

LP3470A プログラマブルな遅延と精度 1% のリセット・スレッシュホールドを備えた超低消費電力電圧スーパーバイザ

1 特長

- LP3470 とピン互換
- 5 ピンの SOT-23 パッケージ
- オープン・ドレインの $\overline{\text{RESET}}$ 出力
- 外付けコンデンサを使用してリセットのタイムアウト時間をプログラム可能
- 短時間の VCC 過渡への耐性
- $\pm 1\%$ (標準値) のリセット・スレッシュホールド精度
- 非常に小さい静止電流 (標準値 $0.3\mu\text{A}$)
- $\overline{\text{RESET}}$ は VCC を 0.95V まで下げても有効

2 アプリケーション

- 重要な μP と μC の電力監視
- インテリジェント機器
- コンピュータ
- 携帯型およびバッテリー駆動の機器
- ビルディング・オートメーション: ビルディングのセキュリティ・システム、ビデオ監視
- ファクトリ・オートメーション: フィールド・トランスミッタ、位置および近接センサ
- モータ・ドライブ

3 概要

LP3470A デバイスは、温度範囲全体にわたってリセット・スレッシュホールドの 1% 以内の精度で電圧を監視するように設計された超低消費電力電圧監視回路であり、既存の TI デバイス LP3470 とピン互換です。LP3470A デバイスは高精度でナノパワー電圧を監視します。その際、遅延をプログラム可能です。

VCC 電源電圧がリセット・スレッシュホールドを下回ると、LP3470A はリセット信号をアサートします。リセットのタイムアウト時間は、外付けコンデンサを使用して調節できます。VCC がスレッシュホールド電圧にヒステリシスを加えた値を上回った後、リセットは一定の期間 (外付けコンデンサでプログラムします) アサート状態を維持します。

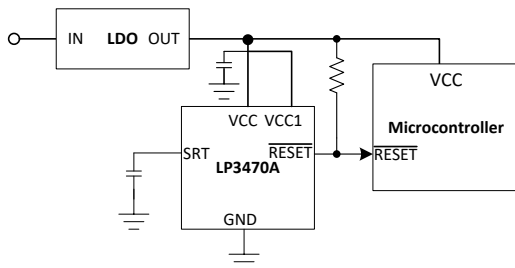
使用できるリセット・スレッシュホールド電圧の選択肢については、「[メカニカル](#)、[パッケージ](#)、[および注文情報](#)」を参照してください。

製品情報⁽¹⁾

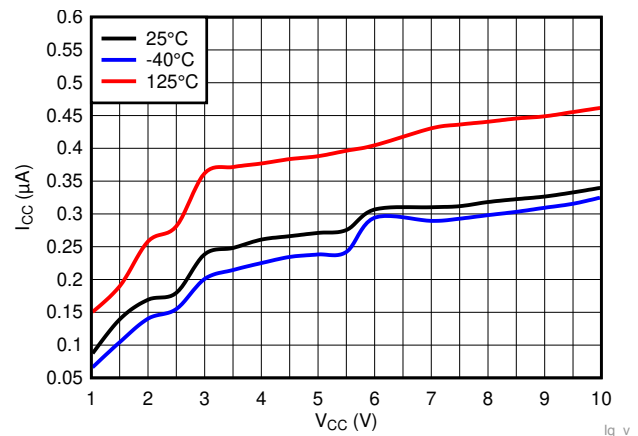
型番	パッケージ	本体サイズ(公称)
LP3470A	SOT-23 (5)	1.60mmx2.90mm

(1) 提供しているすべてのパッケージについては、データシートの末尾にあるパッケージ・オプションについての付録を参照してください。

基本的な動作回路



LP3470A の標準的な消費電流



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4 改訂履歴

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

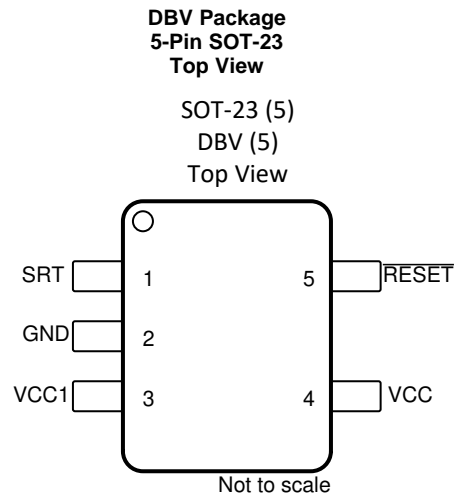
Revision A (October 2019) から Revision B に変更	Page
• 「電气的特性」表に合わせて「非常に小さい静止電流」を 0.35 から 0.3 に変更	1
• Changed the typical value of I_{CC} in the Electrical Characteristics table from 300 to 0.3 to match with the units of μA	6

