

# SGM3110

# MicroPower Regulated Charge Pump

## GENERAL DESCRIPTION

The SGM3110 is a MicroPower switched capacitor voltage converter that delivers a regulated output. No external inductor is required for operation.

The SGM3110 can deliver up to 100mA to the voltage regulated output. It features very low quiescent current and high efficiency over a large portion of its load range, making this device ideal for battery-powered applications. Furthermore, the combination of few external components and small package size keeps the total converter board area to a minimum in space-restricted applications.

The SGM3110 uses a pulse skipping technique to provide a regulated output from a varying input supply. The SGM3110 contains a thermal management circuit to protect the device under continuous output short-circuit conditions.

The SGM3110 has lead (Pb) free SOT23-6 package and is rated over the -40°C to +85°C temperature range.

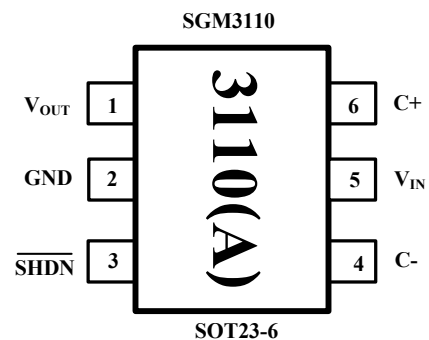
## APPLICATIONS

Cellular Phones  
Digital Cameras  
Handheld Electronics  
LED/Display Backlight Driver  
LEDs for Camera Flash  
Portable Communication Devices  
MP3 Players  
GPS Receivers  
PDAs

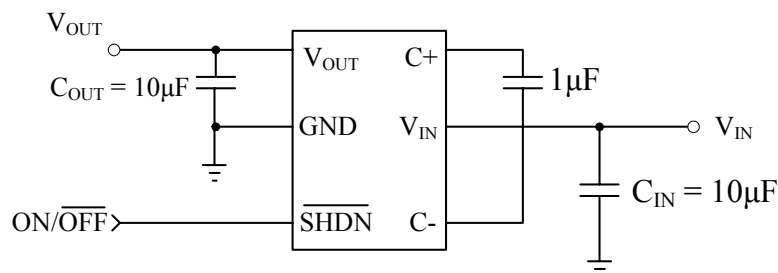
## FEATURES

- Step-Up Voltage Converter
- Input Voltage Range:  
SGM3110-5.0: 2.7 to 5.0V  
SGM3110-4.5: 2.7 to 4.5V
- MicroPower Consumption: 60μA
- Fixed 5V, 4.5V ± 4% Output
- Peak Current 250mA for 100ms
- High Frequency 750kHz Operation
- Logic-Controlled Shutdown
- Short-Circuit/Over-Temperature Protection
- Lead (Pb) Free SOT23-6 Package

## PIN CONFIGURATIONS (TOP VIEW)



## TYPICAL APPLICATION



# ELECTRICAL CHARACTERISTICS

( $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , unless otherwise noted. Typical values are at  $T_A = 25^{\circ}\text{C}$ ,  $C_{\text{FLY}} = 1\mu\text{F}$ ,  $C_{\text{IN}} = 10\mu\text{F}$ ,  $C_{\text{OUT}} = 10\mu\text{F}$ ).

