{IN} = 47 \mu F$, $C_L = 20 \mu F$, $R_L = 10 \Omega$, $V_{IN} = 0.9 V$, $T_A = 25^\circ C$



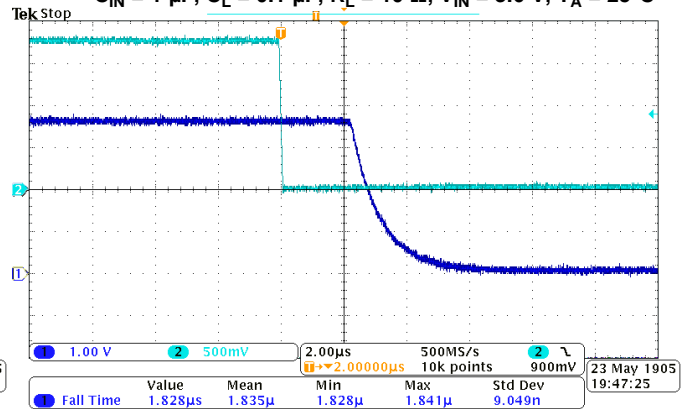
TURN-ON RESPONSE

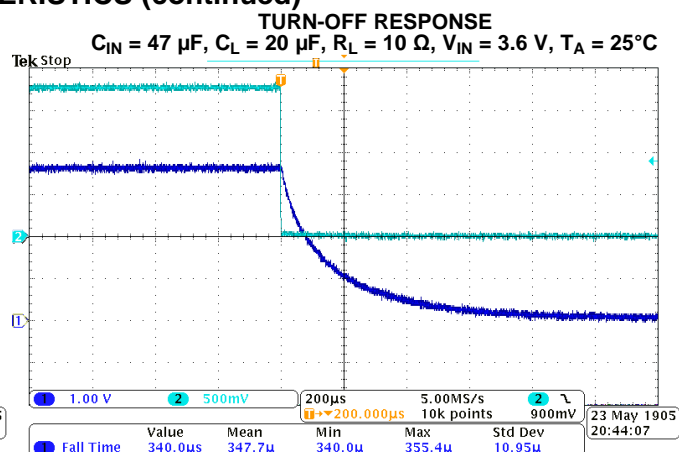
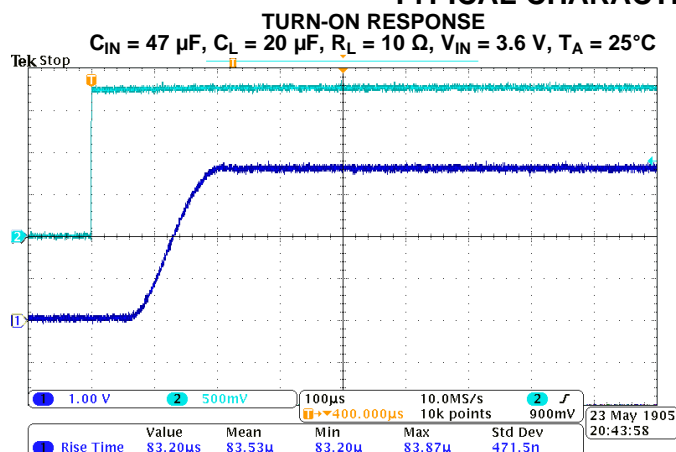
$C_{IN} = 1 \mu F$, $C_L = 0.1 \mu F$, $R_L = 10 \Omega$, $V_{IN} = 3.6 V$, $T_A = 25^\circ C$



TURN-OFF RESPONSE

$C_{IN} = 1 \mu F$, $C_L = 0.1 \mu F$, $R_L = 10 \Omega$, $V_{IN} = 3.6 V$, $T_A = 25^\circ C$



TYPICAL CHARACTERISTICS (continued)

APPLICATION INFORMATION

ON/OFF Control

The ON pin controls the state of the switch. Asserting ON high enables the switch. ON is active high and has a low threshold, making it capable of interfacing with low-voltage signals. The ON pin is compatible with standard GPIO logic threshold. It can be used with any microcontroller with 1.2-V, 1.8-V, 2.5-V or 3.3-V GPIOs.

Input Capacitor

To limit the voltage drop on the input supply caused by transient inrush currents when the switch turns on into a discharged load capacitor or short-circuit, a capacitor needs to be placed between V_{IN} and GND. A 1- μ F ceramic capacitor, C_{IN} , placed close to the pins is usually sufficient. Higher values of C_{IN} can be used to further reduce the voltage drop.