2019年7月発行のものから更新	Page
• 最初の公開リリース	1

5 Device Comparison Table

PART NUMBER	V_{IT-} (typ) (VCC RAMPING DOWN)	V_{IT+} (typ) (VCC RAMPING UP)
LP3470A263	2.63 V	2.73 V
LP3470A275	2.75 V	2.85 V
LP3470A293	2.93 V	3.03 V
LP3470A308	3.08 V	3.28 V
LP3470A365	3.65 V	3.85 V
LP3470A400	4.0 V	4.2 V
LP3470A438	4.38 V	4.58 V
LP3470A463	4.63 V	4.83 V

6 Pin Configuration and Functions



Pin Functions

PIN		I/O	DESCRIPTION
NO.	NAME		
1	SRT	I	Set reset time-out. Connect a capacitor between this pin and ground to select the reset time-out period (t_D). $t_D = 619 \times C_1$ (C_{SRT} in μF and t_D in ms). If no capacitor is connected, leave this pin floating.
2	GND	—	Ground pin.
3	VCC1	I	Can be connected to VCC or left floating. DO NOT CONNECT TO GND.
4	VCC	I	Supply voltage, and reset threshold monitor input.
5	$\overline{\text{RESET}}$	O	Open-drain, active-low reset output. Connect to an external pullup resistor. $\overline{\text{RESET}}$ changes from high to low whenever the monitored voltage (VCC) drops below the reset threshold voltage (V_{IT-}). Once VCC exceeds the reset threshold (V_{IT-}) + hysteresis (V_{HYS}), $\overline{\text{RESET}}$ remains low for the reset time-out period (t_D) and then deasserts to logic high.

7 Specifications

7.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
Voltage	VCC	-0.3	12	V
	$\overline{\text{RESET}}$	-0.3	12	
	SRT	-0.3	5.5	
Current	$\overline{\text{RESET}}$		±70	mA
Temperature ⁽²⁾	Operating junction temperature, T _J	-40	150	°C
	Storage, T _{stg}	-65	150	

- (1) Stresses beyond those listed under *Absolute Maximum Rating* 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 Condition*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) As a result of the low dissipated power in this device, it is assumed that T_J = T_A.

7.2 ESD Ratings

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	± 2000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾	± 750	

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Recommended Operating Conditions

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

		MIN	NOM	MAX	UNIT
V _{CC}	Input supply voltage	0.95		10	V
$\overline{V_{\text{RESET}}}$, V _{RESET}	$\overline{\text{RESET}}$ pin voltage	0		10	V
$\overline{I_{\text{RESET}}}$, I _{RESET}	$\overline{\text{RESET}}$ pin current	0		±5	mA
T _J	Junction temperature (free air temperature)	-40		125	°C

7.4 Thermal Information

THERMAL METRIC ⁽¹⁾		LP3470A	UNIT
		DBV (SOT23-5)	
		5 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	187.5	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	109.2	°C/W
R _{θJB}	Junction-to-board thermal resistance	92.8	°C/W
ψ _{JT}	Junction-to-top characterization parameter	35.4	°C/W
ψ _{JB}	Junction-to-board characterization parameter	92.5	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	N/A	°C/W

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

7.5 Electrical Characteristics

At $0.95\text{ V} \leq V_{CC} \leq 10\text{ V}$, SRT = Open, $\overline{\text{RESET}}$ pull-up resistor ($R_{\text{pull-up}}$) = 100 k Ω to VCC, output reset load (C_{LOAD}) = 10 pF and over the operating free-air temperature range – 40°C to 125°C, unless otherwise noted. Typical values are at $T_J = 25^\circ\text{C}$.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{CC}	Input supply voltage		0.95		10	V
V_{IT-}	Negative-going input threshold accuracy	-40°C to 125°C	-1.5	1	1.5	%
V_{HYS}	Hysteresis on V_{IT-} pin	$V_{IT-} = 3.08\text{ V}$ to 4.63 V	175	200	225	mV
V_{HYS}	Hysteresis on V_{IT-} pin	$V_{IT-} = 2.64\text{ V}$ to 2.93 V	75	100	125	mV
I_{CC}	Supply current into VCC pin	$V_{CC} = 0.95\text{ V} < V_{CC} < 10\text{ V}$ $V_{CC} > V_{IT+}^{(1)}$ $T_A = -40^\circ\text{C}$ to 125°C		0.3	1	μA
R_{SRT}	SRT pin internal resistance ⁽²⁾		350	500	650	k Ω
V_{POR}	Power on Reset Voltage ⁽³⁾	$V_{OL(max)} = 0.2\text{ V}$ $I_{OUT(Sink)} = 5.6\text{ uA}$			950	mV
V_{OL}	Low level output voltage	$1.5\text{ V} < V_{CC} < 5\text{ V}$ $V_{CC} < V_{IT-}$ $I_{OUT(Sink)} = 2\text{ mA}$			200	mV
$I_{lkg(OD)}$	Open-Drain output leakage current	$\overline{\text{RESET}}$ pin in High Impedance, $V_{CC} = V_{\text{RESET}} = 5.5\text{ V}$ $V_{IT+} < V_{CC}$			90	nA