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP <sup>(1)</sup>	MAX	UNITS
<b>SGM3110-5.0</b>						
Input Voltage Range	$V_{\text{IN}}$	$V_{\text{OUT}} = 5.0\text{V}$	2.7		$V_{\text{OUT}}$	V
Output Voltage	$V_{\text{OUT}}$	$2.7\text{V} < V_{\text{IN}} < 5\text{V}$ , $I_{\text{OUT}} \leq 50\text{mA}$	4.8	5.0	5.2	V
		$3.0\text{V} < V_{\text{IN}} < 5\text{V}$ , $I_{\text{OUT}} \leq 100\text{mA}$	4.8	5.0	5.2	
Quiescent Power Supply Current	$I_{\text{Q}}$	$2.7\text{V} < V_{\text{IN}} < 5\text{V}$ , $I_{\text{OUT}} = 0\text{mA}$ , $\overline{\text{SHDN}} = V_{\text{IN}}$		60	68	$\mu\text{A}$
Shutdown Supply Current	$I_{\text{SHDN}}$	$2.7\text{V} < V_{\text{IN}} < 3.6\text{V}$ , $I_{\text{OUT}} = 0\text{mA}$ , $V_{\text{SHDN}} = 0$		0.2	1	$\mu\text{A}$
		$3.6\text{V} < V_{\text{IN}} < 5\text{V}$ , $I_{\text{OUT}} = 0\text{mA}$ , $V_{\text{SHDN}} = 0$			1	
Ripple Voltage	$V_{\text{RIPPLE}}$	$V_{\text{IN}} = 2.7\text{V}$ , $I_{\text{OUT}} = 50\text{mA}$		15		$\text{mV}_{\text{P-P}}$
		$V_{\text{IN}} = 3\text{V}$ , $I_{\text{OUT}} = 100\text{mA}$		88		
Efficiency	$\eta$	$V_{\text{IN}} = 2.7\text{V}$ , $I_{\text{OUT}} = 50\text{mA}$		91		%
Frequency	$f_{\text{OSC}}$	Oscillator Free Running		750		kHz
$\overline{\text{SHDN}}$ Input Threshold High	$V_{\text{IH}}$		1.4			V
$\overline{\text{SHDN}}$ Input Threshold Low	$V_{\text{IL}}$				0.4	
$\overline{\text{SHDN}}$ Input High Current	$I_{\text{IH}}$	$\overline{\text{SHDN}} = V_{\text{IN}}$	-1		+1	$\mu\text{A}$
$\overline{\text{SHDN}}$ Input Low Current	$I_{\text{IL}}$	$\overline{\text{SHDN}} = \text{GND}$	-1		+1	$\mu\text{A}$
Turn-On Time	$T_{\text{ON}}$	$V_{\text{IN}} = 3\text{V}$ , $I_{\text{OUT}} = 0\text{mA}$		0.3		ms
<b>SGM3110-4.5</b>						
Input Voltage Range	$V_{\text{IN}}$	$V_{\text{OUT}} = 4.5\text{V}$	2.7		$V_{\text{OUT}}$	V
Output Voltage	$V_{\text{OUT}}$	$2.7\text{V} < V_{\text{IN}} < 4.5\text{V}$ , $I_{\text{OUT}} \leq 50\text{mA}$	4.32	4.5	4.68	V
		$3.0\text{V} < V_{\text{IN}} < 4.5\text{V}$ , $I_{\text{OUT}} \leq 100\text{mA}$	4.32	4.5	4.68	
Quiescent Power Supply Current	$I_{\text{Q}}$	$2.7\text{V} < V_{\text{IN}} < 4.5\text{V}$ , $I_{\text{OUT}} = 0\text{mA}$ , $\overline{\text{SHDN}} = V_{\text{IN}}$		60	68	$\mu\text{A}$
Shutdown Supply Current	$I_{\text{SHDN}}$	$2.7\text{V} < V_{\text{IN}} < 3.6\text{V}$ , $I_{\text{OUT}} = 0\text{mA}$ , $V_{\text{SHDN}} = 0$		0.2	1	$\mu\text{A}$
		$3.6\text{V} < V_{\text{IN}} < 4.5\text{V}$ , $I_{\text{OUT}} = 0\text{mA}$ , $V_{\text{SHDN}} = 0$			1	
Ripple Voltage	$V_{\text{RIPPLE}}$	$V_{\text{IN}} = 2.7\text{V}$ , $I_{\text{OUT}} = 50\text{mA}$		15		$\text{mV}_{\text{P-P}}$
		$V_{\text{IN}} = 3\text{V}$ , $I_{\text{OUT}} = 100\text{mA}$		88		
Efficiency	$\eta$	$V_{\text{IN}} = 2.7\text{V}$ , $I_{\text{OUT}} = 50\text{mA}$		83		%
Frequency	$f_{\text{OSC}}$	Oscillator Free Running		750		kHz
$\overline{\text{SHDN}}$ Input Threshold High	$V_{\text{IH}}$		1.4			V
$\overline{\text{SHDN}}$ Input Threshold Low	$V_{\text{IL}}$				0.4	
$\overline{\text{SHDN}}$ Input High Current	$I_{\text{IH}}$	$\overline{\text{SHDN}} = V_{\text{IN}}$	-1		+1	$\mu\text{A}$
$\overline{\text{SHDN}}$ Input Low Current	$I_{\text{IL}}$	$\overline{\text{SHDN}} = \text{GND}$	-1		+1	$\mu\text{A}$
Turn-On Time	$T_{\text{ON}}$	$V_{\text{IN}} = 3\text{V}$ , $I_{\text{OUT}} = 0\text{mA}$		0.3		ms

Specifications subject to change without notice.

