Tiny Package, High Efficiency, Constant Current LED Driver

General Description

The RT9269 is a compact, high efficient LED driver with high flexibility of application configurations in charge pump mode or in boost rectifier mode, delivering Tens of mA constant output current for driving 1~4 white LED's.

The 0.25V low reference voltage minimized the power loss across the current-setting resistor.

The wide applicable VDD range makes RT9269 suitable for 1 to 4 battery cell applications as well as being supplied with 2.5/3.3/5/6V system powers. The 500kHz high switching rate minimized the size of external components. Besides, the 17μA low quiescent current together with high efficiency maintains long battery lifetime.

The output current is set with 1 external resistor. And the chip enable (EN) pin can be used for tuning the LED brightness by controlling the ON/OFF duty with external clock. RT9269 is provided in SOT-23-6 package.

Ordering Information

RT9269□ □

Package Type
E : SOT-23-6

Lead Plating System
P : Pb Free
G : Green (Halogen Free and Pb Free)

Note :

Richtek products are :

- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.
- Suitable for use in SnPb or Pb-free soldering processes.

Marking Information

For marking information, contact our sales representative directly or through a Richtek distributor located in your area.

Features

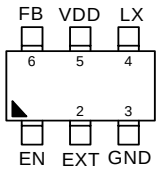
- **0.25V Low Reference Voltage**
- **17μA Quiescent (Switch-off) Supply Current**
- **Zero Shutdown Mode Supply Current**
- **85% Efficiency**
- **500kHz Fixed Switching Rate**
- **Tuning LED brightness with EN Pin ON/OFF Duty**
- **Small SOT-23-6 Package**
- **RoHS Compliant and 100% Lead (Pb)-Free**

Applications

- LED Module
- Hand Held Panel
- Compact Back Light Module
- Small Battery Charger
- Constant Current Source

Pin Configurations

(TOP VIEW)