(1) $V_{IT+} = V_{HYS} + V_{IT-}$

(2) This parameter is guaranteed by design and characterization

(3) V_{POR} is the minimum V_{DD} voltage level for a controlled output state. V_{DD} slew rate $\leq 100\text{mV}/\mu\text{s}$

7.6 Timing Requirements

At $0.95\text{ V} \leq V_{CC} \leq 10\text{ V}$, SRT = Open, $\overline{\text{RESET}}$ pull-up resistor ($R_{\text{pull-up}}$) = 100 k Ω to VCC, output reset load (C_{LOAD}) = 10 pF and over the operating free-air temperature range – 40°C to 125°C, V_{CC} slew rate $< 100\text{mV} / \mu\text{s}$, unless otherwise noted. Typical values are at $T_J = 25^\circ\text{C}$.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{P_HL}	Propagation detect delay for VCC falling below V_{IT-}	$V_{CC} = V_{IT+}$ to $(V_{IT-}) - 10\%$ ⁽¹⁾		15	30	μs
t_D	Reset time delay	SRT pin = open $V_{CC} = (V_{IT-} - 1\text{V})$ to $(V_{IT+} + 1\text{V})$			50	μs
		SRT pin = 10 nF ⁽²⁾⁽³⁾		6.2		ms
		SRT pin = 1 μF ⁽²⁾⁽³⁾		619		ms
t_{GL_VIT-}	Glitch immunity V_{IT-}	5% V_{IT-} overdrive ⁽³⁾⁽⁴⁾		10		μs

(1) t_{P_HL} measured from threshold trip point (V_{IT-}) to V_{OL}

(2) Ideal capacitor

(3) Parameter is guaranteed by design.

(4) Overdrive % = $[(V_{CC} / V_{IT-}) - 1] \times 100\%$

7.7 Typical Characteristics

Typical characteristics show the typical performance of the LP3470A device. Test conditions are at $T_A = T_J = 25^\circ\text{C}$ (unless otherwise noted).

