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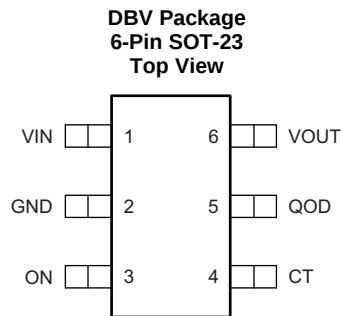
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4 修订历史记录

注：之前版本的页码可能与当前版本有所不同。

Changes from Original (September 2017) to Revision A	Page
• 已更改 产品状态从“预告信息”改为“生产数据”	1

5 Pin Configuration and Functions



Pin Functions

PIN		I/O	DESCRIPTION
NO.	NAME		
1	VIN	I	Switch input.
2	GND	—	Device ground.
3	ON	I	Active high switch control input. Do not leave floating.
4	CT	O	Switch slew rate control. Connect capacitor from this pin to VIN to increase output slew rate and turn on time. Can be left floating for fastest timing.
5	QOD	O	Quick Output Discharge pin. This functionality can be enabled in one of three ways. - Placing an external resistor between VOUT and QOD - Tying QOD directly to VOUT and using the internal resistor value (R_{PD}) - Disabling QOD by leaving pin floating See the Fall Time (t_{FALL}) and Quick Output Discharge (QOD) section for more information.
6	VOUT	O	Switch output.

6 Specifications

6.1 Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{IN}	Input voltage	−0.3	6	V
V _{OUT}	Output voltage	−0.3	6	V
V _{ON}	Enable voltage	−0.3	6	V
V _{QOD}	QOD pin voltage	−0.3	6	V
I _{MAX}	Maximum continuous switch current		2	A
I _{PLS}	Maximum pulsed switch current, pulse < 300-μs, 2% duty cycle		2.5	A
T _{J,MAX}	Maximum junction temperature		125	°C
T _{STG}	Storage temperature	−65	150	°C
T _{LEAD}	Maximum Lead temperature (10-s soldering time)		300	°C

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

6.2 ESD Ratings

		VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	±2000
		Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾	±500

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500-V HBM is possible with the necessary precautions. Pins listed as ±2000 V may actually have higher performance.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 250-V CDM is possible with the necessary precautions. Pins listed as ±500 V may actually have higher performance.

6.3 Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
V _{IN}	Input voltage	1	5.5	V
V _{OUT}	Output voltage	0	5.5	V
V _{IH}	High-level input voltage, ON	1	5.5	V
V _{IL}	Low-level input voltage, ON	0	0.35	V
V _{QOD}	QOD Pin Voltage	0	5.5	V
V _{CT}	Timing Capacitor Voltage Rating	7		V

6.4 Thermal Information

Thermal Parameters ⁽¹⁾		TPS22917	UNIT
		DBV (SOT-23)	
		6 PINS	
θ _{JA}	Junction-to-ambient thermal resistance	183	°C/W
θ _{JCTop}	Junction-to-case (top) thermal resistance	152	°C/W
θ _{JB}	Junction-to-board thermal resistance	34	°C/W
ψ _{JT}	Junction-to-top characterization parameter	37	°C/W
ψ _{JB}	Junction-to-board characterization parameter	33	°C/W

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

6.5 Electrical Characteristics

Unless otherwise noted, the specification in the following table applies for all variants over the entire recommended power supply voltage range of 1 V to 5.5 V. Typical Values are at 25°C.

PARAMETER		TEST CONDITIONS	T _J	MIN	TYP	MAX	UNIT				
INPUT SUPPLY(VIN)											
I _{Q,VIN}	V _{IN} Quiescent current	V _{ON} ≥ V _{IH} , V _{OUT} = Open	–40°C to +85°C	0.5	1.0		μA				
			–40°C to +125°C		1.2		μA				
I _{SD,VIN}	V _{IN} Shutdown current	V _{ON} ≤ V _{IL} , V _{OUT} = GND	–40°C to +85°C	10	100		nA				
			–40°C to +105°C		250		nA				
ON-RESISTANCE(R _{ON})											
R _{ON}	ON-Resistance	I _{OUT} = 200 mA	V _{IN} = 5 V	25°C	80	100	mΩ				
				–40°C to +85°C		120					
				–40°C to +105°C		130					
				–40°C to +125°C		140					
			V _{IN} = 3.6 V	25°C	90	110					
				–40°C to +85°C		140					
				–40°C to +105°C		150					
				–40°C to +125°C		160					
			V _{IN} = 1.8 V	25°C	120	150					
				–40°C to +85°C		175					
				–40°C to +105°C		185					
				–40°C to +125°C		200					
			V _{IN} = 1.2 V	25°C	170	220					
				–40°C to +85°C		265					
				–40°C to +105°C		280					
				–40°C to +125°C		300					
			VIN = 1.0 V	25°C	220	300					
				–40°C to +85°C		350					
				–40°C to +105°C		370					
				–40°C to +125°C		390					
			ENABLE PIN(ON)								
			I _{ON}	ON Pin leakage	V _{ON} ≥ V _{IH}	–40°C to +125°C		–10		10	nA
			R _{PD}	Smart Pull Down Resistance	V _{ON} ≤ V _{IL}	–40°C to +105°C			750		kΩ
			REVERSE CURRENT BLOCKING(RCB)								
			I _{RCB}	RCB Activation Current	V _{ON} ≥ V _{IH} , V _{OUT} > V _{IN}	–40°C to +125°C		–0.5	–1		A
t _{RCB}	RCB Activation time	V _{ON} ≥ V _{IH} , V _{OUT} > V _{IN} + 200mV	–40°C to +125°C		10		μs				
V _{RCB}	RCB Release Voltage	V _{ON} ≥ V _{IH} , V _{OUT} > V _{IN}	–40°C to +125°C		25		mV				
I _{IN,RCB}	VIN Reverse Leakage Current	0 V ≤ V _{IN} + V _{RCB} ≤ V _{OUT} ≤ 5.5 V	–40°C to +105°C	–1			μA				
QUICK OUTPUT DISCHARGE(QOD)											
QOD	Output discharge resistance	V _{ON} ≤ V _{IL}	–40°C to +105°C		150		Ω				