SOT-23-6

Typical Application Circuit

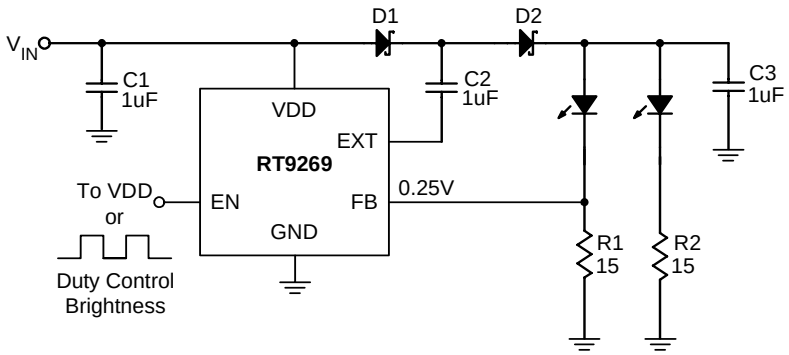


Figure 1. RT9269 drives single or parallel LED's in charge pump configuration

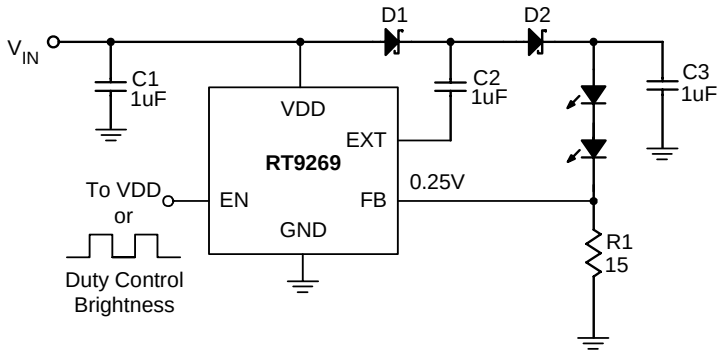


Figure 2. RT9269 drives 2 series connected LED's in charge pump configuration

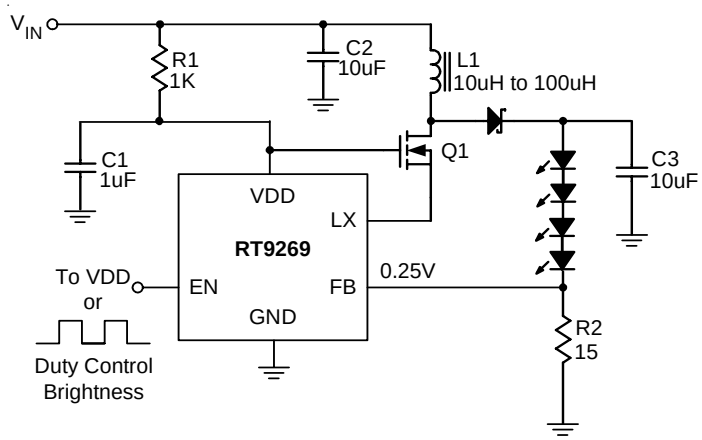


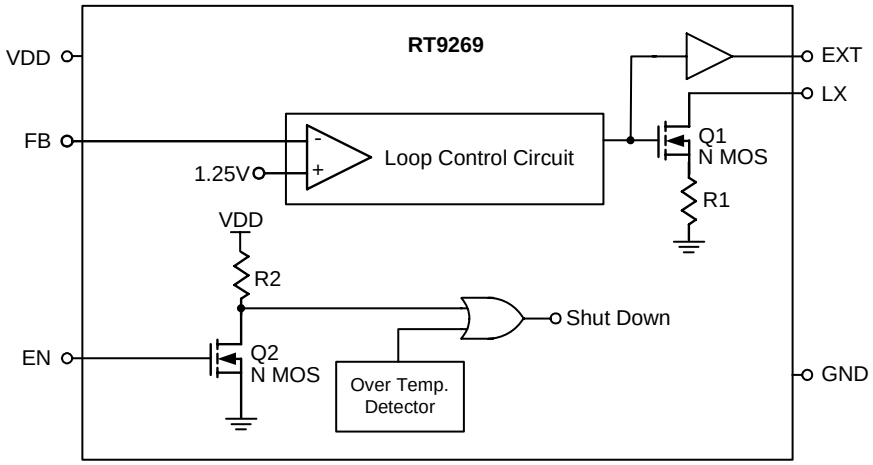
Figure 3. RT9269 drives 2~4 series connected LED's in boost rectifier configuration

Note: NICHIANSCW100 is used for RT9269 LED parts.

Functional Pin Description

Pin No.	Pin Name	Pin Function
1	EN	Chip Enable (Active High)
2	EXT	Output Pin for Configuring Charge Pump or Driving External NMOS
3	GND	Ground
4	LX	Pin for Switching
5	VDD	Input Positive Power Pin of RT9269
6	FB	Feedback Input pin Internal Reference Voltage for the Error Amplifier is 0.25V.

Function Block Diagram



Absolute Maximum Ratings

- Supply Voltage ---------- –0.3V to 7V
- LX Pin Switch Voltage ---------- –0.3V to (V_{DD} +0.8V)
- Other I/O Pin Voltages ---------- –0.3V to (V_{DD} +0.3V)
- LX Pin Switch Current ---------- 2.5A
- EXT Pin Driver Current ---------- 200mA
- Power Dissipation, P_D @ T_A = 25°C
  SOT-23-6 ---------- 0.25W
- Package Thermal Resistance
  SOT-23-6, θ_{JA} ---------- 250°C/W
- Operating Junction Temperature ---------- 125°C
- Storage Temperature Range ---------- –65°C to +150°C