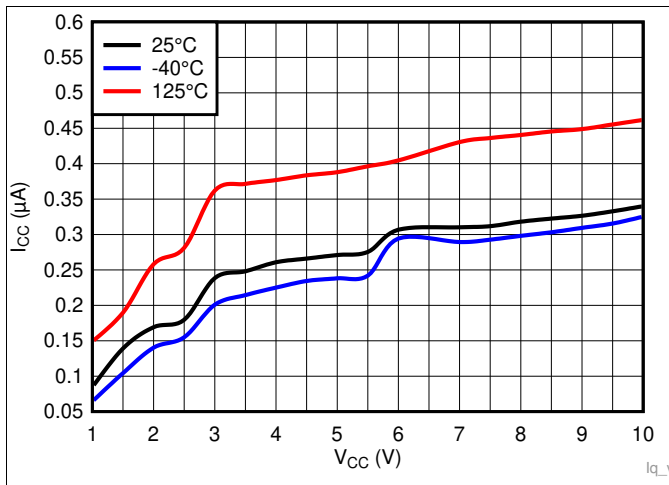


Figure 1. Supply Current vs Supply Voltage

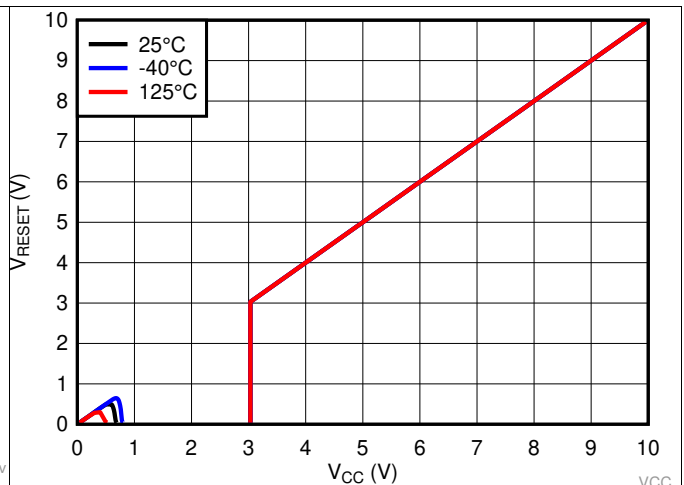


Figure 2. Output Voltage vs Supply Voltage for LP3470A293

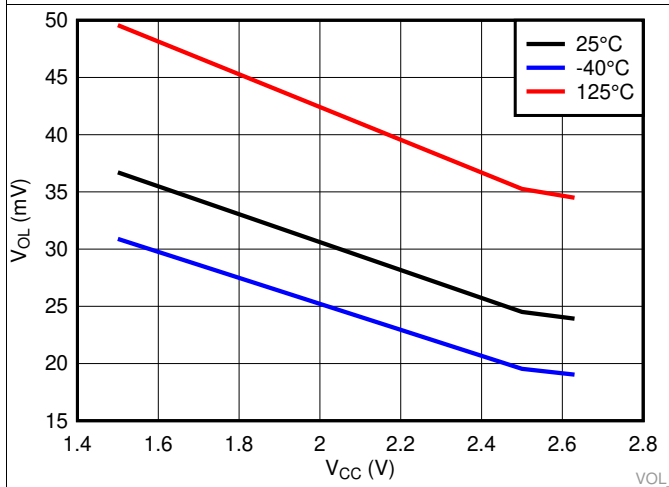


Figure 3. Low Level Output Voltage vs Supply Voltage

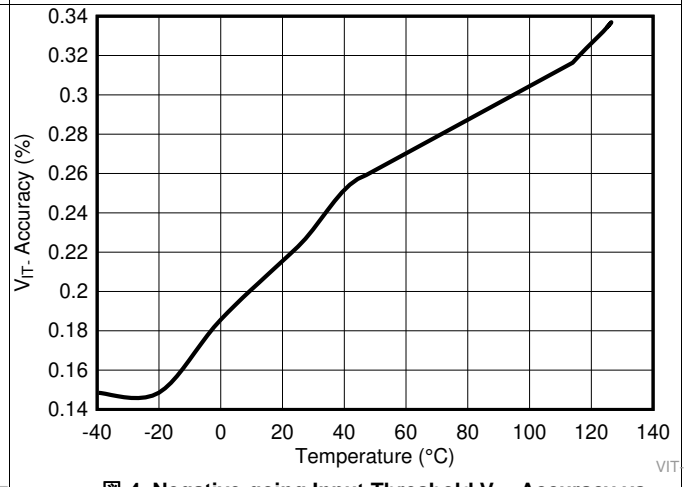


Figure 4. Negative-going Input Threshold V_{IT-} Accuracy vs Temperature

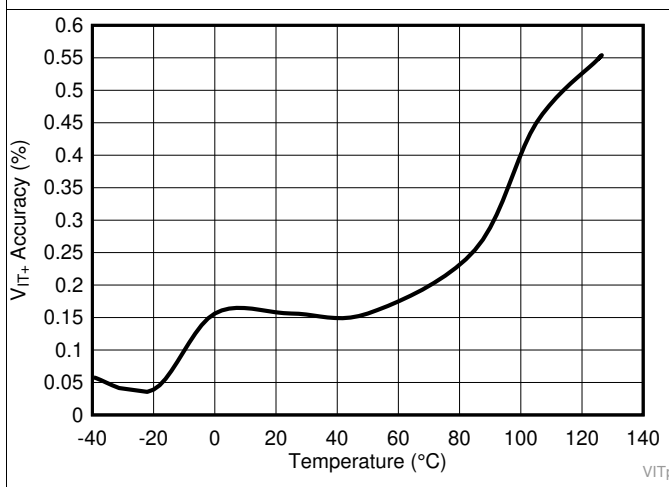


Figure 5. Positive-going Input Threshold V_{IT+} Accuracy vs Temperature

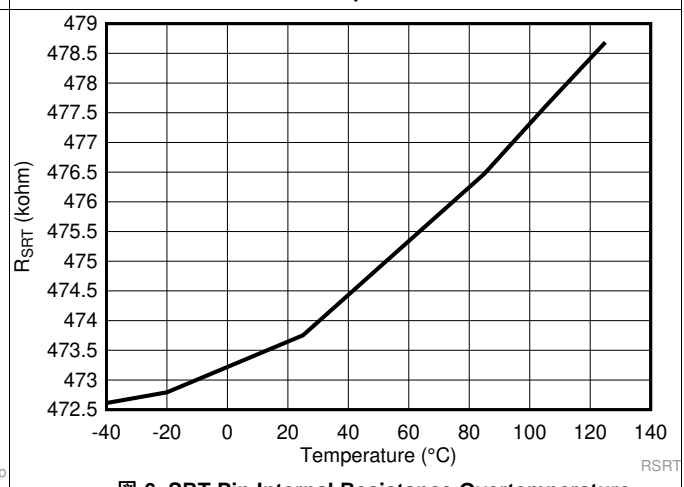
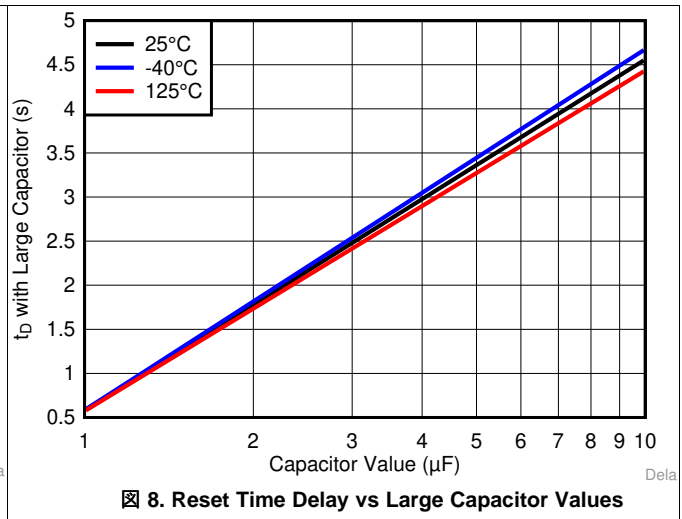
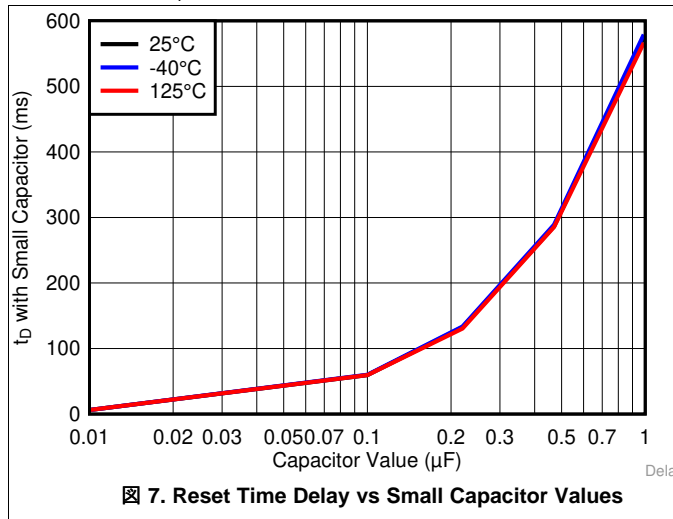