## PACKAGE/ORDERING INFORMATION

ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION	MARKING INFORMATION
SGM3110-5.0YN6/TR	SOT23-6	Tape and Reel, 3000	3110
SGM3110-4.5YN6/TR	SOT23-6	Tape and Reel, 3000	3110A

### ABSOLUTE MAXIMUM RATINGS

$V_{IN}$ to GND .....	-0.3V to 6 V
$V_{OUT}$ to GND .....	-0.3V to 6 V
SHDN to GND .....	-0.3V to 6 V
Storage Temperature Range.....	-65°C to +150°C
Junction Temperature .....	160°C
Operating Temperature Range .....	-40°C to +85°C
Power Dissipation, $P_D$ @ $T_A = 25^\circ\text{C}$	
SOT23-6 .....	0.34W
Package Thermal Resistance	
SOT23-6, $\theta_{JA}$ .....	250°C/W
Lead Temperature Range (Soldering 10 sec)	
.....	260°C
ESD Susceptibility	
HBM.....	2000V
MM.....	400V

### NOTES

1. Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### CAUTION

This integrated circuit can be damaged by ESD. Shengbang Micro-electronics recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

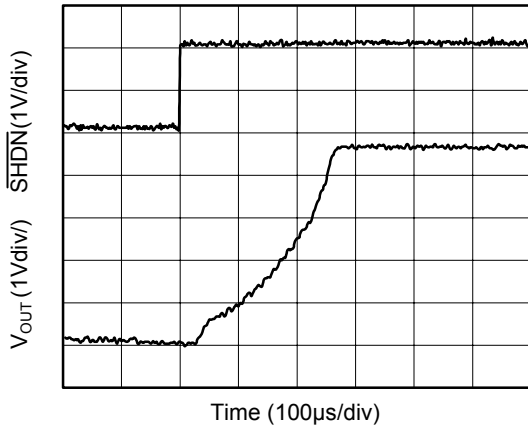
### PIN DESCRIPTION

NAME	FUNCTION
$V_{OUT}$	Regulated output pin.
GND	Ground
$\overline{SHDN}$	Shutdown input. Logic low signal disables the converter.
C-	Flying capacitor negative terminal.
$V_{IN}$	Input supply pin.
C+	Flying capacitor positive terminal.

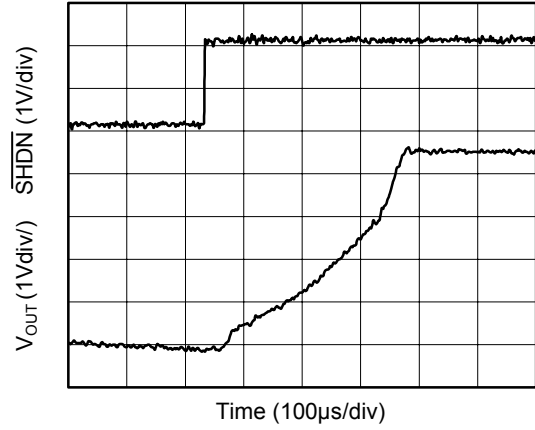
# TYPICAL PERFORMANCE CHARACTERISTICS

At  $V_S = +5.0V$ ,  $T_A = +25^\circ C$ ,  $V_{IN} = 3V$ ,  $C_{IN} = C_{OUT} = 10\mu F$ ,  $C_{FLY} = 1\mu F$ , unless otherwise noted.

