0.8A，Synchronous Step Down Converter

GENERAL DESCRIPTION

The PW2058/PW2059 is a constant frequency, current mode step-down converter. The device integrates a main switch and a synchronous rectifier for high efficiency without an external Schottky diode. It is ideal for powering portable equipment that runs from a single cell Lithium-Ion (Li+) battery. The output voltage can be regulated as low as 0.6V. The PW2058/PW2059 can also run at 100% duty cycle for low dropout operation, extending battery life in portable system. This device offers two operation modes, PWM control and PFM Mode switching control, which allows a high efficiency over the wider range of the load.

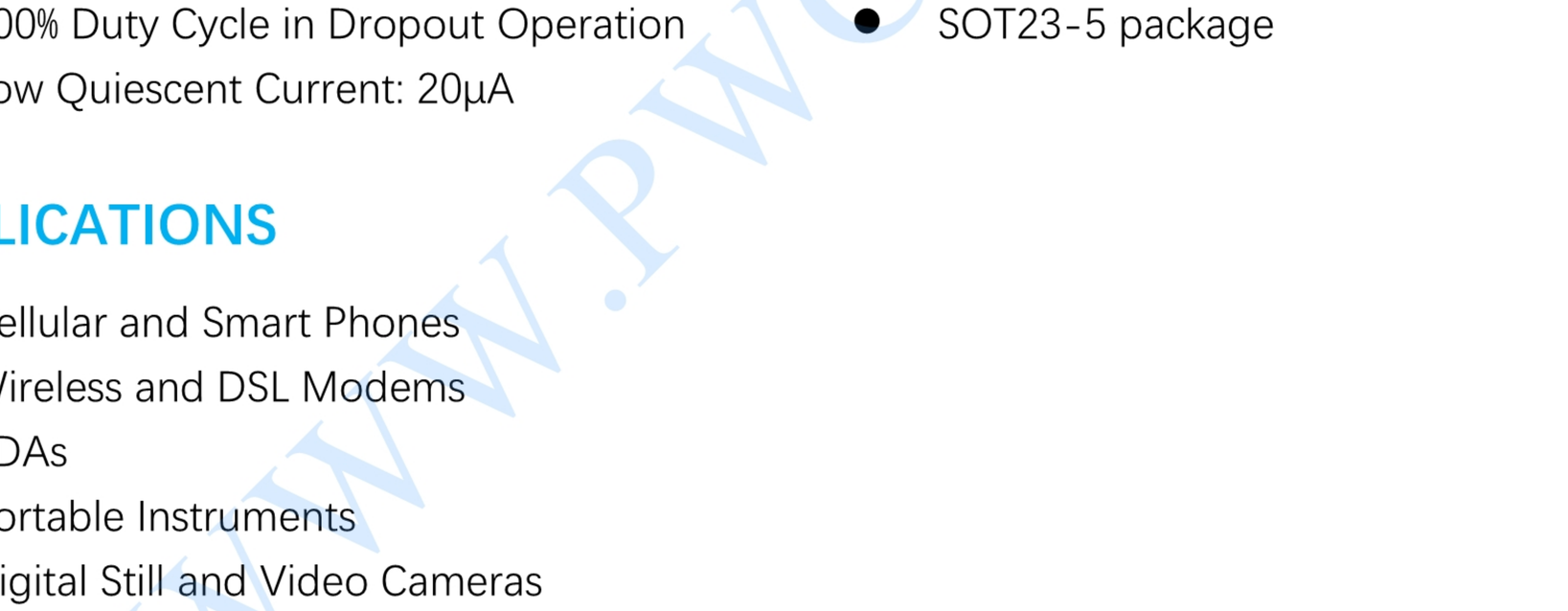
FEATURES

- High Efficiency: Up to 96%
- 1.5MHz Constant Frequency Operation
- 800mA Output Current
- No Schottky Diode Required
- 2V to 6V Input Voltage Range
- Output Voltage as Low as 0.6V
- PFM Mode for High Efficiency in Light Load
- 100% Duty Cycle in Dropout Operation
- Low Quiescent Current: 20μA
- Slope Compensated Current Mode Control for Excellent Line and Load Transient Response
- Short Circuit Protection
- Thermal Fault Protection
- Inrush Current Limit and Soft Start
- <1μA Shutdown Current
- SOT23-5 package