Figure 6. SRT Pin Internal Resistance Overtemperature

Typical Characteristics (continued)

Typical characteristics show the typical performance of the LP3470A device. Test conditions are at $T_A = T_J = 25^\circ\text{C}$ (unless otherwise noted).

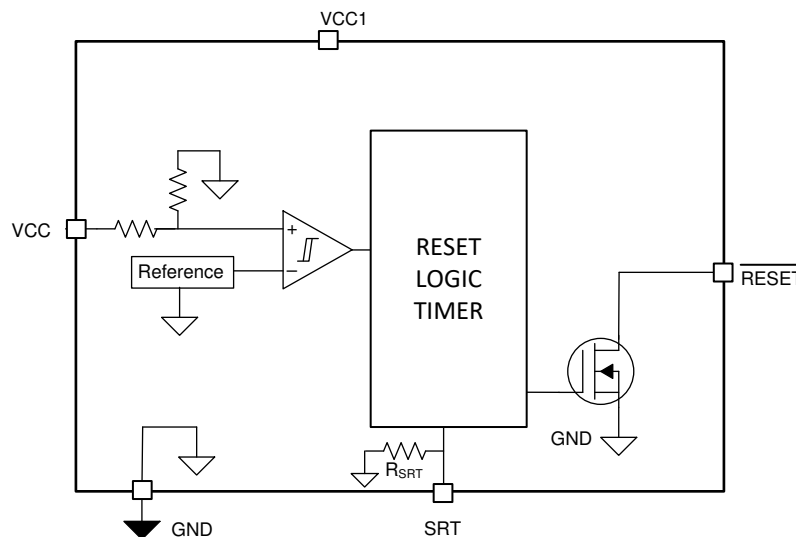


8 Detailed Description

8.1 Overview

The LP3470A micropower voltage supervisory circuit provides a simple solution to monitor the power supplies in microprocessor and digital systems and provides a reset controlled by the factory-programmed reset threshold on the VCC supply voltage pin. When the voltage declines below the reset threshold, the reset signal is asserted and remains asserted for an interval programmed by an external capacitor after VCC has risen above the threshold voltage. The reset threshold options are 2.63 V, 2.75 V, 2.93 V, 3.08 V, 3.65 V, 4 V, 4.38 V, 4.63 V.

8.2 Functional Block Diagram



8.3 Feature Description

8.3.1 $\overline{\text{RESET}}$ Time-Out Period

The reset time delay can be set to a minimum value of 50 μs by leaving the SRT pin floating, or a maximum value of approximately 6.2 seconds by connecting 10 μF delay capacitor. The reset time delay (t_D) can be programmed by connecting a capacitor no larger than 10 μF between SRT pin and GND.

The relationship between external capacitor (C_{SRT}) in Farads at SRT pin and the time delay (t_D) in seconds is given by 式 1.

$$t_D = -\ln(0.29) \times R_{\text{SRT}} \times C_{\text{SRT}} + t_{D(\text{no cap})} \quad (1)$$

式 1 is simplified to 式 2 by plugging R_{SRT} and $t_{D(\text{no cap})}$ given in [Electrical Characteristics](#) section:

$$t_D = 618937 \times C_{\text{SRT}} + 50 \mu\text{s} \quad (2)$$

式 3 solves for external capacitor value (C_{SRT}) in units of Farads where t_D is in units of seconds

$$C_{\text{SRT}} = (t_D - 50 \mu\text{s}) \div 618937 \quad (3)$$

The reset delay varies according to three variables: the external capacitor variance (C_{SRT}), SRT pin internal resistance (R_{SRT}) provided in the [Electrical Characteristics](#) table, and a constant. The minimum and maximum variance due to the constant is shown in [Equation 5](#) and [Equation 6](#).