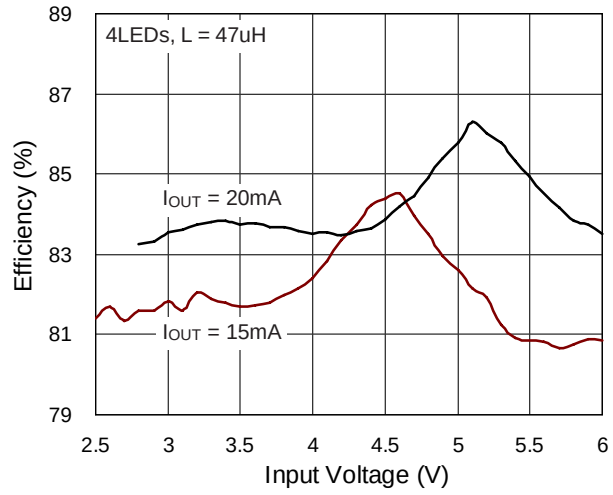
Electrical Characteristics

(V_{IN} =3.3V, V_{DD} set to 5V, Load Current = 0, T_A = 25°C, unless otherwise specified)

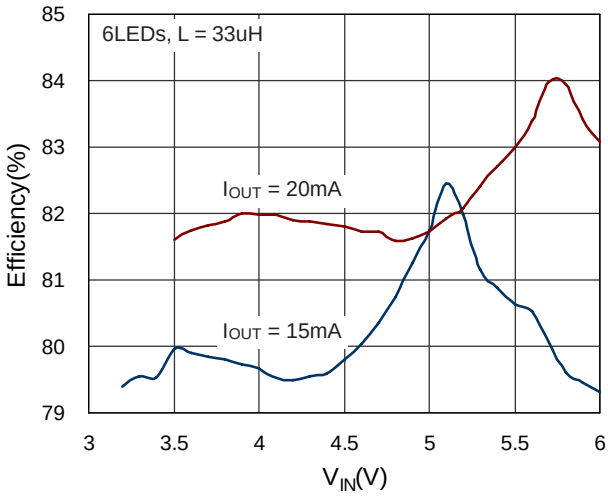
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Start-UP Voltage	V_{ST}	I_L = 1mA	--	0.98	1.05	V
Operating V_{DD} Range	V_{DD}	V_{DD} pin voltage	2	--	6.5	V
No Load Current I (V_{IN})	$I_{NO\ LOAD}$	V_{IN} = 3.3V, V_{OUT} = 5V	--	30	--	μA
Switch-off Current I (V_{DD})	I_{SWITCH}	V_{IN} = 6V	--	17	--	μA
Shutdown Current I (V_{IN})	I_{OFF}	EN Pin = 0V, V_{IN} = 6V	--	0.1	1	μA
Feedback Reference Voltage	V_{REF}	Close Loop, VDD = 5V		0.25		V
Switching Rate	F_S	V_{DD} = 5V	--	500	--	kHz
Maximum Duty	D_{MAX}	V_{DD} = 5V	--	75	--	%
LX ON Resistance		V_{DD} = 5V	--	0.4	--	Ω
Current Limit Setting	I_{LIMIT}	V_{DD} = 5V	--	500	--	mA
EXT ON Resistance to V_{DD}		V_{DD} = 5V	--	5	--	Ω
EXT ON Resistance to GND		V_{DD} = 5V	--	5	--	Ω
EN Pin Trip Level		V_{DD} = 5V	0.4	0.8	1.2	V
Temperature Stability for V_{REF}	T_S		--	50	--	ppm/°C
Thermal Shutdown	T_{SD}		--	165	--	°C
Thermal Shutdown Hysterises	ΔT_{SD}		--	10	--	°C

