



USR1051

Preliminary

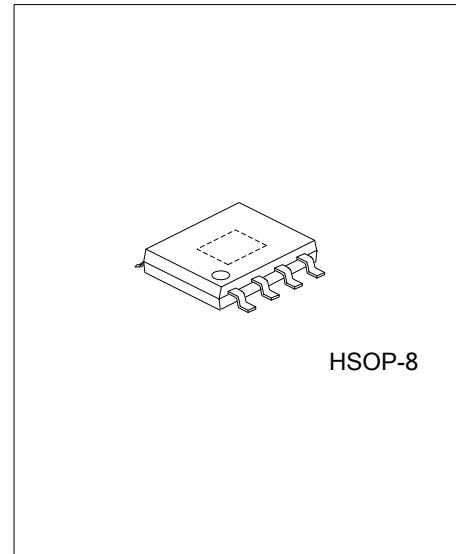
LINEAR INTEGRATED CIRCUIT

3 A SYNCHRONOUS BUCK REGULATOR

DESCRIPTION

The UTC **USR1051** is a high efficiency, 3A synchronous buck regulator. The UTC **USR1051** works from 5V to 23V input voltage range, and provides up to 3A of continuous output current with an output voltage adjustable down to 0.8V.

The UTC **USR1051** comes in an exposed pad HSOP-8 package and is rated over a -40°C~+85°C operating ambient temperature range.



HSOP-8

FEATURES

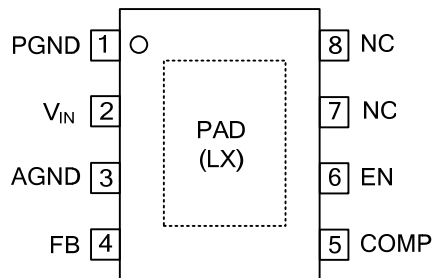
- * Synchronous Buck
- * 5V~23V operating input voltage range
- * High efficiency
- * Internal soft start
- * Output voltage adjustable to 0.8V
- * 3A continuous output current
- * Cycle-by-cycle current limit
- * 400kHz PWM operation
- * Pre-bias start-up
- * Thermal shutdown
- * Short-circuit protection
- * Exposed pad HSOP-8 package

ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|-----------------|----------------|---------|-----------|
| Lead Free | Halogen Free | | |
| USR1051L-SH2-T | USR1051G-SH2-T | HSOP-8 | Tube |
| USR1051L-SH2-R | USR1051G-SH2-R | HSOP-8 | Tape Reel |

| | |
|--|--|
| <p>USR1051L-HS2-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Halogen Free</p> | <p>(1) T: Tube, R: Tape Reel</p> <p>(2) HS2: HSOP-8</p> <p>(3) L: Lead Free, G: Halogen Free</p> |
|--|--|

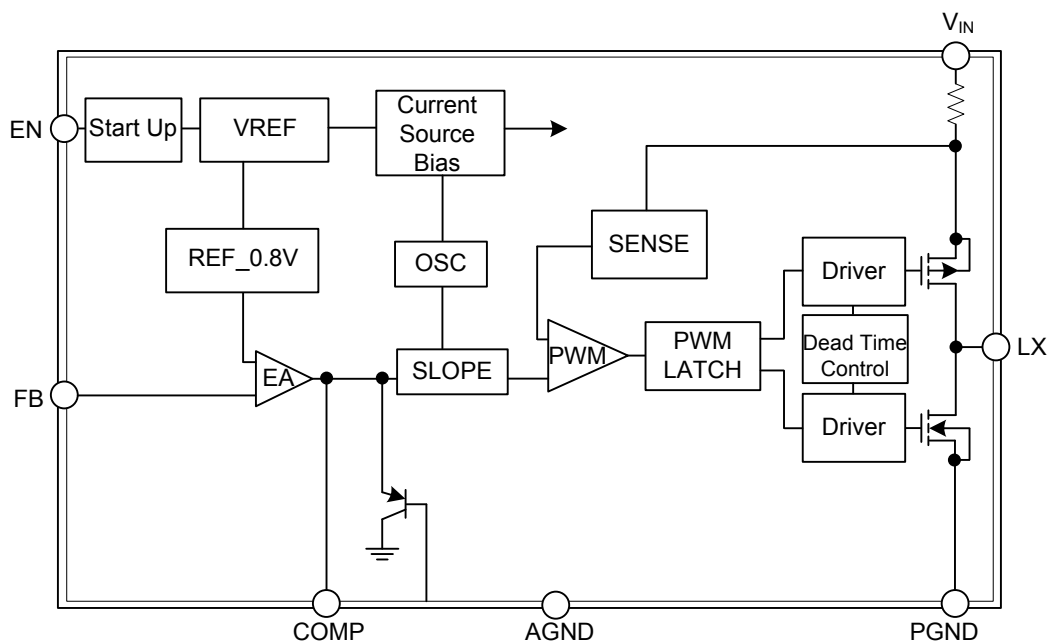
■ PIN CONFIGURATION



■ PIN DESCRIPTION

| PIN NO. | PIN NAME | DESCRIPTION |
|-------------|-----------------|--------------------------------|
| 1 | PGND | Power ground |
| 2 | V _{IN} | Supply voltage input |
| 3 | AGND | Analog ground |
| 4 | FB | Feedback input |
| 5 | COMP | External loop compensation pin |
| 6 | EN | Enable pin |
| 7 | NC | No Connect Pin. |
| 8 | NC | No Connect Pin. |
| Exposed pad | LX | Switching node |