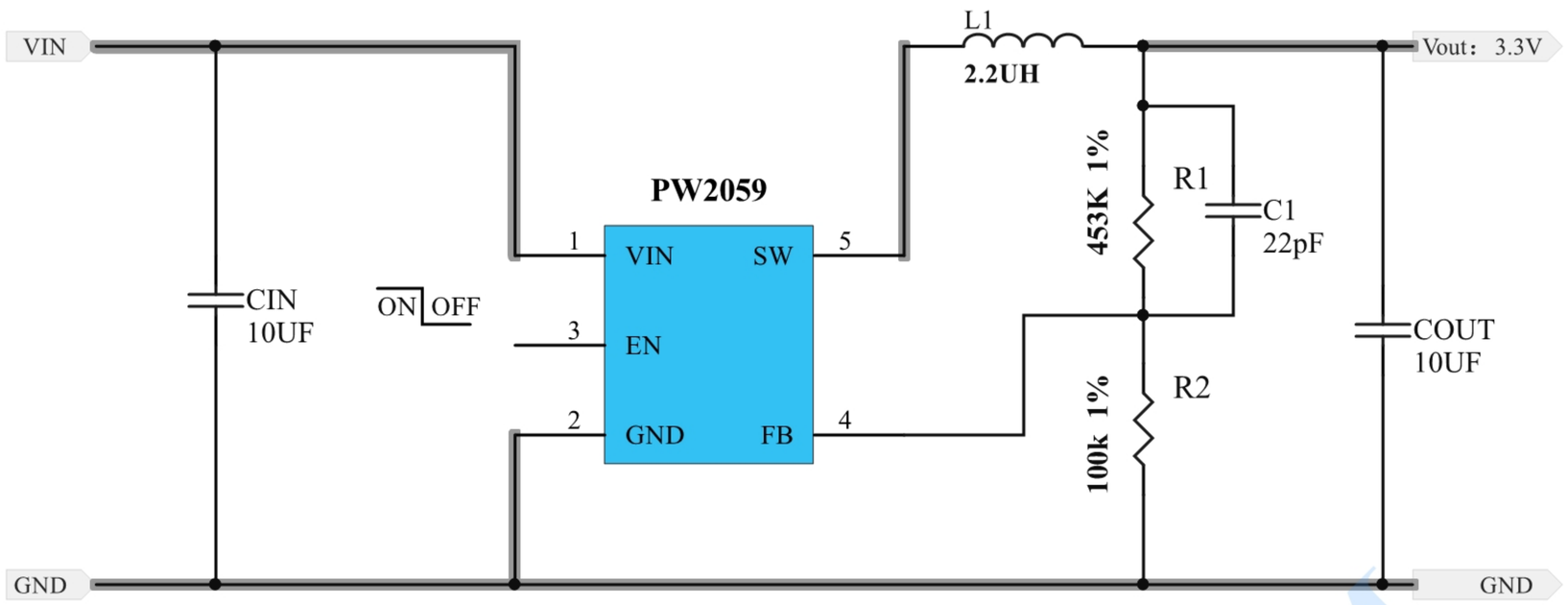
APPLICATIONS

- Cellular and Smart Phones
- Wireless and DSL Modems
- PDAs
- Portable Instruments
- Digital Still and Video Cameras
- DTV

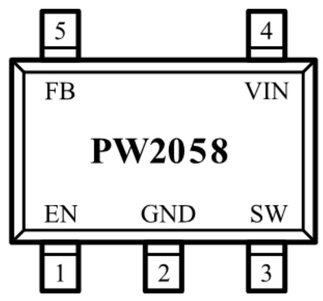
TYPICAL APPLICATION CIRCUIT



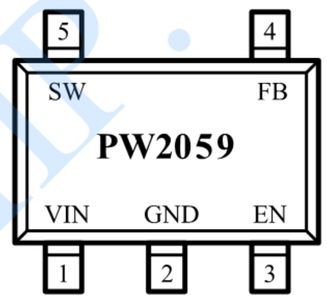
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PIN ASSIGNMENT/DESCRIPTION



SOT-23-5L
(TOP VIEW)

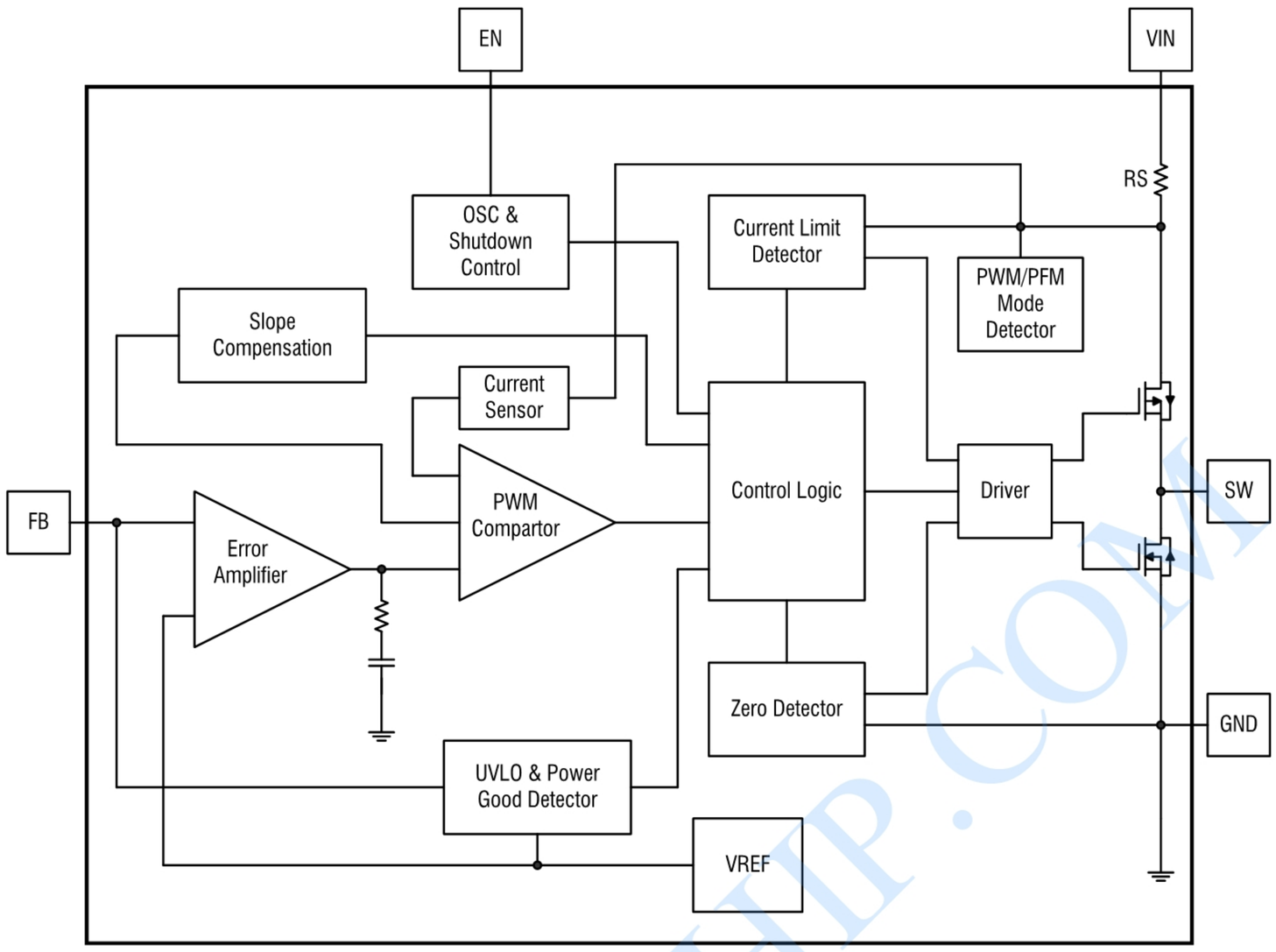


SOT-23-5L
(TOP VIEW)

Pin Name	Function
EN	Chip Enable Pin. Drive EN above 1.5V to turn on the part. Drive EN below 0.3V to turn it off. Do not leave EN floating.
GND	IC Ground
SW	Power Switch Output. It is the switch node connection to Inductor. This pin connects to the drains of the internal P-ch and N-ch MOSFET switches.
VIN	Power Supply Input.Must be closely decoupled to GND with a 4.7μF or greater ceramic capacitor.
FB	Output Voltage Feedback Pin. An internal resistive divider divides the output voltage down for comparison to the internal reference voltage.