$$t_{D(\text{minimum})} = -\ln(0.36) \times R_{\text{SRT}(\text{min})} \times C_{\text{SRT}(\text{min})} + t_{D(\text{no cap, min})} \quad (4)$$

$$t_{D(\text{maximum})} = -\ln(0.26) \times R_{\text{SRT}(\text{max})} \times C_{\text{SRT}(\text{max})} + t_{D(\text{no cap, max})} \quad (5)$$

Feature Description (continued)

The recommended maximum delay capacitor for the LP3470A is limited to 10 μF as this ensures there is enough time for the capacitor to fully discharge when the reset condition occurs. When a voltage fault occurs, the previously charged up capacitor discharges, and if the monitored voltage returns from the fault condition before the delay capacitor discharges completely, the delay capacitor will begin charging from a voltage above zero and the reset delay will be shorter than expected. Larger delay capacitors can be used so long as the capacitor has enough time to fully discharge during the duration of the voltage fault.

8.3.2 $\overline{\text{RESET}}$ Output

In applications like microprocessor (μP) systems, errors might occur in system operation during power up, power down, or brownout conditions. It is imperative to monitor the power supply voltage to prevent these errors from occurring.

The LP3470A asserts a reset signal whenever the VCC supply voltage is below a threshold ($V_{\text{IT-}}$) voltage. $\overline{\text{RESET}}$ is ensured to be a logic low for $V_{\text{CC}} > 0.95\text{ V}$. Once VCC exceeds the reset threshold plus a hysteresis voltage, the reset is kept asserted for a time period (t_{D}) programmed by an external capacitor (C_{SRT}); after this interval $\overline{\text{RESET}}$ goes to logic high. If a brownout condition occurs (monitored voltage falls below the reset threshold), $\overline{\text{RESET}}$ goes low. When VCC returns above the reset threshold plus a hysteresis voltage, $\overline{\text{RESET}}$ remains low for a time period t_{D} before going to logic high. [Figure 9](#) shows this behavior.

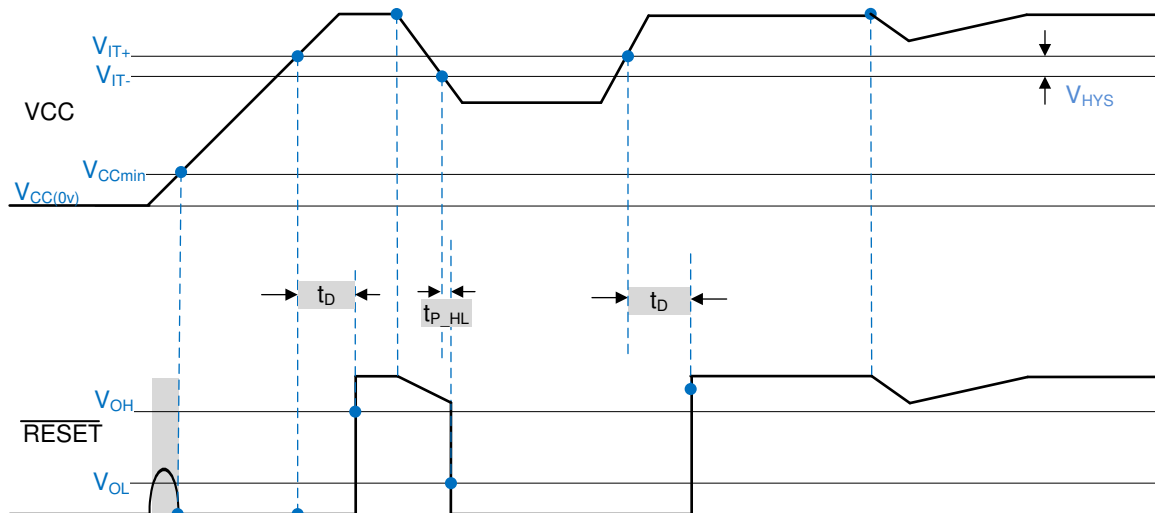


Figure 9. $\overline{\text{RESET}}$ Output Timing Diagram

8.3.3 Pull-up Resistor Selection

The $\overline{\text{RESET}}$ output structure of the LP3470A is an open-drain N-channel MOSFET switch. A pull-up resistor ($R_{\text{pull-up}}$) must be connected to VCC to keep the output logic high when $\overline{\text{RESET}}$ is not asserted.

Connect the pull-up resistor to the desired pull-up voltage source and $\overline{\text{RESET}}$ can be pulled up to any voltage up to 10 V independent of the VCC voltage. To ensure proper voltage levels, give some consideration when choosing the pull-up resistor values. $R_{\text{pull-up}}$ must be large enough to limit the current through the output within the recommended operating conditions. The pull-up resistor value determines the actual VOL, the output capacitive loading, and the output leakage current ($I_{\text{LKG(OD)}}$). A typical pull-up resistor value of 20 k Ω is sufficient in most applications.