6.6 Switching Characteristics

Unless otherwise noted, the typical characteristics in the following table applies over the entire recommended power supply voltage range of 1 V to 5.5 V at 25°C with a load of $C_L = 1\ \mu\text{F}$, $R_L = 10\ \Omega$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{ON}	Turn ON Time	$V_{IN} = 5.0\ \text{V}$	$C_T = \text{Open}$	100		μs
			$C_T \geq 100\ \text{pF}$	4		$\mu\text{s/pF}$
	$V_{IN} = 3.6\ \text{V}$	$C_T = \text{Open}$		120		μs
			$C_T \geq 100\ \text{pF}$	3.8		$\mu\text{s/pF}$
	$V_{IN} = 1.8\ \text{V}$	$C_T = \text{Open}$		200		μs
			$C_T \geq 100\ \text{pF}$	3.6		$\mu\text{s/pF}$
	$V_{IN} = 1.2\ \text{V}$	$C_T = \text{Open}$		300		μs
			$C_T \geq 200\ \text{pF}$	3.4		$\mu\text{s/pF}$
	$V_{IN} = 1.0\ \text{V}$	$C_T = \text{Open}$		400		μs
			$C_T \geq 400\ \text{pF}$	3		$\mu\text{s/pF}$
t_R	Output Rise Time	$V_{IN} = 5.0\ \text{V}$	$C_T = \text{Open}$	55		μs
			$C_T \geq 100\ \text{pF}$	1.8		$\mu\text{s/pF}$
	$V_{IN} = 3.6\ \text{V}$	$C_T = \text{Open}$		65		μs
			$C_T \geq 100\ \text{pF}$	1.6		$\mu\text{s/pF}$
	$V_{IN} = 1.8\ \text{V}$	$C_T = \text{Open}$		100		μs
			$C_T \geq 100\ \text{pF}$	1.2		$\mu\text{s/pF}$
	$V_{IN} = 1.2\ \text{V}$	$C_T = \text{Open}$		150		μs
			$C_T \geq 200\ \text{pF}$	0.95		$\mu\text{s/pF}$
	$V_{IN} = 1.0\ \text{V}$	$C_T = \text{Open}$		200		μs
			$C_T \geq 400\ \text{pF}$	0.6		$\mu\text{s/pF}$
SR_{ON}	Turn ON Slew Rate ⁽¹⁾	$V_{IN} = 5.0\ \text{V}$	$C_T = \text{Open}$	72		$\text{mV}/\mu\text{s}$
			$C_T \geq 100\ \text{pF}$	2300		$(\text{mV}/\mu\text{s}) \cdot \text{pF}$
	$V_{IN} = 3.6\ \text{V}$	$C_T = \text{Open}$		44		$\text{mV}/\mu\text{s}$
			$C_T \geq 100\ \text{pF}$	1900		$(\text{mV}/\mu\text{s}) \cdot \text{pF}$
	$V_{IN} = 1.8\ \text{V}$	$C_T = \text{Open}$		14		$\text{mV}/\mu\text{s}$
			$C_T \geq 100\ \text{pF}$	1100		$(\text{mV}/\mu\text{s}) \cdot \text{pF}$
	$V_{IN} = 1.2\ \text{V}$	$C_T = \text{Open}$		6.2		$\text{mV}/\mu\text{s}$
			$C_T \geq 200\ \text{pF}$	1000		$(\text{mV}/\mu\text{s}) \cdot \text{pF}$
	$V_{IN} = 1.0\ \text{V}$	$C_T = \text{Open}$		3.9		$\text{mV}/\mu\text{s}$
			$C_T \geq 400\ \text{pF}$	1100		$(\text{mV}/\mu\text{s}) \cdot \text{pF}$
t_{OFF}	Turn OFF Time			10		μs
t_{FALL}	Output Fall Time ⁽²⁾	$R_L = 10\ \Omega$	$C_L = 1\ \mu\text{F}$, $R_{QOD} = \text{Short}$	22		μs
		$R_L = \text{Open}$	$C_L = 10\ \mu\text{F}$, $R_{QOD} = \text{Short}$	3.8		ms
			$C_L = 10\ \mu\text{F}$, $R_{QOD} = 100\ \Omega$	5.9		ms
			$C_L = 220\ \mu\text{F}$, $R_{QOD} = \text{Short}$	72		ms

(1) SR_{ON} is the fastest Slew Rate during the turn on time (t_{ON})

(2) Output may not discharge completely if QOD is not connected to VOUT.

6.7 Typical Characteristics

6.7.1 Typical Electrical Characteristics

The typical characteristics curves in this section apply at 25°C unless otherwise noted.

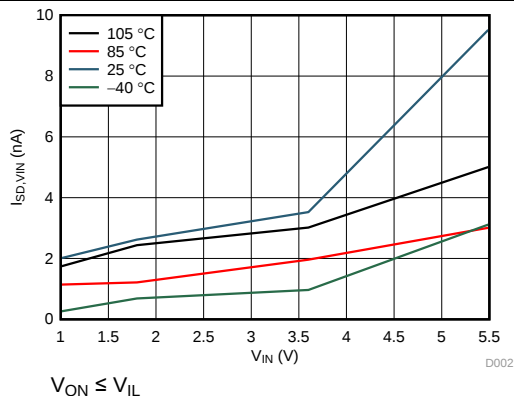


图 1. Shutdown Current (I_{SD})

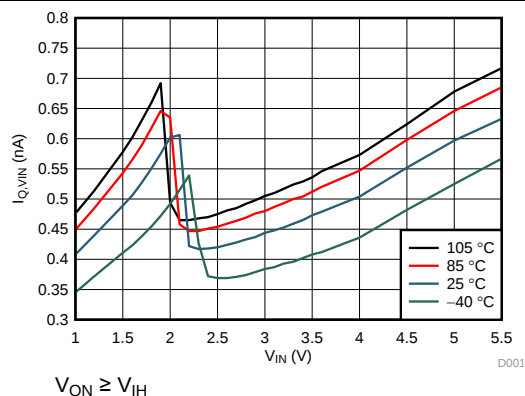


图 2. Quiescent Current (I_Q)

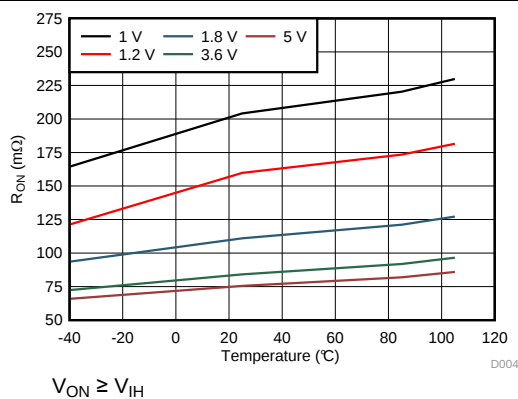


图 3. ON-Resistance (R_{ON})

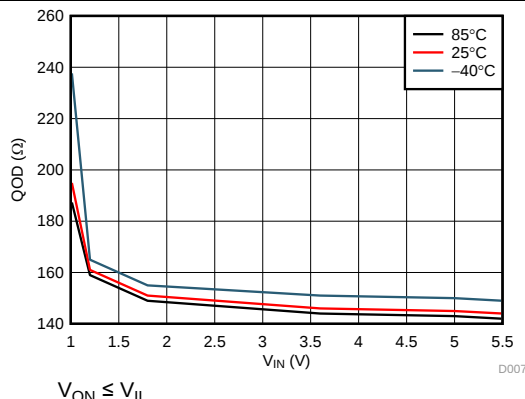


图 4. Quick Output Discharge (QOD)

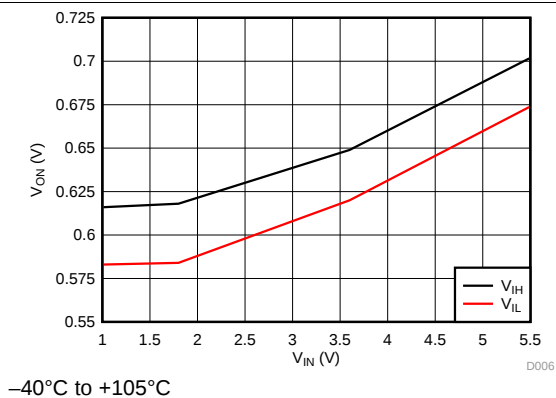


图 5. ON Pin Threshold

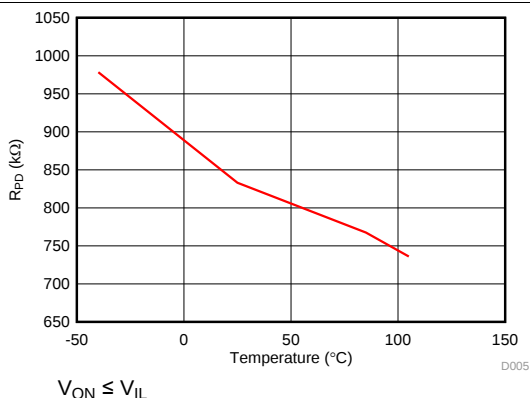


图 6. ON Pin Smart Pull Down (R_{PD})

6.7.2 Typical Switching Characteristics

The typical data in this section apply at 25°C with a load of $C_L = 1\ \mu\text{F}$, $R_L = 10\ \Omega$, and QOD shorted to VOUT unless otherwise noted.