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Function Block Diagram



Absolute Maximum Ratings (note1)

Item		VALUE	Unit
Input Supply Voltage		-0.3 to 6.5	V
EN,FB Voltages		-0.3 to (VIN+0.3)	V
SW Voltages		-0.3 to (VIN+0.3)	V
Power Dissipation		0.4	W
Thermal Resistance θ_{JC}		130	°C /W
Thermal Resistance θ_{JA}		250	°C /W
Junction Temperature(Note2)	PW2058	150	°C
	PW2059	125	
Operating Temperature Range		-40 to 85	°C
Lead Temperature(Soldering,10s)		300	°C
Storage Temperature Range		-65 to 150	°C
ESD HBM(Human Body Mode)		2000	V
ESD MM(Machine Mode)		200	V

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

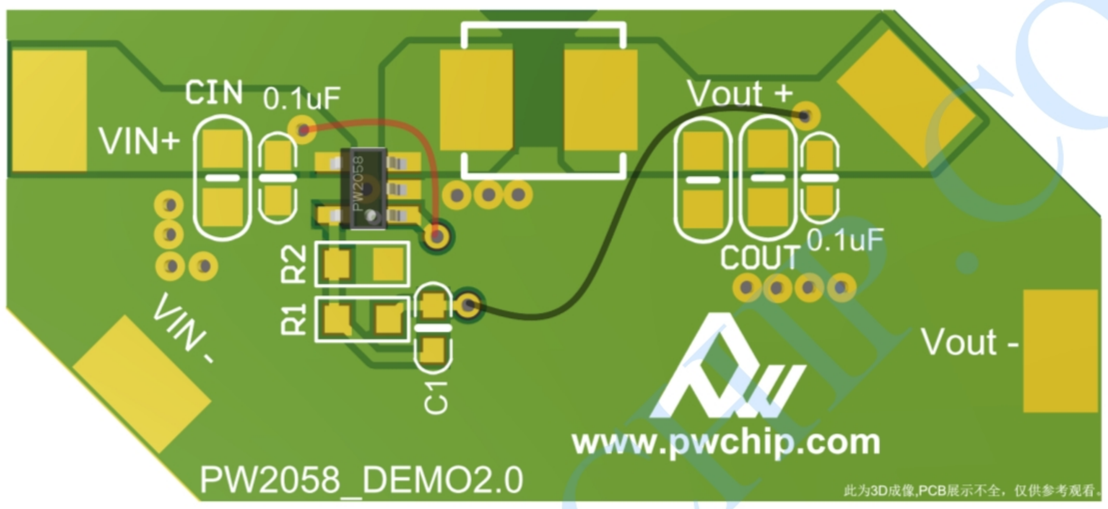
Note 2: TJ is calculated from the ambient temperature TA and power dissipation PD according to the following formula: TJ = TA + (PD) x (250°C/W).

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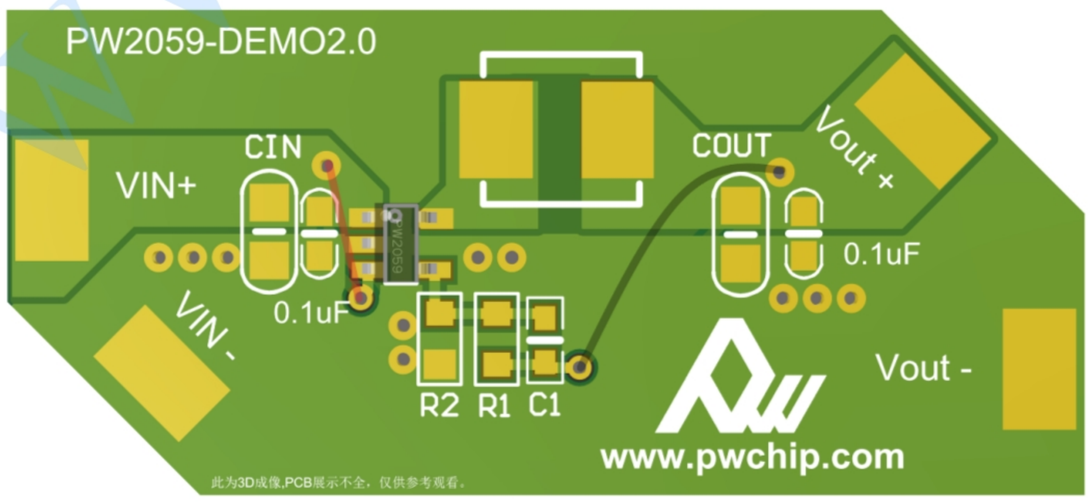
PCB Layout Recommendations

When laying out the printed circuit board, the following checking should be used to ensure proper operation of the PW2058/PW2059. Check the following in your layout:

1. The power traces, consisting of the GND trace, the SW trace and the Vin trace should be kept short, direct and wide.
2. Does the (+) plates of CIN connect to VIN as closely as possible. This capacitor provides the AC current to the internal power MOSFETs.
3. Keep the switching node, SW, away from the sensitive VOUT node.
4. Keep the (-) plates of CIN and COUT as close as possible



PW2058 Suggested Layout



PW2059 Suggested Layout

ELECTRICAL CHARACTERISTICS(note1)

(V_{IN}=V_{EN}=3.6V, VOUT=1.8V, TA = 25°C, unless otherwise noted.)