Typical Operating Characteristics

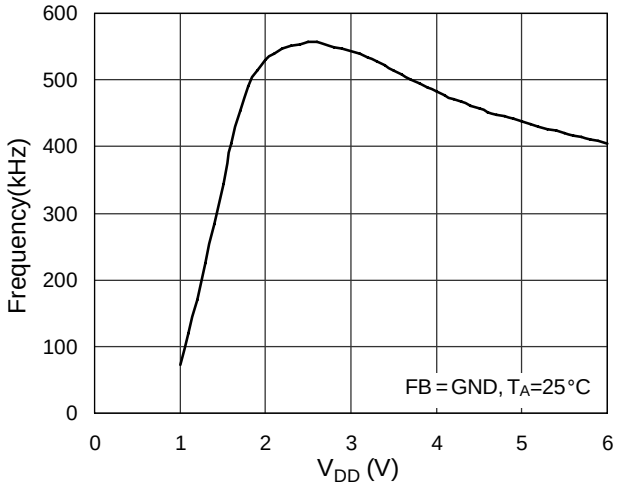
Efficiency vs. Input Voltage



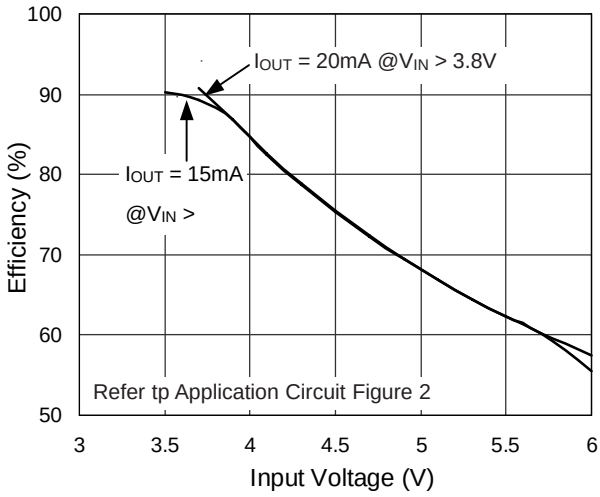
Efficiency vs. V_{IN}



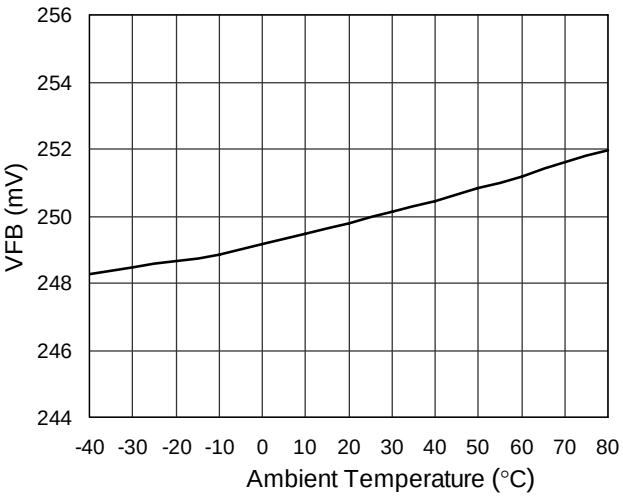
Frequency vs. V_{DD}



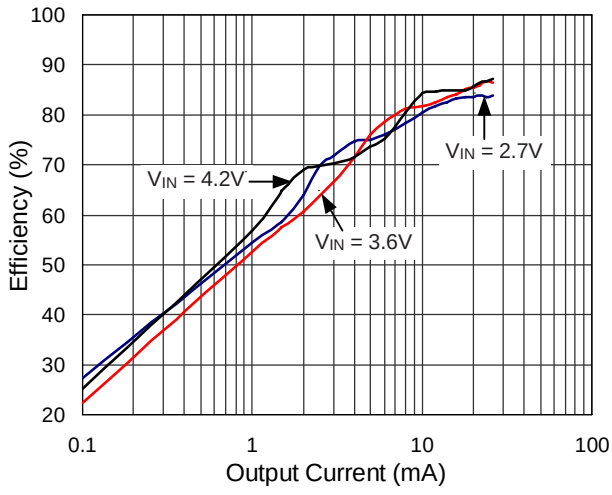
Efficiency vs. Input Voltage