■ BLOCK DIAGRAM



■ **ABSOLUTE MAXIMUM RATING**

| PARAMETER | SYMBOL | RATINGS | UNIT |
|----------------------|-----------|--------------------------|------|
| Supply Voltage | V_{IN} | 23 | V |
| LX to AGND | | $-0.7 \sim V_{IN} + 0.3$ | V |
| LX to AGND (20ns) | | -5~22 | V |
| EN to AGND | | $-0.3 \sim V_{IN} + 0.3$ | V |
| FB, SS, COMP to AGND | | -0.3~6.0 | V |
| PGND to AGND | | -0.3~+0.3 | V |
| Ambient Temperature | T_A | -40~+85 | °C |
| Junction Temperature | T_J | +150 | °C |
| Storage Temperature | T_{STG} | -65~+150 | °C |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ **THERMAL DATA**

| PARAMETER | SYMBOL | RATING | UNIT |
|------------------------------|---------------|--------|------|
| Junction to Ambient (Note 2) | θ_{JA} | 50 | °C/W |

■ **RECOMMENDED OPERATING CONDIIIONS**

| PARAMETER | SYMBOL | RATINGS | UNIT |
|----------------|-----------|-------------------------------|------|
| Supply Voltage | V_{IN} | 5~23 | V |
| Output Voltage | V_{OUT} | $0.8 \sim 0.85 \times V_{IN}$ | V |

■ **ELECTRICAL CHARACTERISTICS (Note 3)**

($T_A=25^\circ\text{C}$, $V_{IN}=V_{EN}=12\text{V}$, $V_{OUT}=3.3\text{V}$, unless otherwise specified)

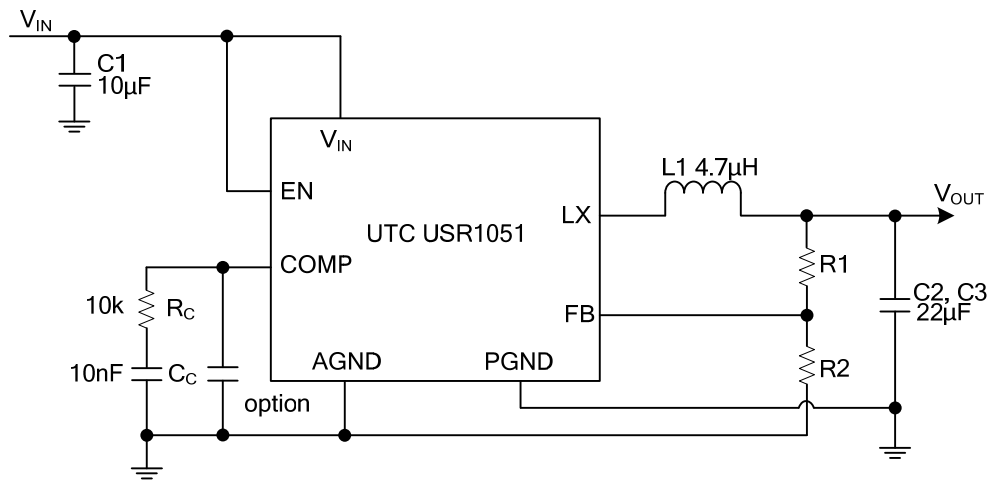
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------|-----------|---|-------|-----|-------|-----------------|
| Supply Voltage | V_{IN} | | 5 | | 23 | V |
| Supply Current (Quiescent) | I_{IN} | $I_{OUT}=0$, $V_{FB}=1.2\text{V}$, $V_{EN}>2\text{V}$ | | 3.5 | 5 | mA |
| Shutdown Supply Current | I_{OFF} | $V_{EN}=0\text{V}$ | | 1 | 10 | μA |
| Feedback Voltage | V_{FB} | $T_A=25^\circ\text{C}$ | 0.788 | 0.8 | 0.812 | V |
| Load Regulation | | | | 0.5 | | % |
| Line Regulation | | | | 1 | | % |
| Feedback Voltage Input Current | I_{FB} | | | | 200 | nA |
| EN Input Threshold | V_{EN} | Off Threshold | | | 0.6 | V |
| | | On Threshold | 2 | | | V |
| SS Time | | $C_{SS}=16\text{nF}$ | | 2 | | ms |
| MODULATOR | | | | | | |
| Frequency | f_O | | 380 | 450 | 550 | kHz |
| Maximum Duty Cycle | D_{MAX} | | 85 | | | % |
| Controllable Minimum On Time | T_{MIN} | | | | 150 | ns |
| Current Sense Transconductance | | | | 7 | | A/V |
| Error Amplifier Transconductance | | | | 180 | | $\mu\text{A/V}$ |
| PROTECTION | | | | | | |
| Current Limit | | | 3.5 | 4.5 | | A |
| Over-Temperature Shutdown Limit | | T_J Rising | | 150 | | °C |
| | | T_J Falling | | 100 | | °C |

Notes: 1. Devices are inherently ESD sensitive, handling precautions are required. Human body model rating: 1.5 k Ω in series with 100pF.

2. The value of θ_{JA} is measured with the device mounted on a 1-in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design.

3. Specification in BOLD indicate an ambient temperature range of $-40^\circ\text{C} \sim +85^\circ\text{C}$. These specifications are guaranteed by design.

■ **TYPICAL APPLICATION CIRCUIT**



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