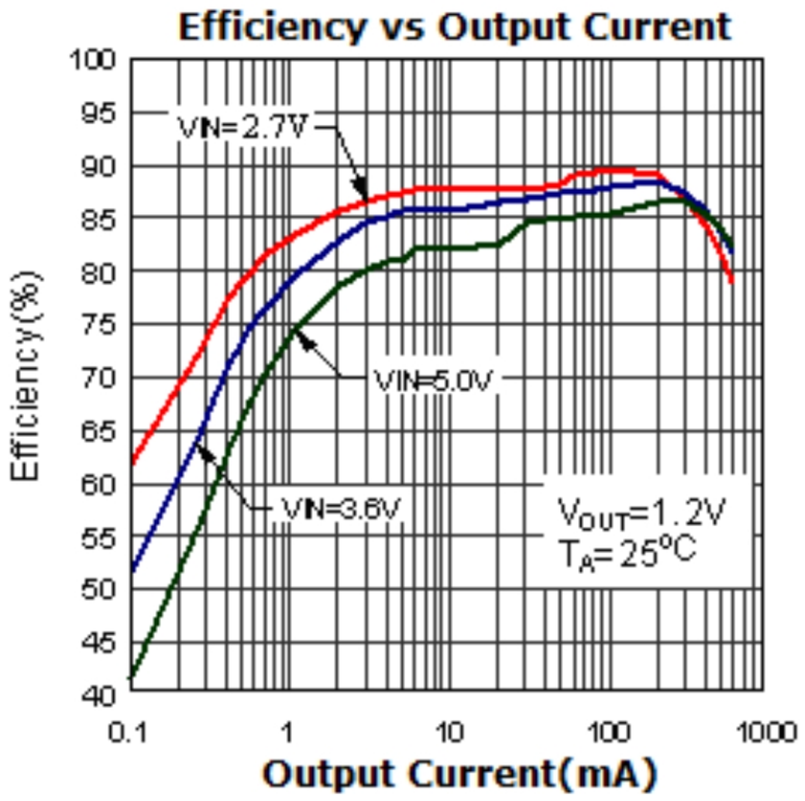
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range		2		6	V
UVLO Threshold	PW2059	1.7	1.9	2.1	V
Input DC Supply Current	(Note 2)				μA
PWM Mode	V_{OUT} = 90%, I_{LOAD}=0mA		140	300	μA
PFM Mode	V_{OUT} = 105%, I_{LOAD} =0mA		20	35	μA
Shutdown Mode	V_{EN} = 0V, V_{IN}=4.2V		0.1	1.0	μA
Regulated Feedback Voltage V_{FB}	T_A = 25°C	0.588	0.600	0.612	V
Reference Voltage Line Regulation	V_{IN} =2.7V to 5.5V		0.04	0.40	%/V
Output Voltage Line Regulation	V_{IN} =2.7V to 5.5V		0.04	0.40	%
Output Voltage Load Regulation			0.5		%
Oscillation Frequency	V_{OUT} =100%		1.5		MHz
	V_{OUT} =0V		300		kHz
On Resistance of PMOS	I_{SW}=100 mA		350	450	mΩ
On Resistance of NMOS	I_{SW}=-100 mA		300	450	mΩ
Peak Current Limit	V_{IN}= 3V, V_{OUT} =90%		1.5		A
PW2058/PW2059					
EN High-Level Input Voltage	V_{ENH}	1.5			V
EN Low-Level Input Voltage	V_{ENL}			0.4	V
PW2059					
EN Threshold		0.3	1.0	1.5	V
EN Leakage Current			±0.01	±1.0	μA
SW Leakage Current	V_{EN}=0V,V_{IN}=V_{SW}=5V		±0.01	±1.0	μA

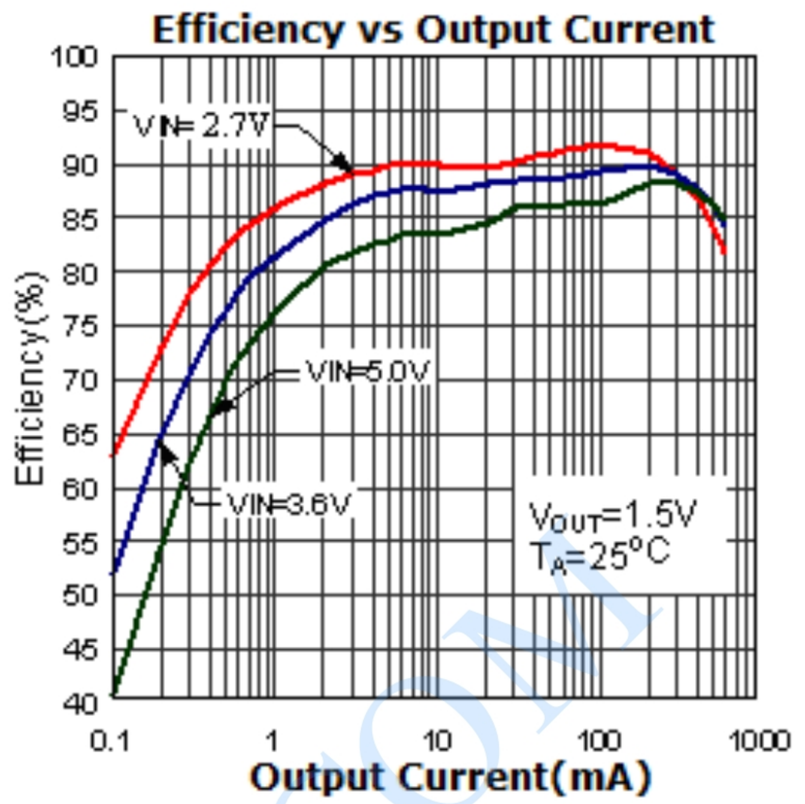
Note 1: 100% production test at +25°C. Specifications over the temperature range are guaranteed by design and characterization.