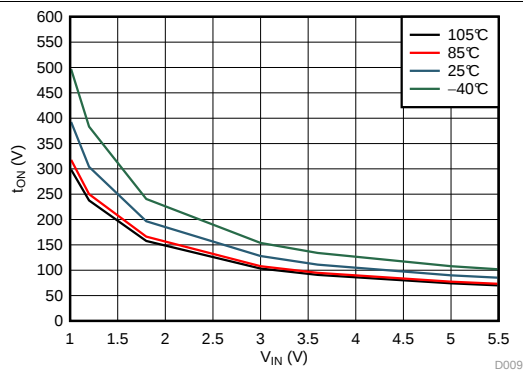


图 7. Turn On Time (CT = Open)

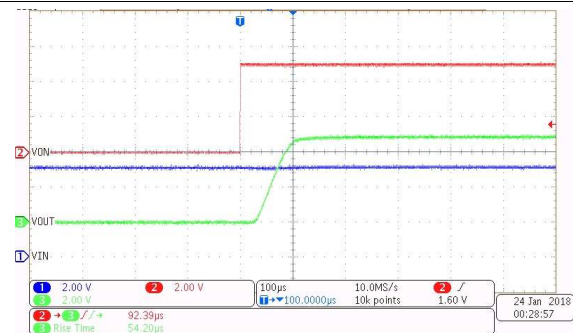


图 8. Turn On at 5 V (CT = Open)

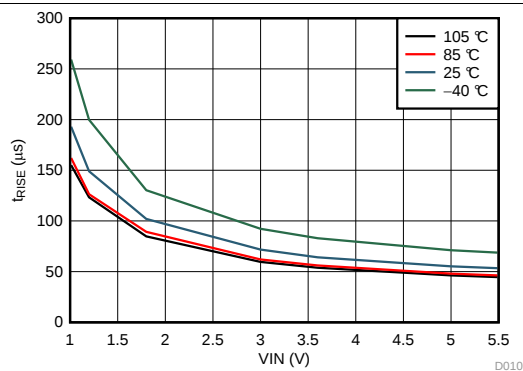


图 9. Rise Time (CT = Open)

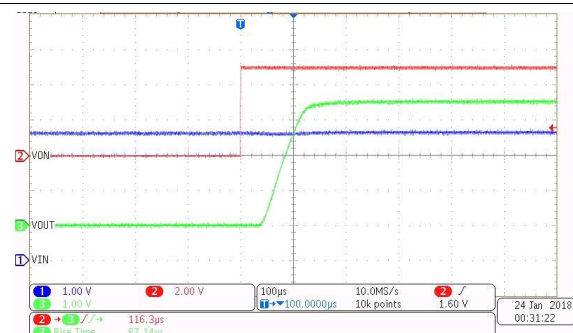


图 10. Turn On at 3.6 V (CT = Open)

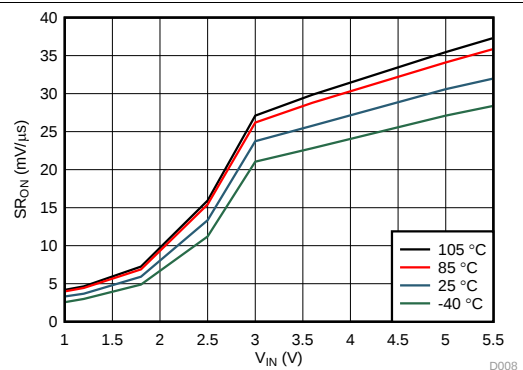


图 11. Slew Rate (CT = Open)

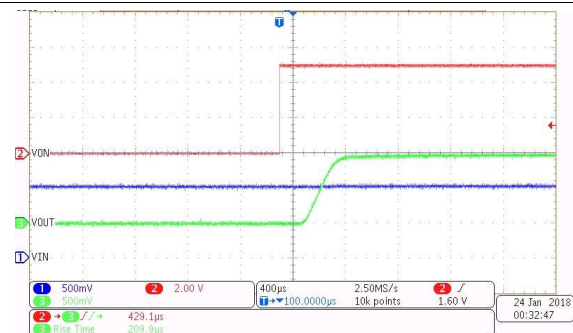


图 12. Turn On at 1 V (CT = Open)

Typical Switching Characteristics (接下页)

The typical data in this section apply at 25°C with a load of $C_L = 1\ \mu\text{F}$, $R_L = 10\ \Omega$, and QOD shorted to VOUT unless otherwise noted.

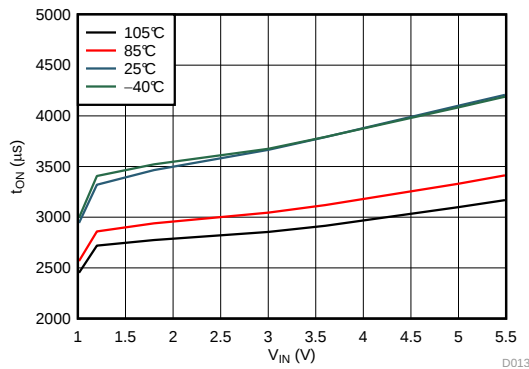


图 13. Turn On Time (CT = 1000 pF)

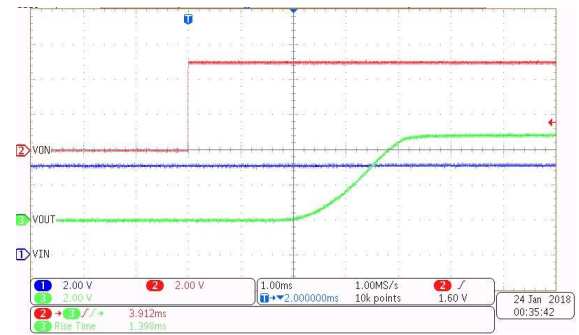


图 14. Turn On at 5 V (CT = 1000 pF)

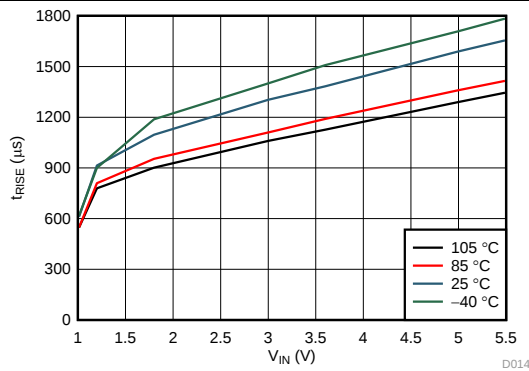


图 15. Rise Time (CT = 1000 pF)

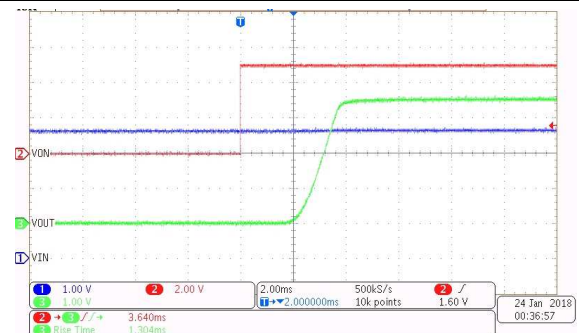


图 16. Turn On at 3.6 V (CT = 1000 pF)