Output Capacitor

Due to the integral body diode in the NMOS switch, a C_{IN} greater than C_L is highly recommended. A C_L greater than C_{IN} can cause V_{OUT} to exceed V_{IN} when the system supply is removed. This could result in current flow through the body diode from V_{OUT} to V_{IN} . A C_{IN} to C_L ratio of 10 to 1 is recommended for minimizing V_{IN} dip caused by inrush currents during startup.

Output Pulldown

The output pulldown is active when the user is turning off the main pass FET. The pulldown discharges the output rail to approximately 10% of the rail, then the output pulldown is automatically disconnected to optimize the shutdown current.

Board Layout

For best performance, all traces should be as short as possible. To be most effective, the input and output capacitors should be placed close to the device to minimize the effects that parasitic trace inductances may have on normal and short-circuit operation. Using wide traces for V_{IN} , V_{OUT} , and GND helps minimize the parasitic electrical effects along with minimizing the case to ambient thermal impedance.

REVISION HISTORY

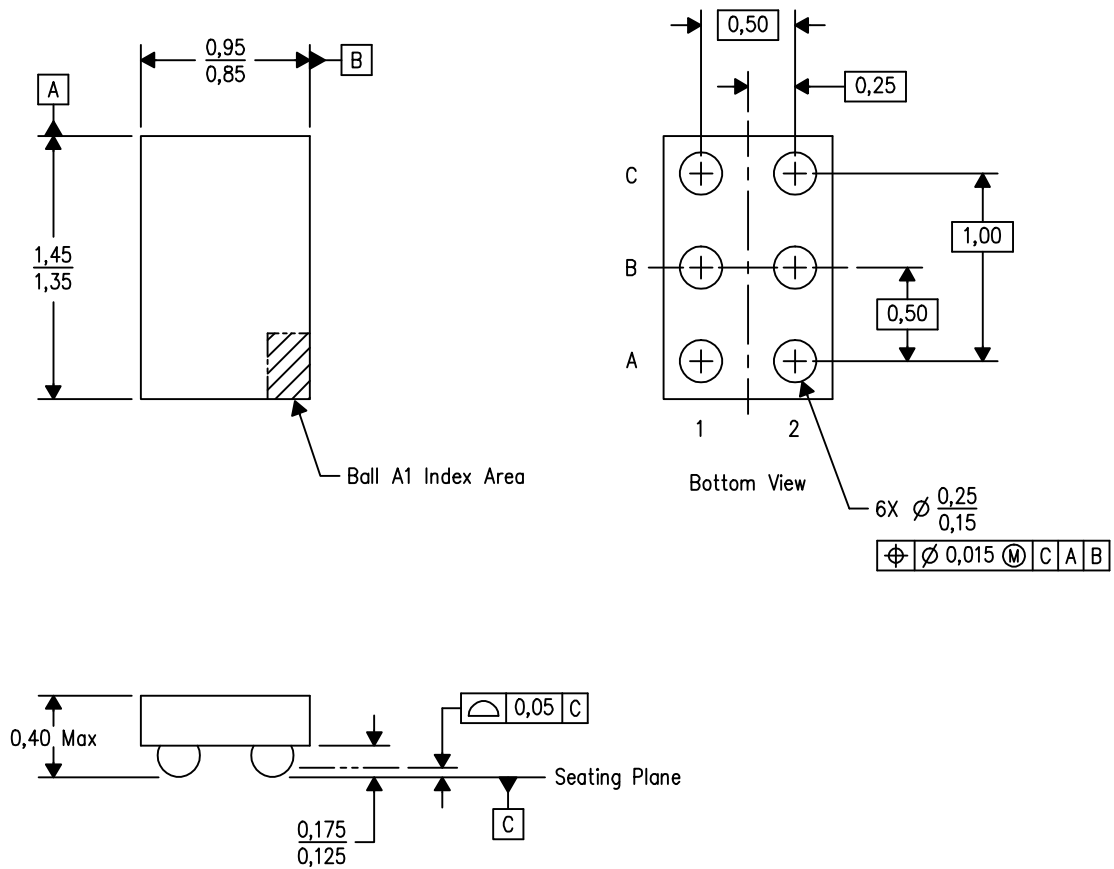
Changes from Revision A (June 2011) to Revision B

Page

- Added new orderable part number to the ORDERING INFORMATION table. [2](#)

YZ (R-XBGA-N6)

(CUSTOM) DIE-SIZE BALL GRID ARRAY



CUSTOM 10/2010

- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - This drawing is subject to change without notice.
 - NanoFree™ package configuration.
 - This package is lead-free.