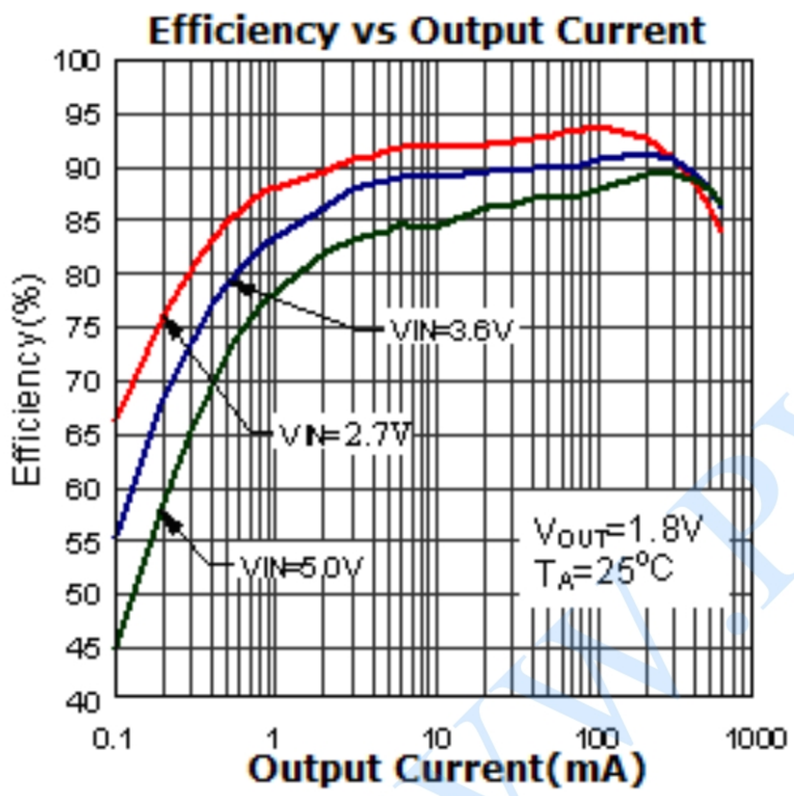
Note 2: Dynamic supply current is higher due to the gate charge being delivered at the switching frequency.

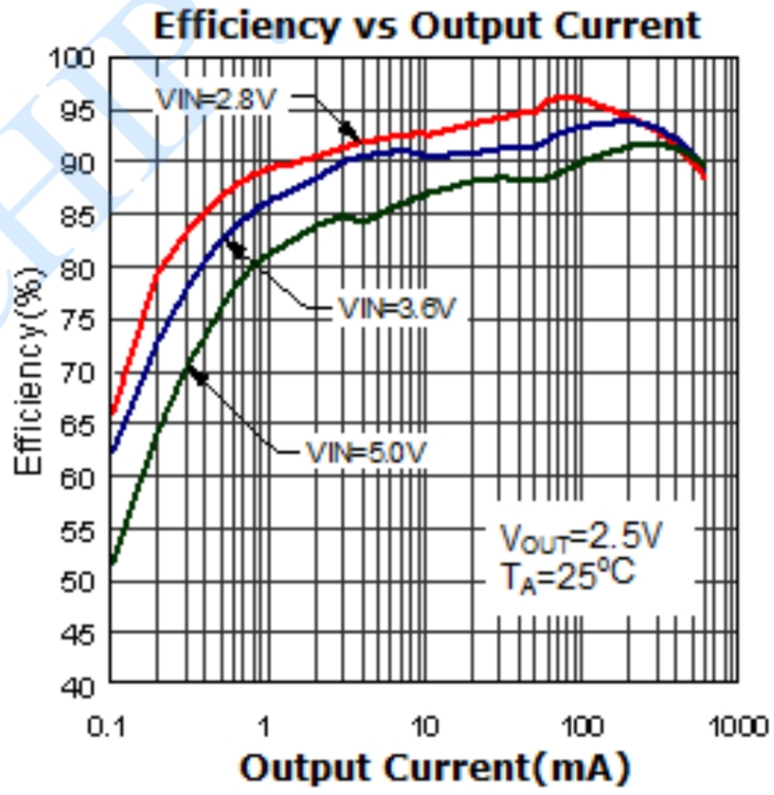
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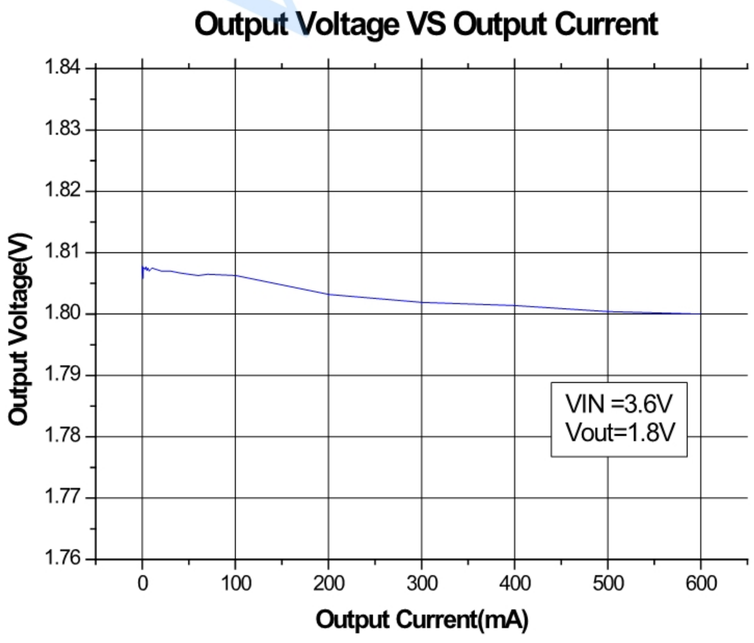
TYPICAL OPERATING CHARACTERISTICS