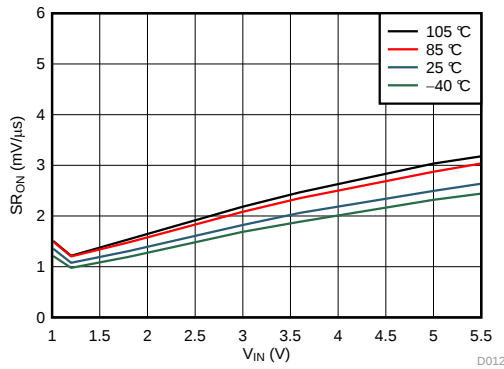


图 17. Slow Slew Rate (CT = 1000 pF)

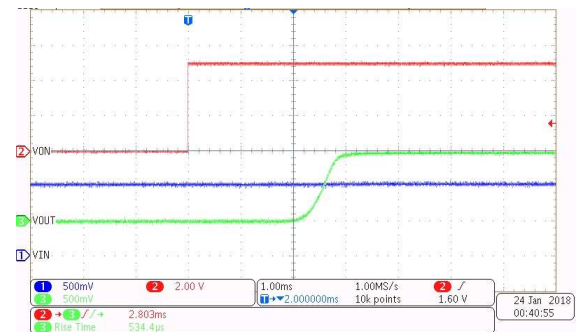
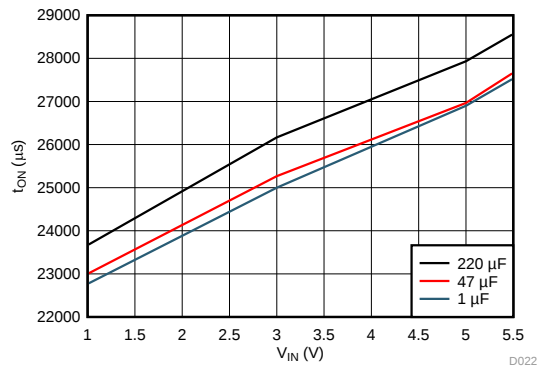


图 18. Turn On at 1 V (CT = 1000 pF)

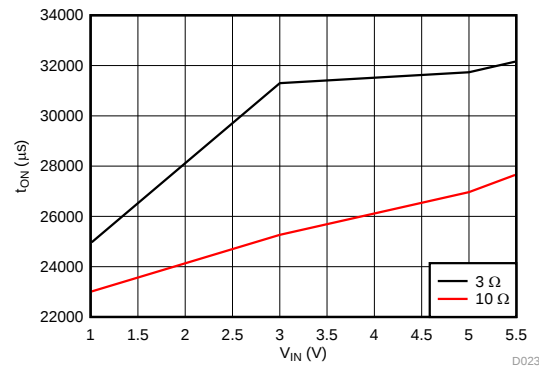
Typical Switching Characteristics (接下页)

The typical data in this section apply at 25°C with a load of $C_L = 1\ \mu\text{F}$, $R_L = 10\ \Omega$, and QOD shorted to VOUT unless otherwise noted.



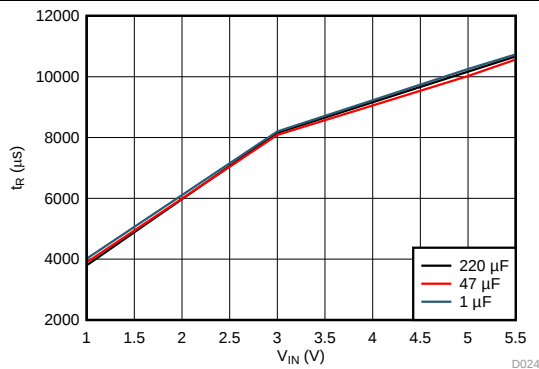
$R_L = 10\ \Omega$

图 19. Turn On vs Load Capacitance (CT = 10000 pF)



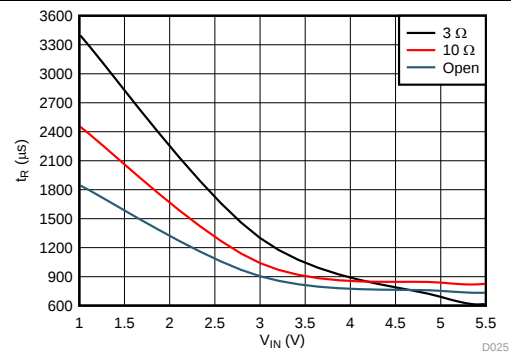
$C_L = 47\ \mu\text{F}$

图 20. Turn On vs Load Resistance (CT = 10000 pF)



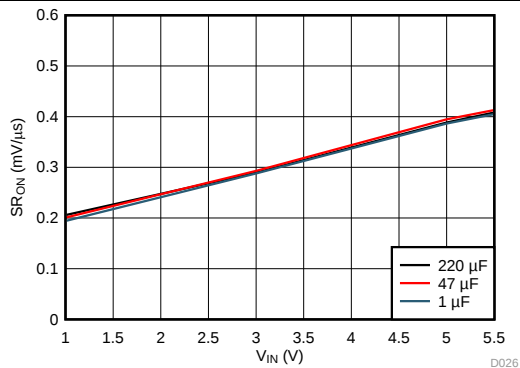
$R_L = 10\ \Omega$

图 21. Rise Time vs Load Capacitance (CT = 10000 pF)



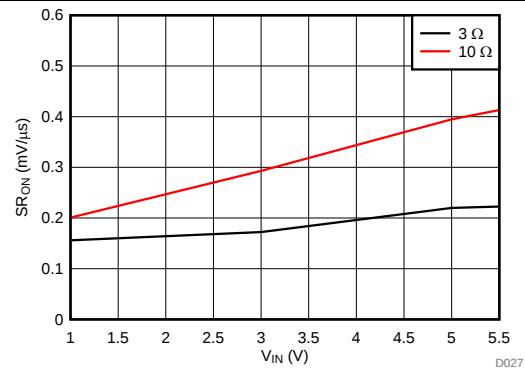
$C_L = 47\ \mu\text{F}$

图 22. Rise Time vs Load Resistance (CT = 10000 pF)



$R_L = 10\ \Omega$

图 23. Slew Rate vs Load Capacitance (CT = 10000 pF)



$C_L = 47\ \mu\text{F}$

图 24. Slew Rate vs Load Resistance (CT = 10000 pF)

Typical Switching Characteristics (接下页)

The typical data in this section apply at 25°C with a load of $C_L = 1\ \mu\text{F}$, $R_L = 10\ \Omega$, and QOD shorted to VOUT unless otherwise noted.