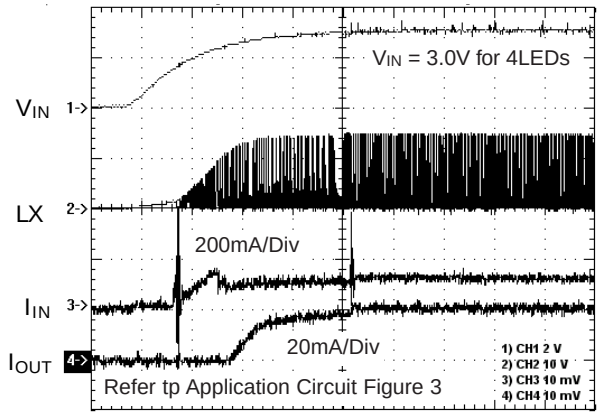
VFB vs. Ambient Temperature



Efficiency vs. Output Current

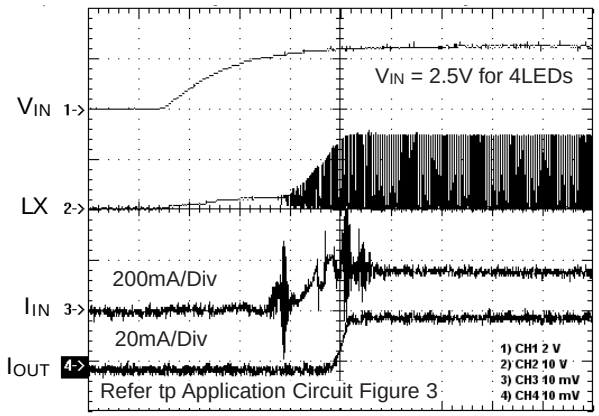


Power ON Waveform



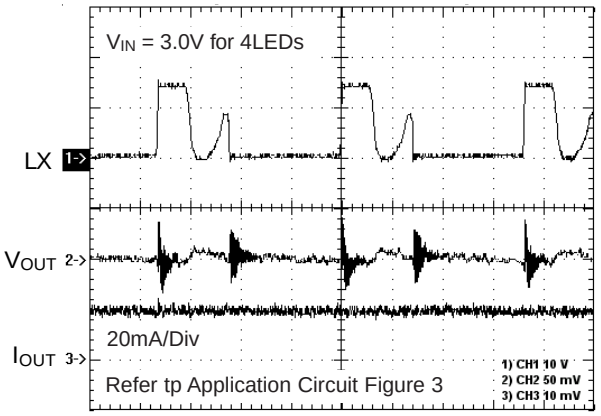
Time (2.5ms/Div)

Power ON Waveform



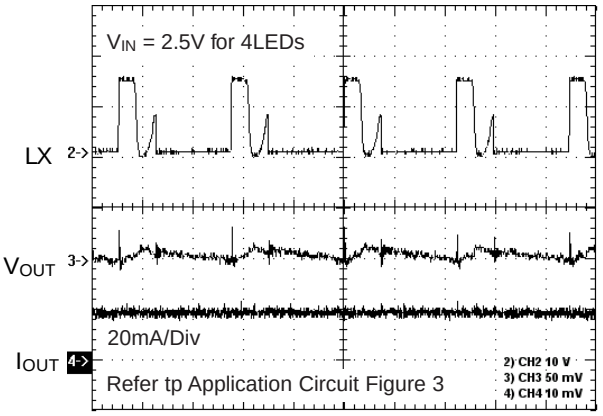
Time (2.5ms/Div)