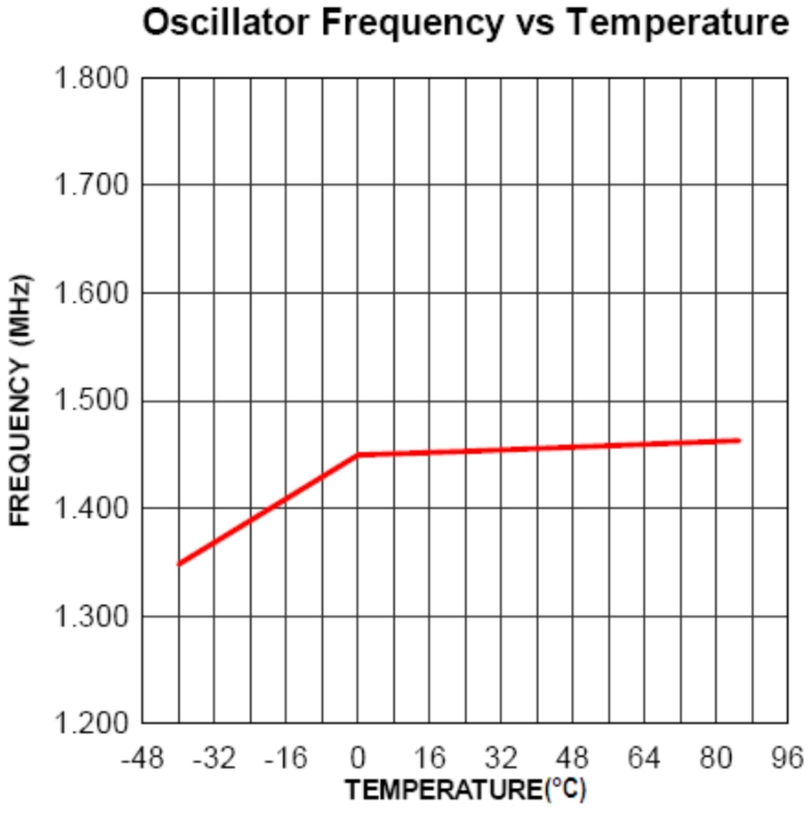


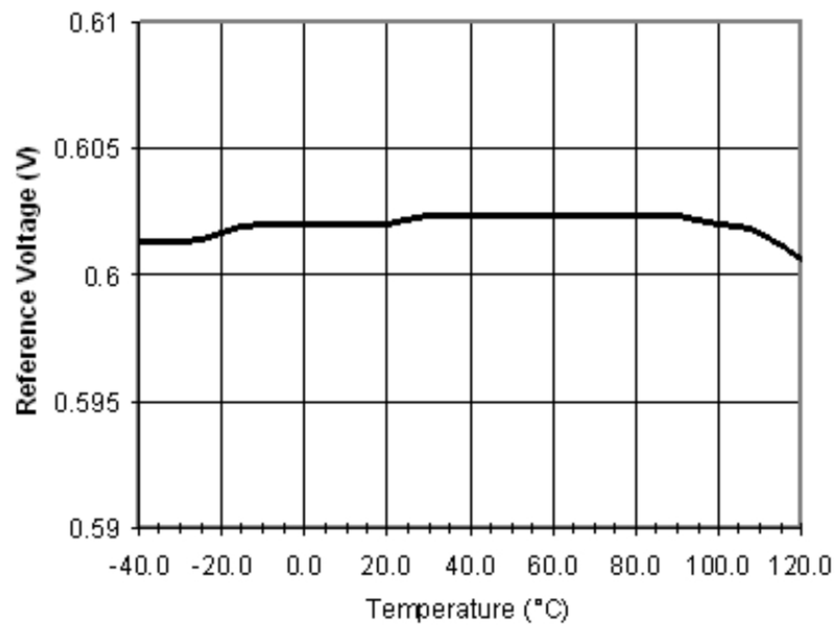


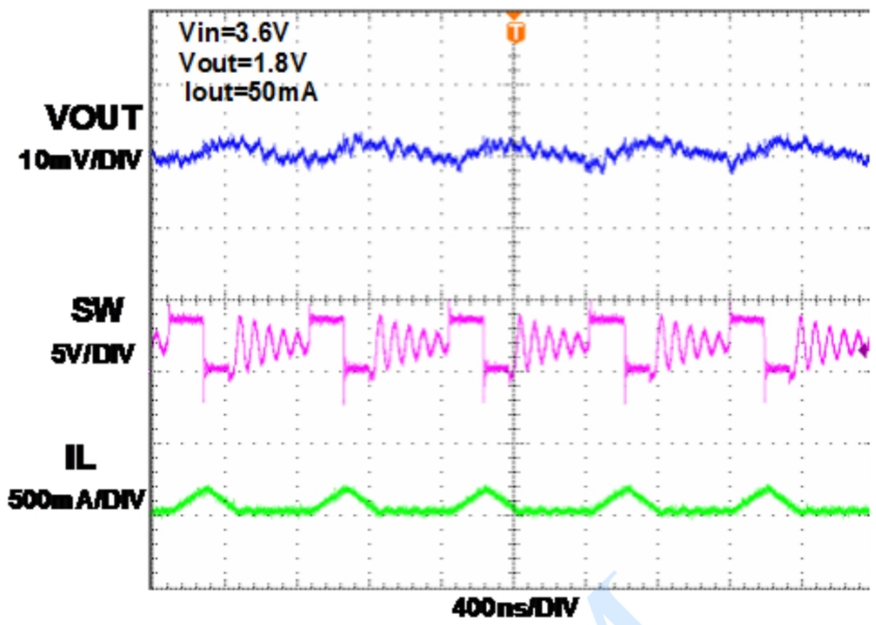




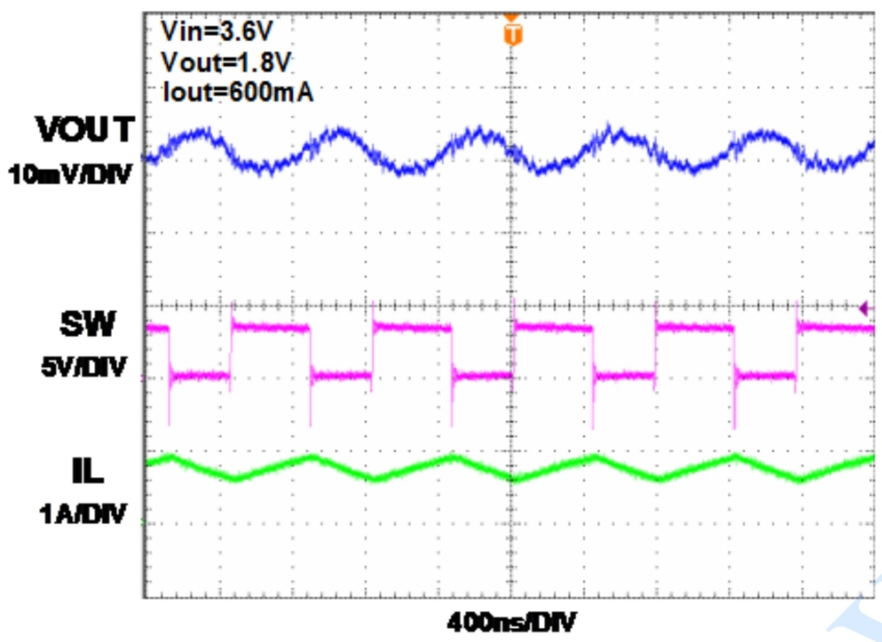




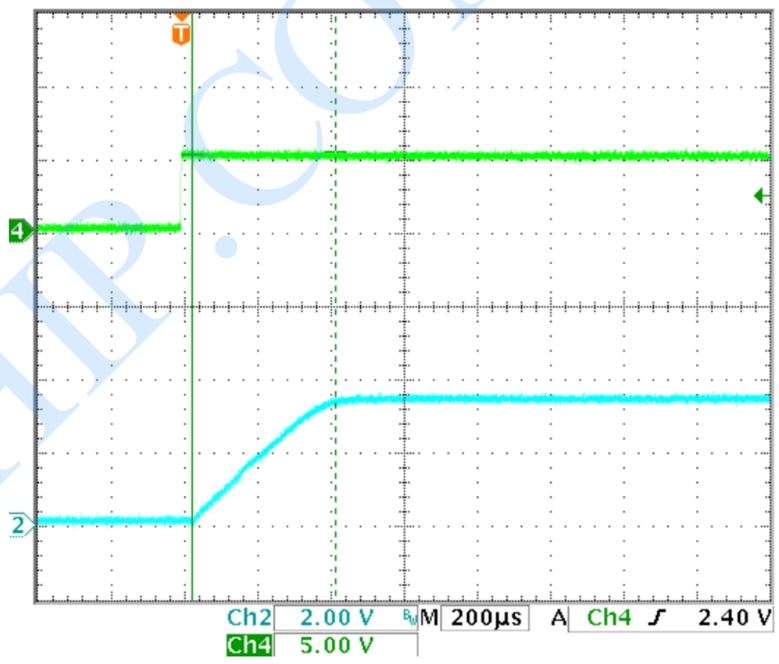




PFM MODE



PWM MODE



START UP RESPONSE

Function Description

The PW2058/PW2059 is a high performance, 800mA, 1.5MHz monolithic step-down converter. The PW2058/PW2059 requires only three external power components (CIN, COUT and L). The adjustable version can be programmed with external feedback to any voltage, ranging from 0.6V to the input voltage.

At dropout operation, the converter duty cycle increases to 100% and the output voltage tracks the input voltage minus the RDS(ON) drop of the high-side MOSFET.

The internal error amplifier and compensation provides excellent transient response, load, and line regulation. Soft start function prevents input inrush current and output overshoot during start up.

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Application Information

Setting the Output Voltage

The internal reference VREF is 0.6V (Typical). The output voltage is divided by a resistor divider,R1 and R2 to the FB pin. The output voltage is given by

$$\left(1+\frac{R1}{R2}\right)*0.6V = Vout$$

Inductor Selection

For most designs, the PW2058/PW2059 operates with inductors of 1μH to 4.7μH. Low inductance values are physically smaller but require faster switching, which results in some efficiency loss. The inductor value can be derived from the following equation:

$$L = \frac{V_{OUT} \times (V_{IN} - V_{OUT})}{V_{IN} \times \Delta I_L \times f_{OSC}}$$

Where Δ IL is inductor Ripple Current. Large value inductors result in lower ripple current and small value inductors result in high ripple current. For optimum voltage-positioning load transients, choose an inductor with DC series resistance in the 50mΩ to 150mΩ range.