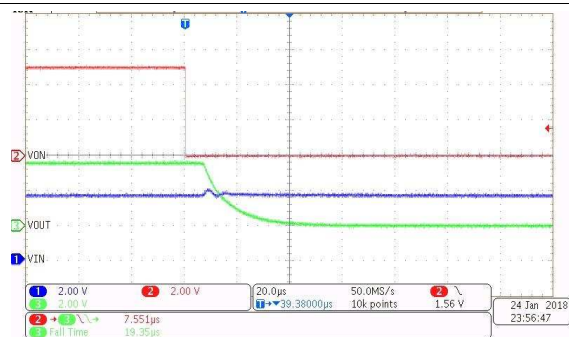
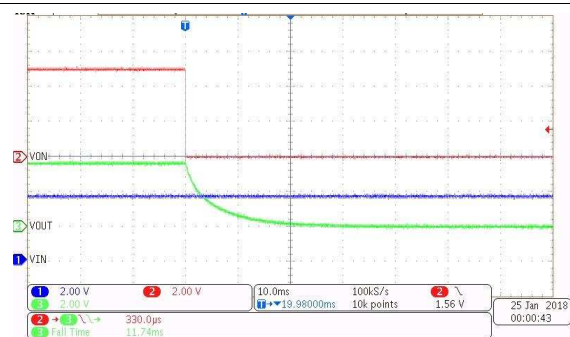
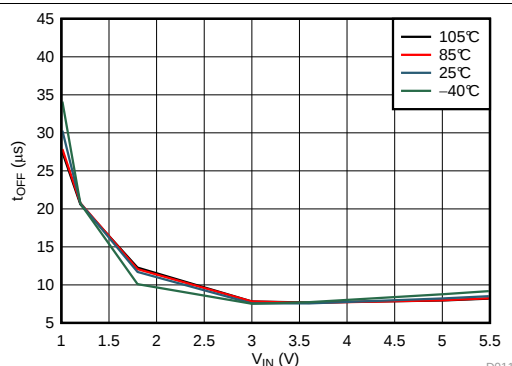


图 25. Turn Off at 3.6 V



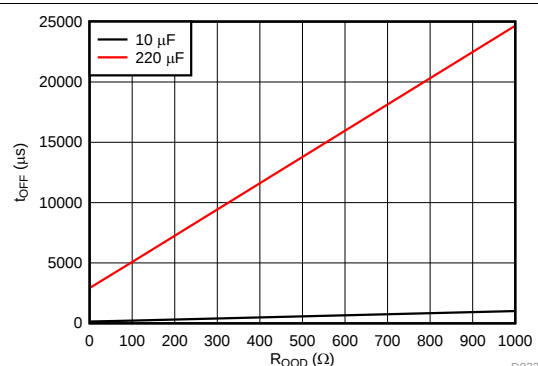
$R_L = \text{Open}$ $C_L = 47\ \mu\text{F}$

图 26. Turn Off at 3.6 V (Open Load)



$V_{IN} = 1\ \text{V to } 5.5\ \text{V}$

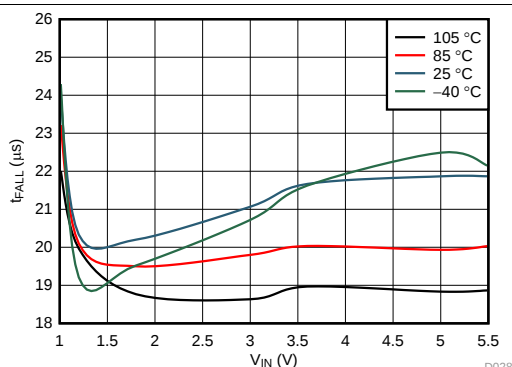
图 27. Turn Off Time



$V_{IN} = 1\ \text{V to } 5.5\ \text{V}$

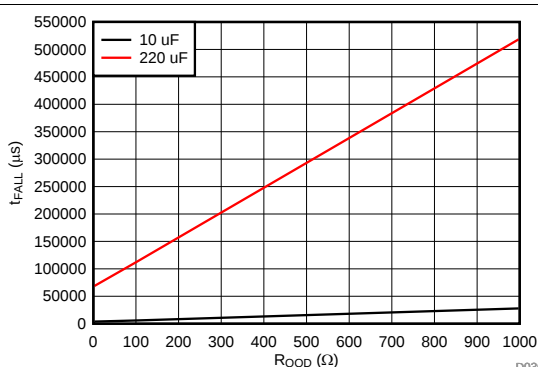
$R_L = \text{Open}$

图 28. Turn Off Time (Open Load)



$V_{IN} = 1\ \text{V to } 5.5\ \text{V}$

图 29. Fall Time



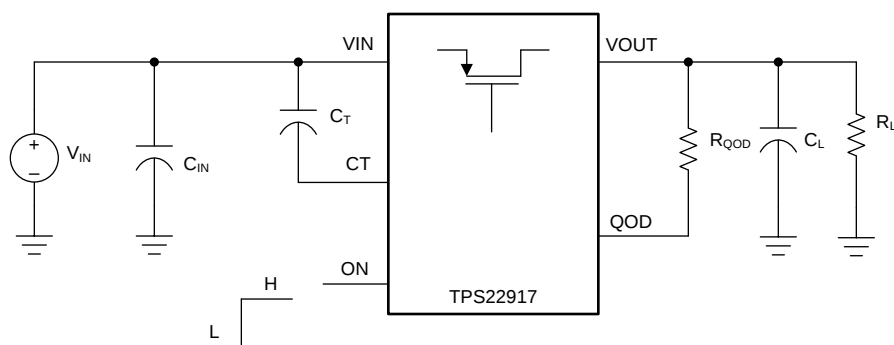
$V_{IN} = 1\ \text{V to } 5.5\ \text{V}$

$R_L = \text{Open}$

图 30. Fall Time (Open Load)

7 Parameter Measurement Information

7.1 Test Circuit and Timing Waveforms Diagrams



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- (1) Rise and fall times of the control signal are 100 ns
- (2) Turn-off times and fall times are dependent on the time constant at the load. For TPS22917, the internal pull-down resistance QOD is enabled when the switch is disabled. The time constant is $(R_{QOD} + QOD \parallel R_L) \times C_L$.