LX vs. Output Ripple



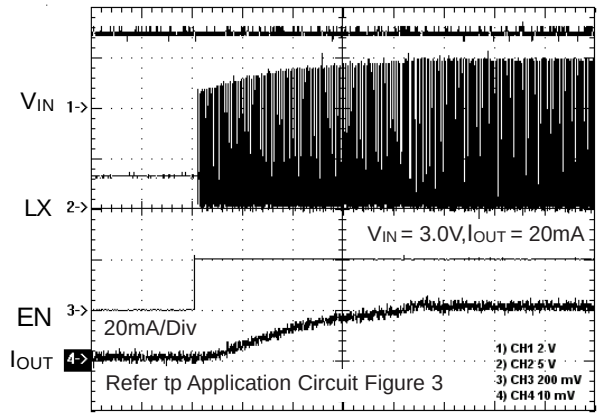
Time (500ns/Div) ((500ns/Div)

LX vs. Output Ripple



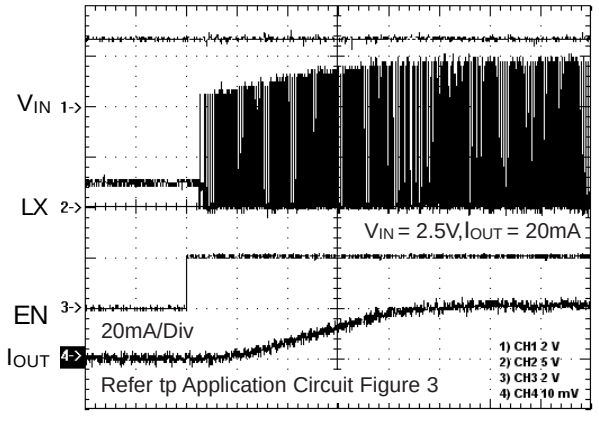
Time (1us/Div)

Power UP Waveform



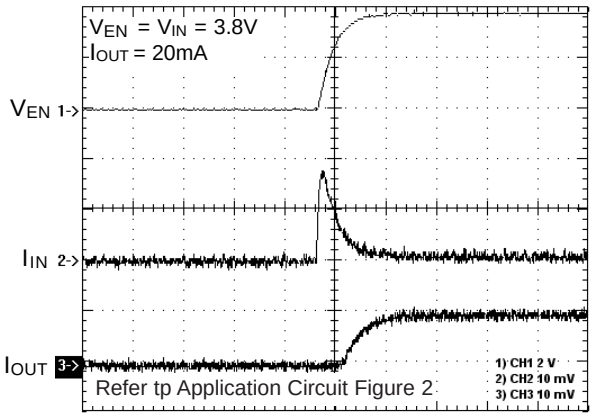
Time (250us/Div)

Power UP Waveform



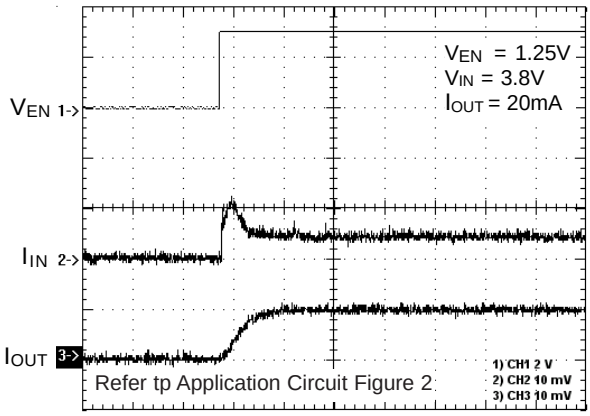
Time (100us/Div)