Capacitor Selection

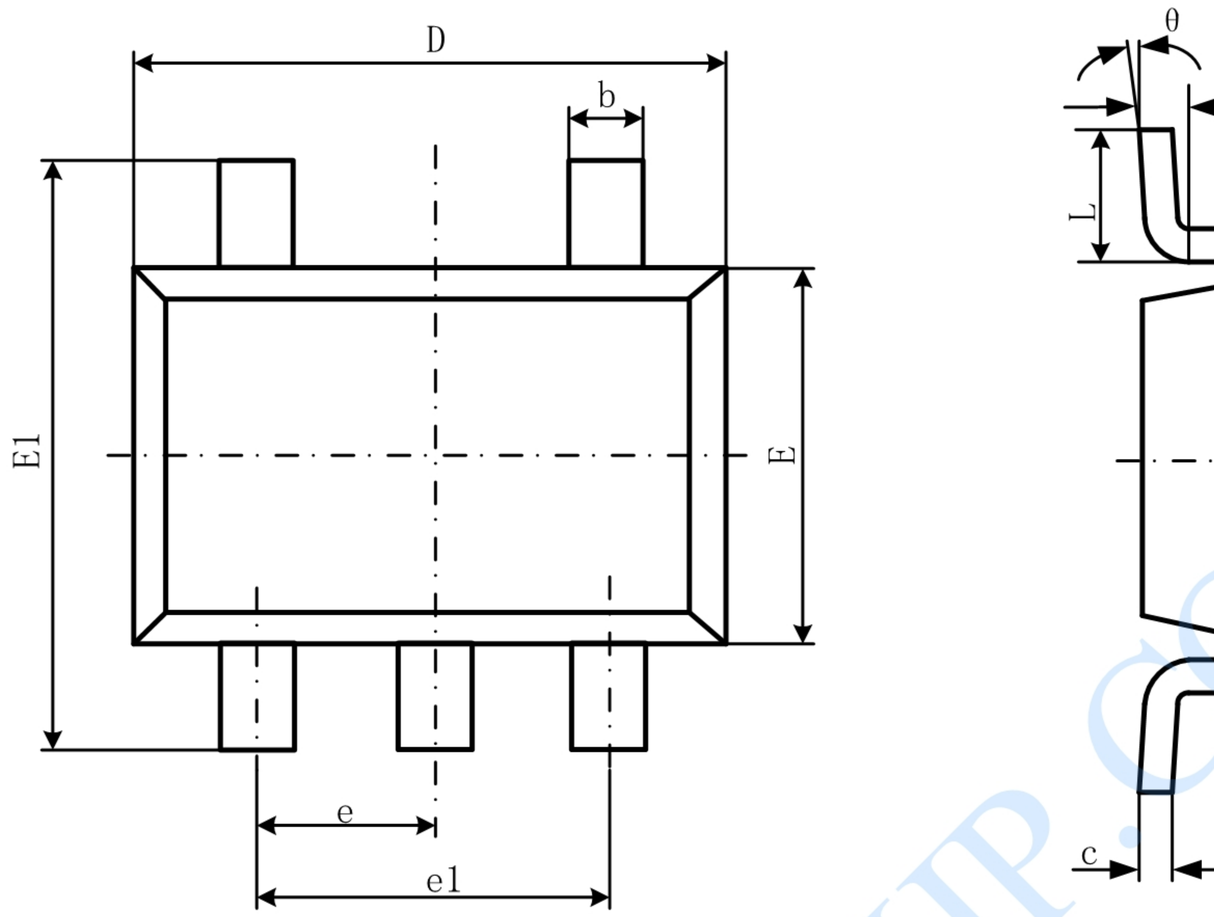
The input capacitor reduces the surge current drawn from the input and switching noise from the device. The input capacitor impedance at the switching frequency should be less than input source impedance to prevent high frequency switching current passing to the input. A low ESR input capacitor sized for maximum RMS current must be used. Ceramic capacitors with X5R or X7R dielectrics are highly recommended because of their low ESR and small temperature coefficients. A 4.7uf ceramic capacitor for most applications is sufficient. A large value may be used for improved input voltage filtering.

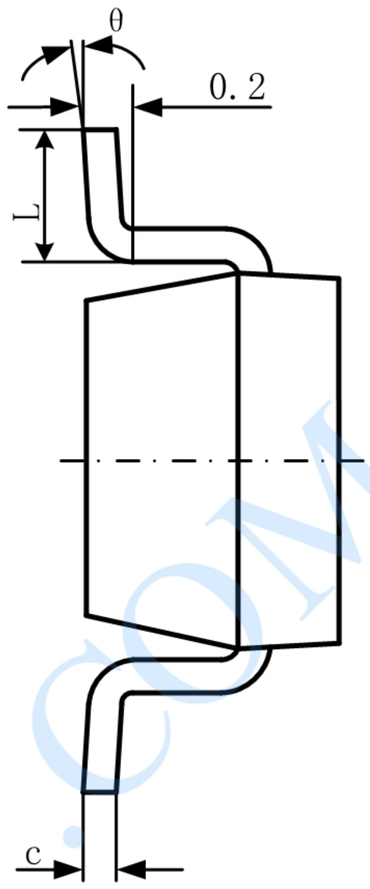
The output capacitor is required to keep the output voltage ripple small and to ensure regulation loop stability. The output capacitor must have low impedance at the switching frequency. Ceramic capacitors with X5R or X7R dielectrics are recommended due to their low ESR and high ripple current ratings. The output ripple Δ VOUT is determined by: （A 10μF ceramic can satisfy most applications.）

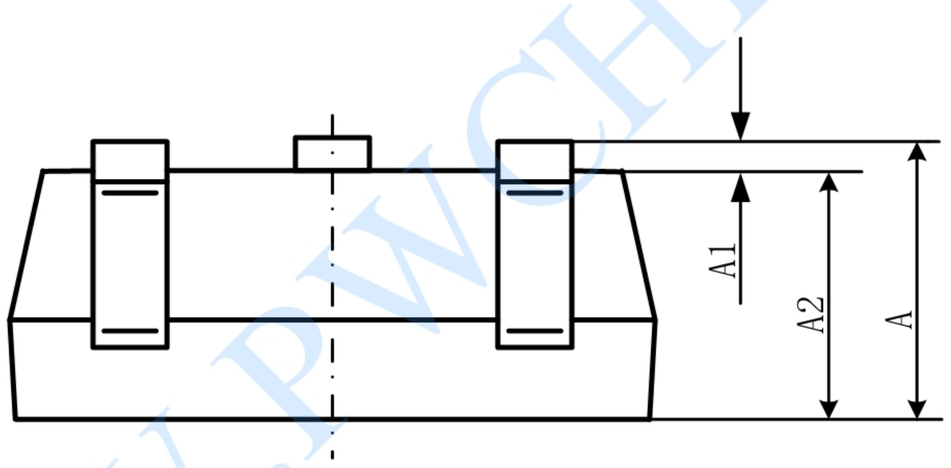
$$\Delta V_{OUT} \le \frac{V_{OUT} \times (V_{IN} - V_{OUT})}{V_{IN} \times f_{OSC} \times L} \times \left(ESR + \frac{1}{8 \times f_{OSC} \times C_{OUT}}\right)$$

PACKAGE DESCRIPTION

SOT23-5L







Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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