图 31. Test Circuit

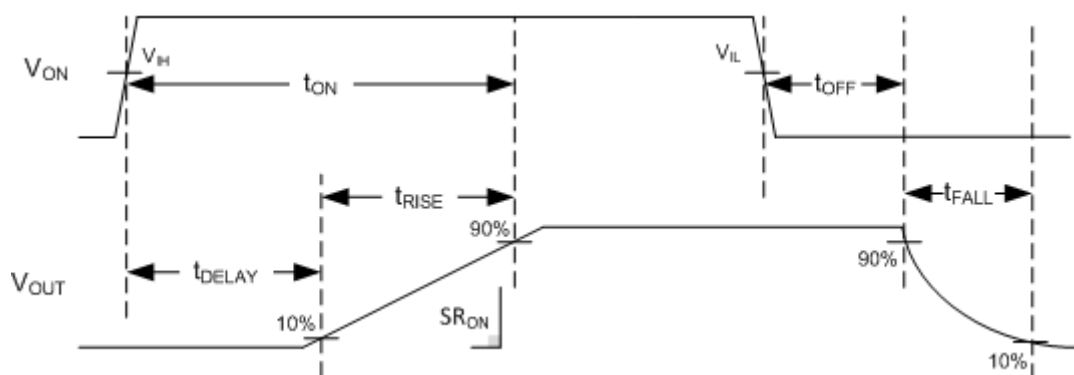


图 32. Timing Waveforms

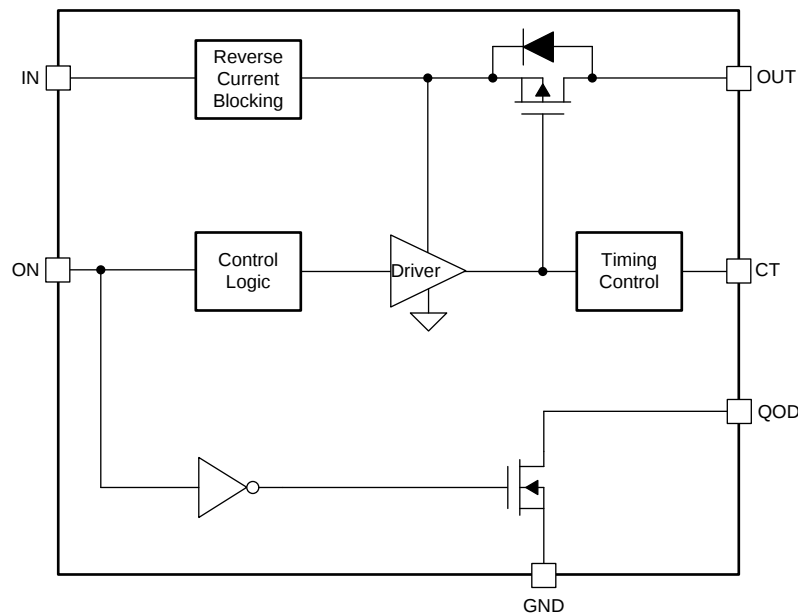
8 Detailed Description

8.1 Overview

The TPS22917 device is a 5.5-V, 2-A load switch in a 6-pin SOT-23 package. To reduce voltage drop for low voltage and high current rails, the device implements a low resistance P-channel MOSFET which reduces the drop out voltage across the device.

The TPS22917 device has a configurable slew rate which helps reduce or eliminate power supply droop because of large inrush currents. Furthermore, the device features a QOD pin, which allows the configuration of the discharge rate of VOUT once the switch is disabled. During shutdown, the device has very low leakage currents, thereby reducing unnecessary leakages for downstream modules during standby. Integrated control logic, driver, charge pump, and output discharge FET eliminates the need for any external components which reduces solution size and bill of materials (BOM) count.

8.2 Functional Block Diagram



8.3 Feature Description

8.3.1 On and Off Control

The ON pin controls the state of the switch. The ON pin is compatible with standard GPIO logic threshold so it can be used in a wide variety of applications. When power is first applied to VIN, a Smart Pull Down is used to keep the ON pin from floating until system sequencing is complete. Once the ON pin is deliberately driven high ($\geq V_{IH}$), the Smart Pull Down is disconnected to prevent unnecessary power loss. 表 1 shown then the ON Pin Smart Pull Down is active.

表 1. Smart-ON Pull Down

VON	Pull Down
$\leq V_{IL}$	Connected
$\geq V_{IH}$	Disconnected

8.3.2 Turn On Time (t_{ON}) and Adjustable Slew Rate (CT)

A capacitor to VIN on the CT pin sets the slew rate of V_{OUT} . The CT capacitor voltage will ramp until shortly after the switch is turned on and V_{OUT} becomes stable.

Leaving the CT pin open will result in the highest slew rate and fastest turn on time. These values can be found in the Switching Characteristics Table. For slower slew rates the required CT capacitor can be found using 公式 1:

$$CT = (\text{Slew Rate}) \div SR_{ON}$$

where

- Slew Rate = Desired slew rate (mV/us)
- CT = The capacitance value on the CT pin (pF)
- SR_{ON} = Slew Rate Constant from Table ((mV/ μ s) $\times$ pF) (1)

The total turn on time has a direct correlation to the output slew rate. The fastest turn on times (t_{ON}), with CT pin open, can be found in the [Switching Characteristics](#). For slower slew rates, the resulting turn on time can be found with 公式 2:

$$\text{Turn On time} = CT \times t_{ON}$$

where

- Turn On Time = Total Time from Enable until V_{OUT} rises to 90% of V_{IN} (μ s)
- CT = The capacitance value on the CT pin (pF)
- t_{ON} = Turn On Time Constant (μ s/pF) (2)

8.3.3 Fall Time (t_{FALL}) and Quick Output Discharge (QOD)

The TPS22917 device includes a QOD pin that can be configured in one of three ways:

- QOD pin shorted to VOUT pin. Using this method, the discharge rate after the switch becomes disabled is controlled with the value of the internal resistance QOD.
- QOD pin connected to VOUT pin using an external resistor R_{QOD} . After the switch becomes disabled, the discharge rate is controlled by the value of the total discharge resistance. To adjust the total discharge resistance, 公式 3 can be used:

$$R_{DIS} = QOD + R_{QOD}$$

Where:

- R_{DIS} = Total output discharge resistance (Ω)
- QOD = Internal pulldown resistance (Ω)
- R_{QOD} = External resistance placed between the VOUT and QOD pins (Ω) (3)
- QOD pin is unused and left floating. Using this method, there will be no quick output discharge functionality, and the output will remain floating after the switch is disabled.

The fall times of the device depend on many factors including the total discharge resistance (R_{DIS}) and the output capacitance (C_L). To calculate the approximate fall time of V_{OUT} use 公式 4.

$$t_{FALL} = 2.2 \times (R_{DIS} \parallel R_L) \times C_L$$

Where:

- t_{FALL} = Output Fall Time from 90% to 10% (μs)
 - R_{DIS} = Total QOD + R_{QOD} Resistance (Ω)
 - R_{L} = Output Load Resistance (Ω)
 - C_{L} = Output Load Capacitance (μF)
- (4)

8.3.3.1 QOD when System Power is Removed

The adjustable QOD can be used to control the power down sequencing of a system even when the system power supply is removed. When the power is removed, the input capacitor discharges at V_{IN} . Past a certain V_{IN} level, the strength of the R_{PD} will be reduced. If there is still remaining charge on the output capacitor, this will result in longer fall times. For further information regarding this condition, see the [Setting Fall Time for Shutdown Power Sequencing](#) section.

8.4 Full-Time Reverse Current Blocking

In a scenario where the device is enabled and V_{OUT} is greater than V_{IN} there is potential for reverse current to flow through the pass FET or the body diode. When the reverse current threshold (I_{RCB}) is exceeded, the switch is disabled within t_{RCB} . The Switch will remain off and block reverse current as long as the reverse voltage condition exists. Once V_{OUT} has dropped below the V_{RCB} release threshold the device will turn back on with slew rate control.

8.5 Device Functional Modes

[表 2](#) describes the connection of the VOUT pin depending on the state of the ON pin as well as the various QOD pin configurations.

表 2. VOUT Connection

ON	QOD CONFIGURATION	TPS22917 VOUT
L	QOD pin connected to VOUT with R_{QOD}	GND (via QOD + R_{QOD})
L	QOD pin tied to VOUT directly	GND (via QOD)
L	QOD pin left open	Floating
H	N/A	VIN

9 Application and Implementation

注

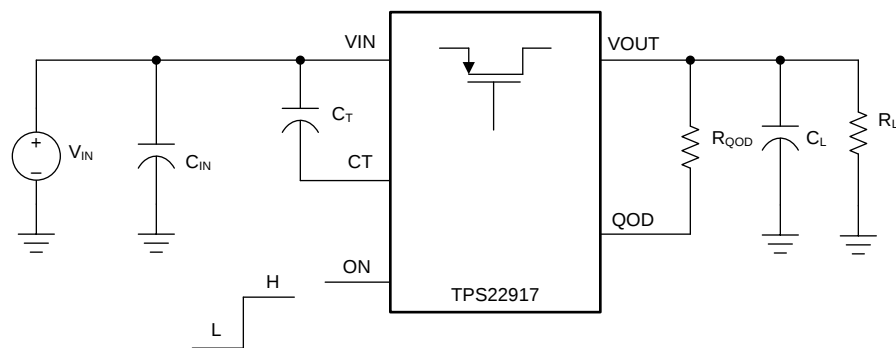
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

This section highlights some of the design considerations when implementing this device in various applications.