Power On Waveform



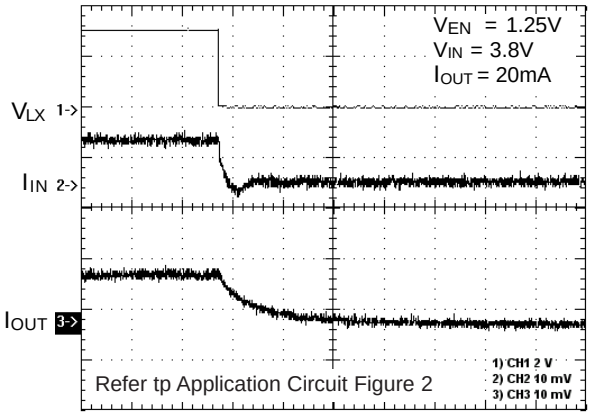
Time (10ms/Div)

Power Up Waveform



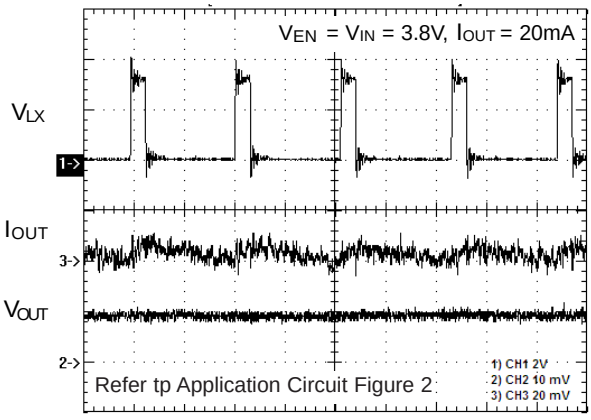
Time (500us/Div)

EN Pin Shutdown Response



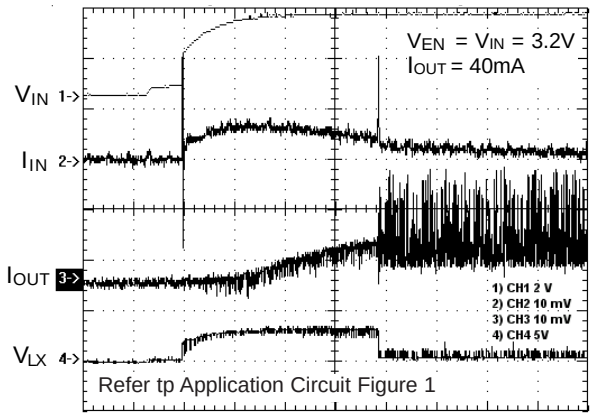
Time (500us/Div)

LX vs. Output Ripple



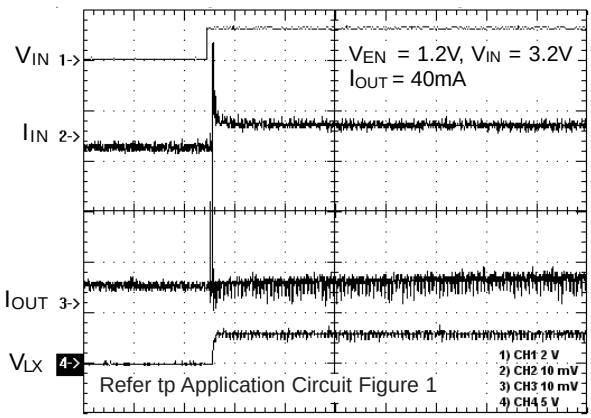
Time (1us/Div)

Power On Waveform



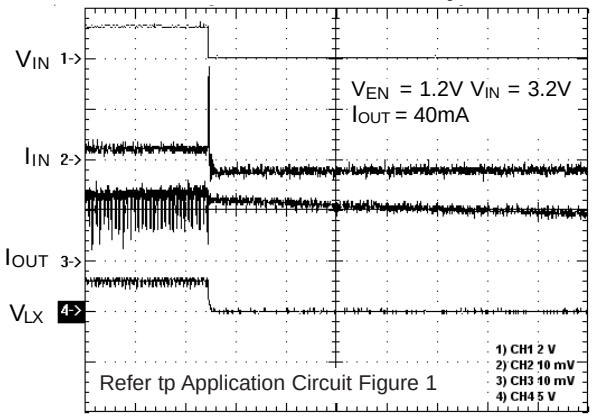
Time (5ms/Div)