8.3.4 VCC Transient Immunity

The LP3470A is immune to quick voltage transients or excursions on VCC. Sensitivity to transients depends on both pulse duration and overdrive. Overdrive is defined by how much VCC deviates from the specified threshold. Threshold overdrive is calculated as a percent of the threshold in question, as shown in [Equation 6](#). A 0.1- μF bypass capacitor mounted close to VCC provides additional transient immunity.

$$\text{Overdrive} = | (V_{\text{CC}} / V_{\text{IT-}} - 1) \times 100\% | \quad (6)$$

Feature Description (continued)

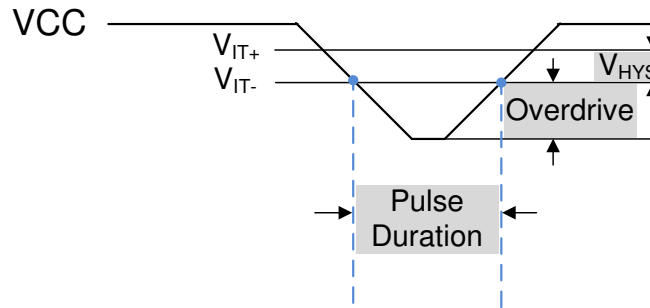


FIG 10. Overdrive vs Pulse Duration

8.4 Device Functional Modes

8.4.1 $\overline{\text{RESET}}$ Output Low

When the VCC supply voltage is below the reset threshold (V_{IT-}), the $\overline{\text{RESET}}$ pin will output logic low. $\overline{\text{RESET}}$ is ensured to be a logic low for $V_{CC} > 0.95 \text{ V}$.

8.4.2 $\overline{\text{RESET}}$ Output High

When the VCC supply voltage exceeds the reset threshold (V_{IT-}) plus the hysteresis voltage (V_{HYS}), the $\overline{\text{RESET}}$ remains asserted for a time period (t_D) programmed by an external capacitor (C_{SRT}); after this interval $\overline{\text{RESET}}$ goes to logic high.

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

The LP3470A is a micropower CMOS voltage supervisor that is ideal for use in battery-powered microprocessor and other digital systems. It is small in size and provides voltage monitoring and supervisory functions with nano-Iq and programmable delay, making it a good solution in a variety of applications. The LP3470A is available in six standard reset threshold voltage options, and the reset time-out period is adjustable using an external capacitor providing maximum flexibility in any application. This device can ensure system reliability and ensures that a connected microprocessor will operate only when a minimum voltage supply is satisfied.

9.2 Typical Application

The LP3470A can be used as a simple supervisor circuit to monitor the input supply to a microprocessor as shown in [Figure 11](#).

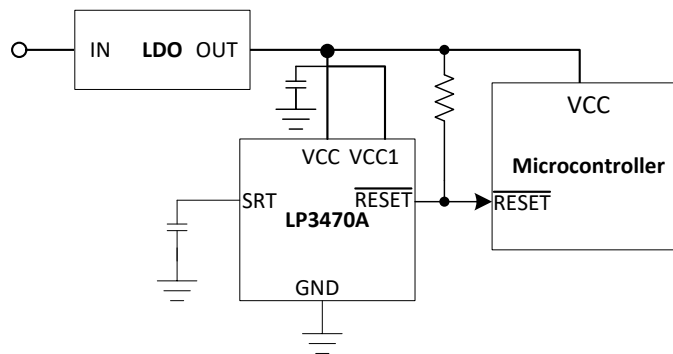


Figure 11. Power-On Reset Circuit

9.2.1 Design Requirements

For this design example, use the parameters listed in [Table 1](#) as the input parameters.

Table 1. Design Parameters

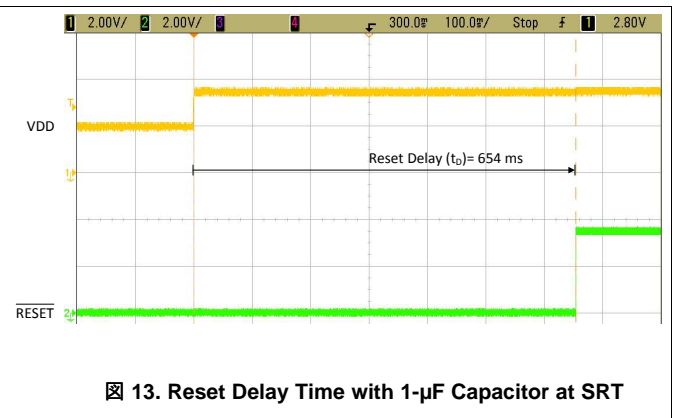
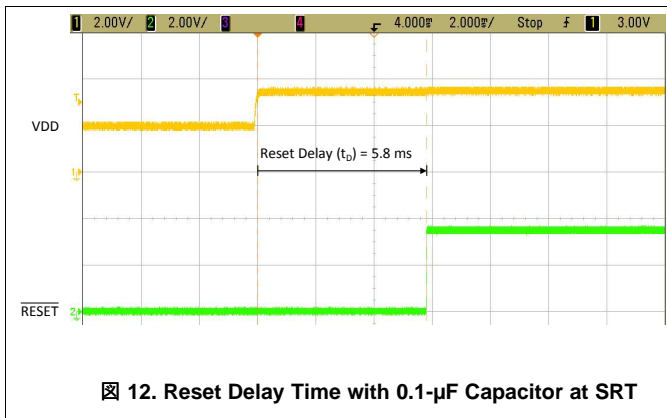
DESIGN PARAMETER	EXAMPLE VALUE
Input supply voltage	0.95 to 10 V
Reset threshold voltage	2.63 V, 2.75 V, 2.93 V, 3.08 V, 3.65 V, 4 V, 4.38 V, 4.63 V
External pullup resistor	0.68 to 68 kΩ
External reset time-out period capacitor	$C_{SRT} = 1 \text{ nF}$
Reset time-out period	619 μs