NanoFree is a trademark of Texas Instruments.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS22924BYZPRB	ACTIVE	DSBGA	YZP	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	5N	Samples
TPS22924BYZR	ACTIVE	DSBGA	YZ	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	5N	Samples
TPS22924BYZT	ACTIVE	DSBGA	YZ	6	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	5N	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TPS22924BYZPRB	DSBGA	YZP	6	3000	178.0	9.2	1.02	1.52	0.63	4.0	8.0	Q1
TPS22924BYZR	DSBGA	YZ	6	3000	178.0	9.2	1.02	1.52	0.63	4.0	8.0	Q1
TPS22924BYZT	DSBGA	YZ	6	250	178.0	9.2	1.02	1.52	0.63	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS

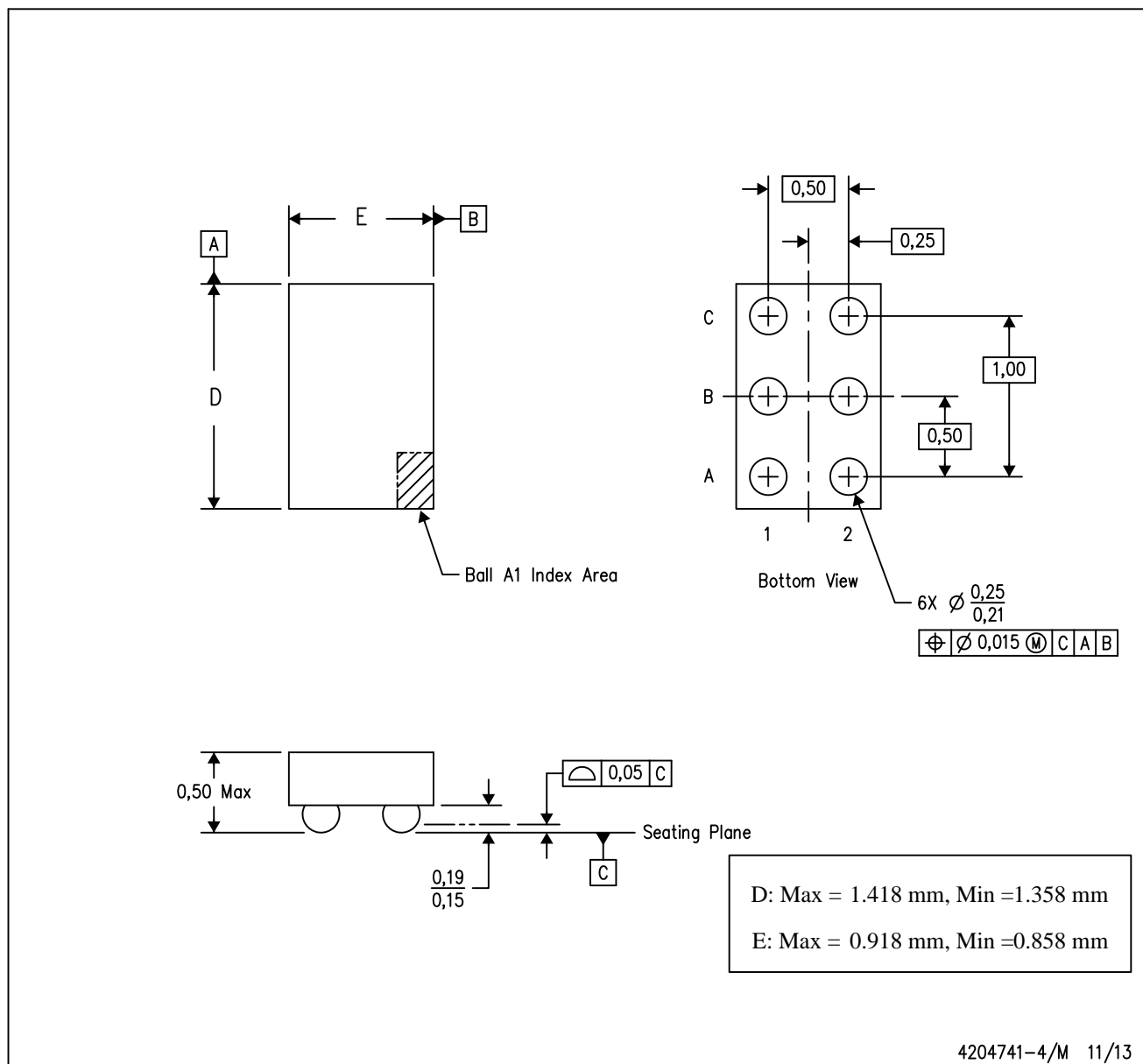


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS22924BYZPRB	DSBGA	YZP	6	3000	220.0	220.0	35.0
TPS22924BYZR	DSBGA	YZ	6	3000	220.0	220.0	35.0
TPS22924BYZT	DSBGA	YZ	6	250	220.0	220.0	35.0

YZP (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. NanoFree™ package configuration.

NanoFree is a trademark of Texas Instruments.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com