9.2 Typical Application

This typical application demonstrates how the TPS22917 device can be used to power downstream modules.



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图 33. Typical Application Schematic

9.2.1 Design Requirements

For this design example, use the values listed in 表 3 as the design parameters:

表 3. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Input Voltage (V_{IN})	3.6 V
Load Current / Resistance (R_L)	1 k Ω
Load Capacitance (C_L)	47 μ F
Minimum Fall Time (t_F)	40 ms
Maximum Inrush Current (I_{RUSH})	150 mA

9.2.2 Detailed Design Procedure

9.2.2.1 Limiting Inrush Current

Use 公式 5 to find the maximum slew rate value to limit inrush current for a given capacitance:

$$(\text{Slew Rate}) = I_{\text{RUSH}} \div C_L$$

where

- I_{INRUSH} = maximum acceptable inrush current (mA)
- C_L = capacitance on VOUT (μF)
- Slew Rate = Output Slew Rate during turn on (mV/ μs)

(5)

Once the required slew rate shown in 公式 1 can be used to find the minimum CT capacitance

$$CT = SR_{\text{ON}} \div (\text{Slew Rate})$$

(6)

$$CT = 1900 \div 3.2 = 594 \text{ pF}$$

(7)

To ensure an inrush current of less than 150 mA, choose a CT value greater than 594 pF. An appropriate value should be placed on such that the I_{MAX} and I_{PLS} specifications of the device are not violated.

9.2.2.2 Application Curves

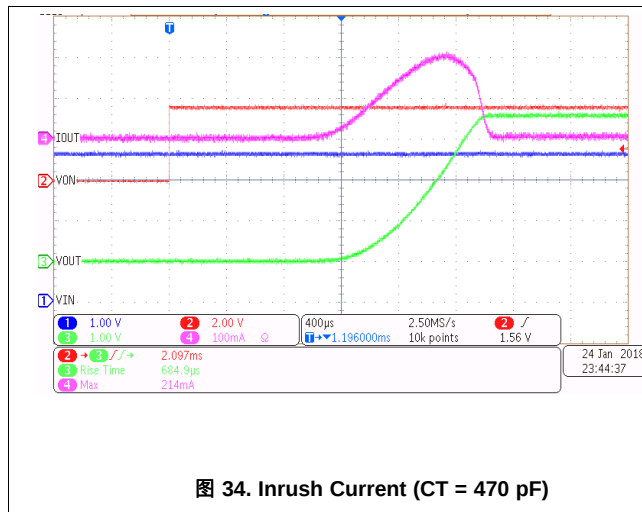


图 34. Inrush Current (CT = 470 pF)

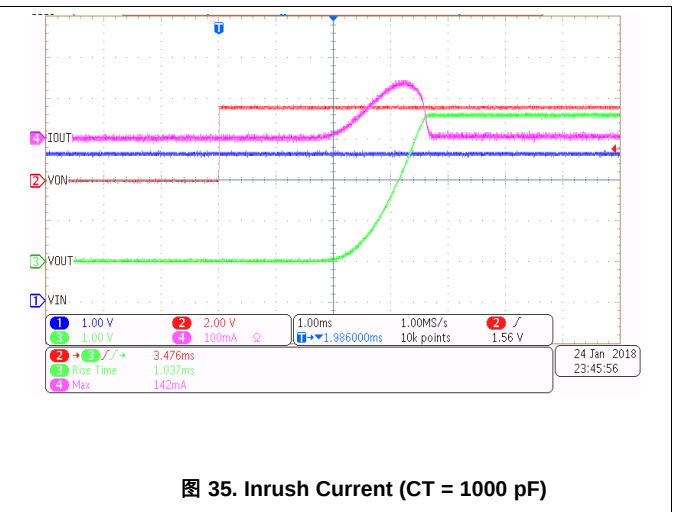


图 35. Inrush Current (CT = 1000 pF)

9.2.2.3 Setting Fall Time for Shutdown Power Sequencing

Microcontrollers and processors often have a specific shutdown sequence in which power must be removed. Using the adjustable Quick Output Discharge function of the TPS22917, adding a load switch to each power rail can be used to manage the power down sequencing. To determine the QOD values for each load switch, first confirm the power down order of the device you wish to power sequence. Be sure to check if there are voltage or timing margins that must be maintained during power down.

Once the required fall time is determined, the maximum external discharge resistance (R_{DIS}) value can be found using 公式 4:

$$t_{\text{FALL}} = 2.2 \times (R_{\text{DIS}} \parallel R_L) \times C_L$$

(8)

$$R_{\text{DIS}} = 630 \Omega$$

(9)

公式 3 can then be used to calculate the R_{QOD} resistance needed to achieve a particular discharge value:

$$R_{\text{DIS}} = QOD + R_{\text{QOD}}$$

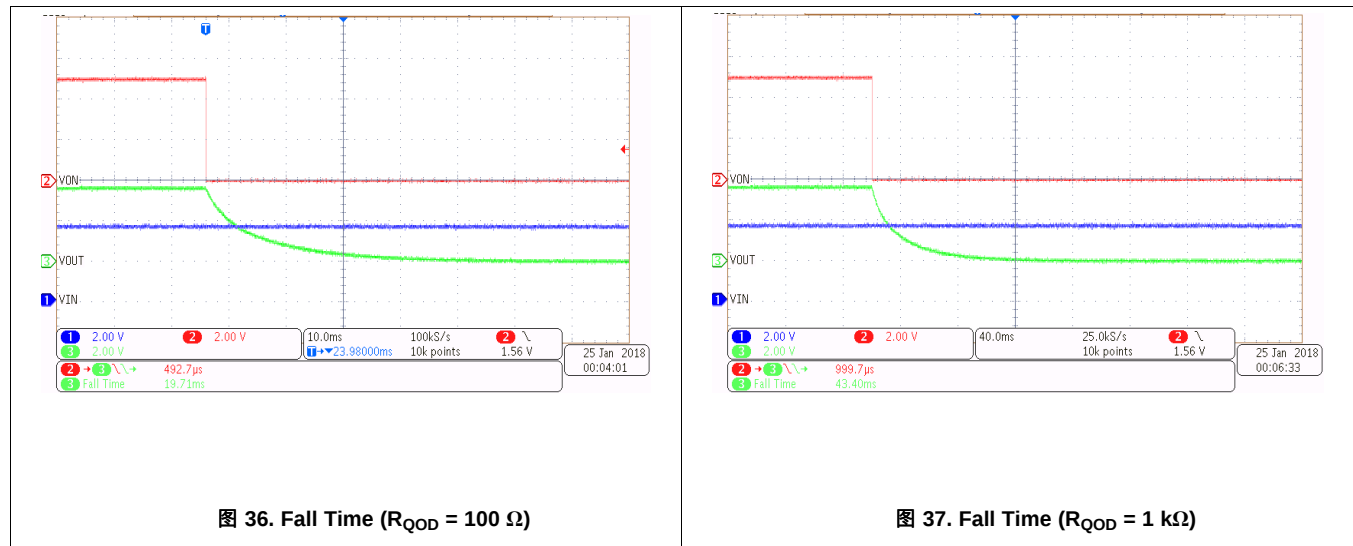
(10)

$$R_{\text{QOD}} = 480 \Omega$$

(11)

To ensure a fall time greater than, choose an R_{QOD} value greater than 480 Ω .