9.2.2 Detailed Design Procedure

The minimum application circuit requires the LP3470A Power-On Reset Circuit IC and a pullup resistor connecting the reset pin to VCC. The reset delay can be programmed with an additional capacitor connected from the SRT pin to GND. See [RESET Time-Out Period](#) and [Pull-up Resistor Selection](#) for information on choosing specific values for components.

9.2.3 Application Curves

Two capacitor values for C_{SRT} (0.1 μ F and 1 μ F) are used as examples to show the programmability of the output time delay as shown in [Figure 12](#) and [Figure 13](#).



10 Power Supply Recommendations

The input of the LP3470A is designed to handle up to the supply voltage absolute maximum rating of 12 V. If the input supply is susceptible to any large transients above the maximum rating, then take extra precautions. An input capacitor is optional but not required to help avoid false reset output triggers due to noise.

11 Layout

11.1 Layout Guidelines

- Good analog design practice recommends placing a minimum of 0.1- μ F ceramic capacitor as near as possible to the VCC pin.
- Place components as close as possible to the IC
- Keep traces short between the IC and the C_{SRT} capacitor to ensure the timing delay is as accurate as possible.
- For VCC slew rate > 100 mV/ μ s, increase input capacitance and pull-up resistor value

11.2 Layout Example

Figure 14 shows a layout example.

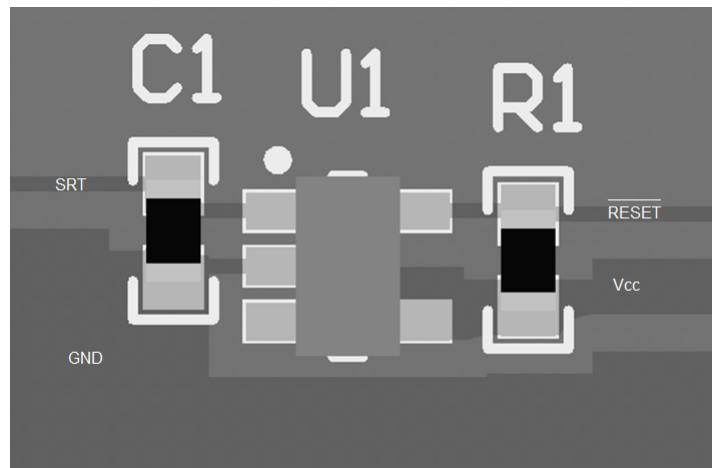


Figure 14. LP3470A Layout Example

12 デバイスおよびドキュメントのサポート

12.1 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、ti.comのデバイス製品フォルダを開いてください。右上の「アラートを受け取る」をクリックして登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取れます。変更の詳細については、修正されたドキュメントに含まれている改訂履歴をご覧ください。

12.2 サポート・リソース

TI E2E™ [support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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12.3 商標

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12.4 静電気放電に関する注意事項



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12.5 Glossary

[SLYZ022](#) — *TI Glossary*.

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

13 メカニカル、パッケージ、および注文情報

以降のページには、メカニカル、パッケージ、および注文に関する情報が記載されています。この情報は、そのデバイスについて利用可能な最新のデータです。このデータは予告なく変更されることがあり、ドキュメントが改訂される場合もあります。本データシートのブラウザ版を使用されている場合は、画面左側の説明をご覧ください。

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
LP3470A263DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	D263	Samples
LP3470A275DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	D275	Samples
LP3470A293DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	D293	Samples
LP3470A308DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	D308	Samples
LP3470A365DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	D365	Samples
LP3470A400DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	D400	Samples
LP3470A438DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	D438	Samples
LP3470A463DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	D463	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".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

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

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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
LP3470A263DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LP3470A275DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LP3470A293DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LP3470A308DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LP3470A365DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LP3470A400DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LP3470A438DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LP3470A463DBVR	SOT-23	DBV	5	3000	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)
LP3470A263DBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0
LP3470A275DBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0
LP3470A293DBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0
LP3470A308DBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0
LP3470A365DBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0
LP3470A400DBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0
LP3470A438DBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0
LP3470A463DBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0

EXAMPLE BOARD LAYOUT

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

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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

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



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

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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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