Power Up Waveform



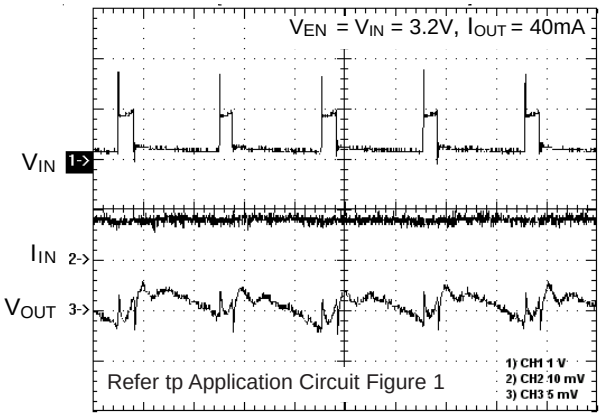
Time (250us/Div)

EN Pin Shutdown Response



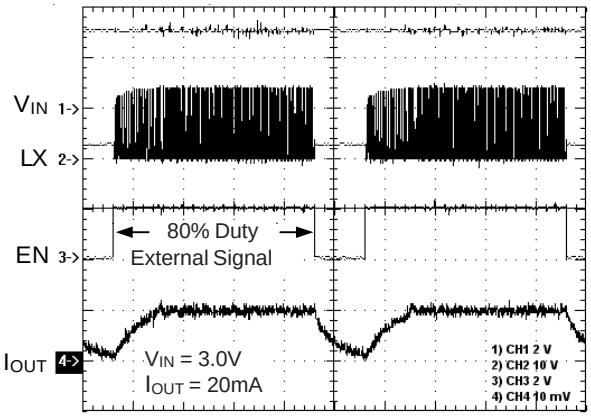
Time (250us/Div)

LX vs. Output Ripple



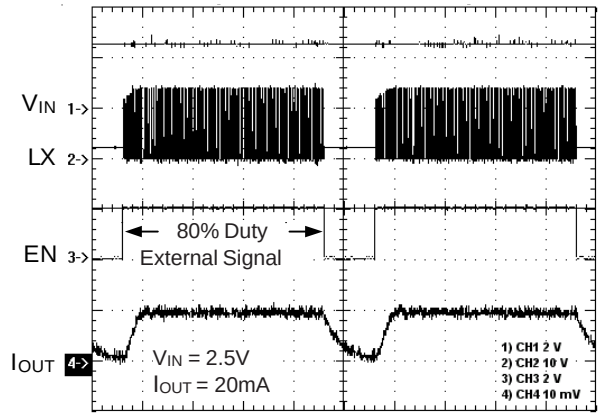
Time (1us/Div)

Brightness Control



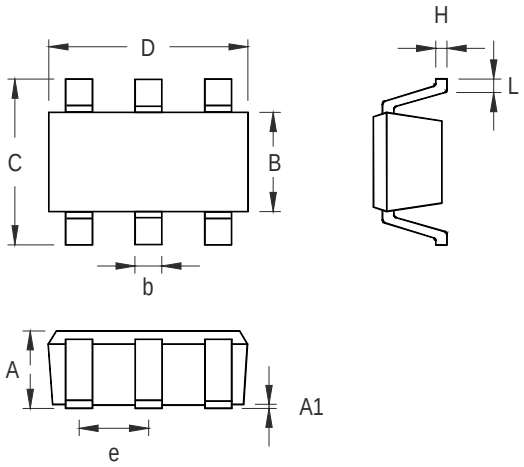
Time (1ms/Div)

Brightness Control



Time (1ms/Div)

Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.031	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.250	0.560	0.010	0.022
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012	0.024

SOT-23-6 Surface Mount Package

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