9.2.2.4 Application Curves



10 Power Supply Recommendations

The device is designed to operate with a V_{IN} range of 1 V to 5.5 V. The V_{IN} power supply must be well regulated and placed as close to the device terminal as possible. The power supply must be able to withstand all transient load current steps. In most situations, using an input capacitance (C_{IN}) of 1 μF is sufficient to prevent the supply voltage from dipping when the switch is turned on. In cases where the power supply is slow to respond to a large transient current or large load current step, additional bulk capacitance may be required on the input.

11 Layout

11.1 Layout Guidelines

For best performance, all traces must be as short as possible. To be most effective, the input and output capacitors must be placed close to the device to minimize the effects that parasitic trace inductances may have on normal operation. Using wide traces for VIN, VOUT, and GND helps minimize the parasitic electrical effects.

11.2 Layout Example

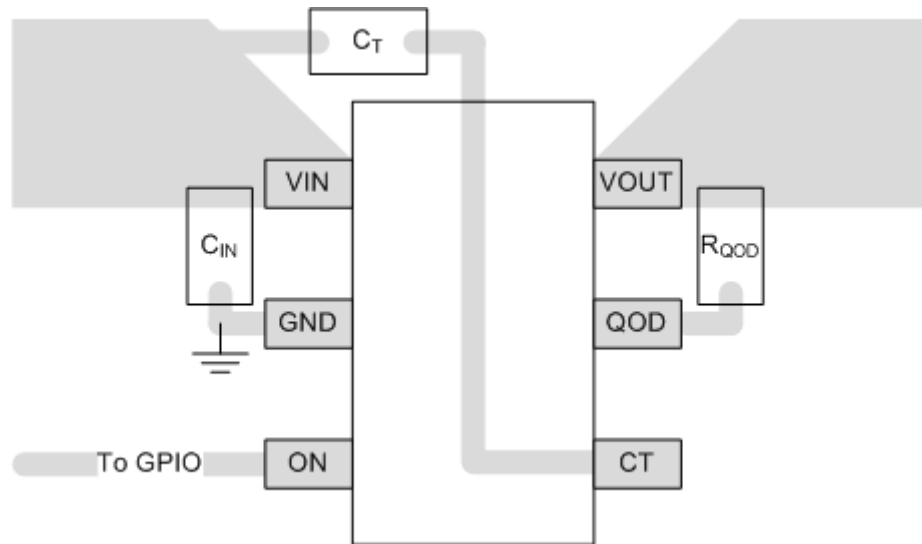


图 38. Recommended Board Layout

11.3 Thermal Considerations

The maximum IC junction temperature should be restricted to 125°C under normal operating conditions. To calculate the maximum allowable dissipation, $P_{D(max)}$ for a given output current and ambient temperature, use 公式 12:

$$P_{D(MAX)} = \frac{T_{J(MAX)} - T_A}{\theta_{JA}}$$

where

- $P_{D(MAX)}$ = maximum allowable power dissipation
- $T_{J(MAX)}$ = maximum allowable junction temperature (125°C for the TPS22917)
- T_A = ambient temperature of the device
- θ_{JA} = junction to air thermal impedance. Refer to the table. This parameter is highly dependent upon board layout. (12)

12 器件和文档支持

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ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

12.5 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

13 机械、封装和可订购信息

以下页面包含机械、封装和可订购信息。这些信息是指定器件的最新可用数据。数据如有变更，恕不另行通知和修订此文档。如欲获取此数据表的浏览器版本，请参阅左侧的导航。

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS22917DBVR	ACTIVE	SOT-23	DBV	6	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	1IAF	Samples
TPS22917DBVT	ACTIVE	SOT-23	DBV	6	250	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	1IAF	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⁾ **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

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Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

⁽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.

⁽⁶⁾ Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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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
TPS22917DBVR	SOT-23	DBV	6	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TPS22917DBVT	SOT-23	DBV	6	250	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

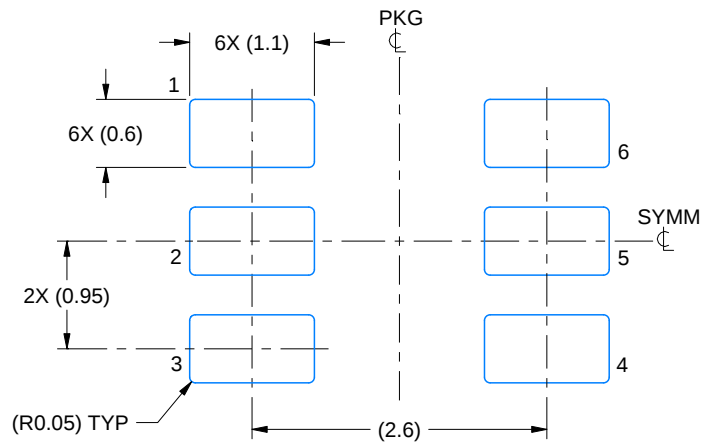
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS22917DBVR	SOT-23	DBV	6	3000	210.0	185.0	35.0
TPS22917DBVT	SOT-23	DBV	6	250	210.0	185.0	35.0

EXAMPLE BOARD LAYOUT

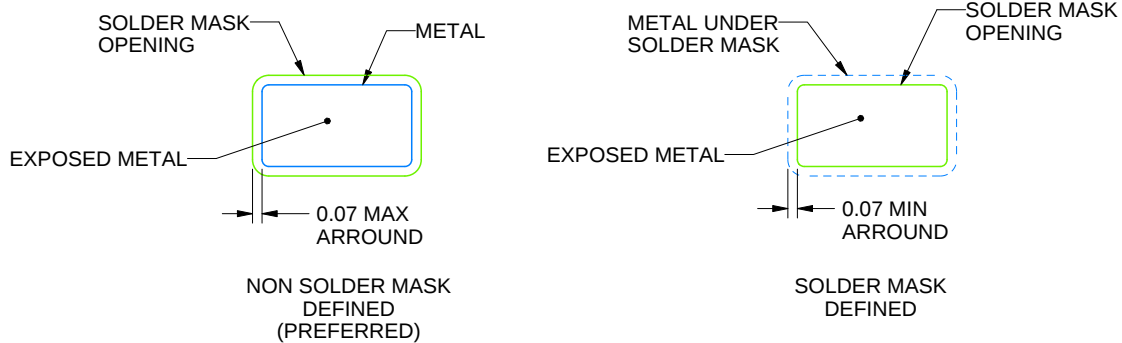
DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214840/B 03/2018

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

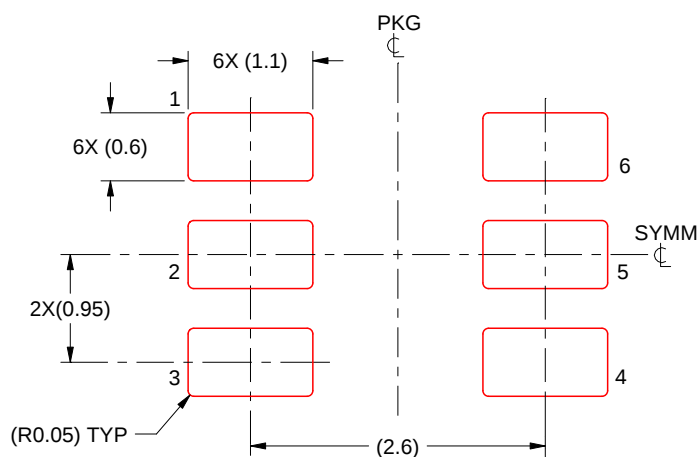
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

4214840/B 03/2018

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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