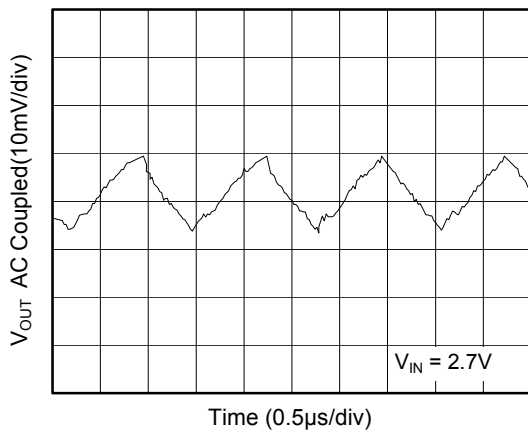
Startup Time with 50mA Load



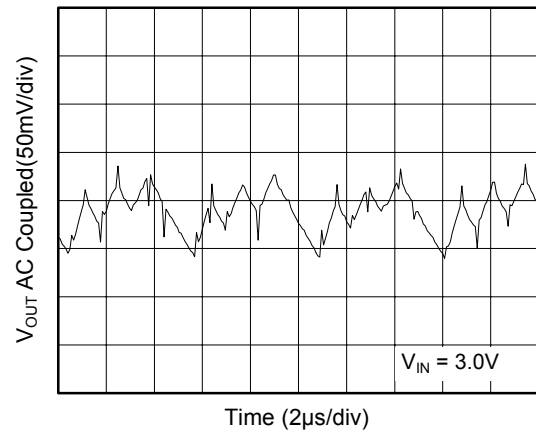
Startup Time with 100mA Load



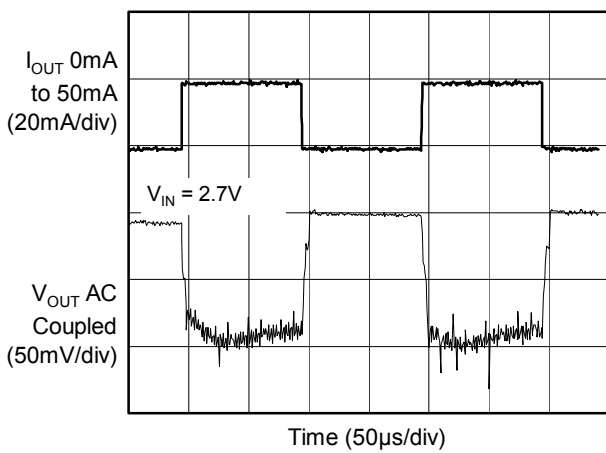
Output Ripple with  $I_{OUT} = 50mA$



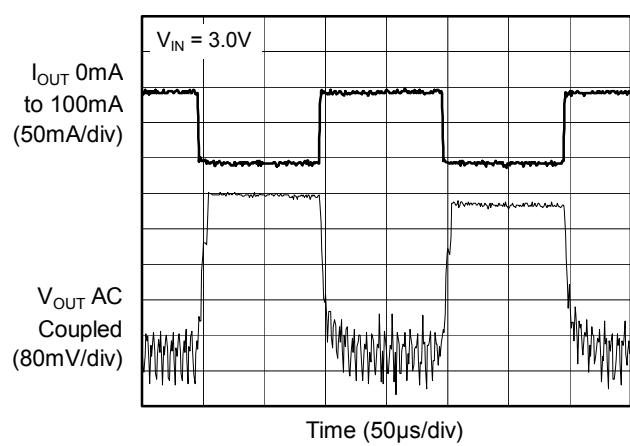
Output Ripple with  $I_{OUT} = 100mA$



Load Transient Response for 50mA

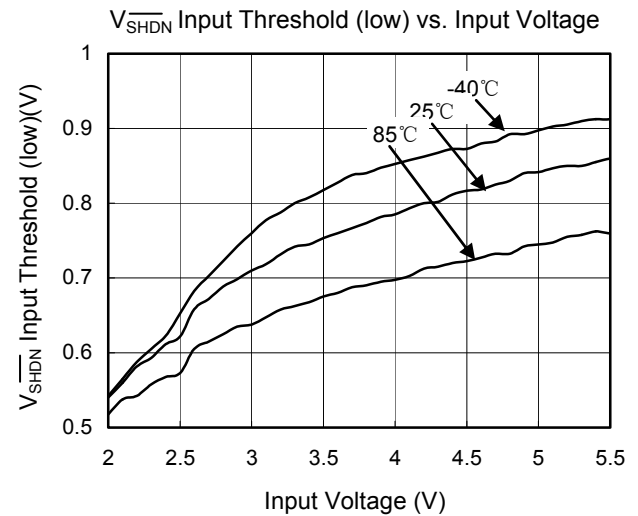
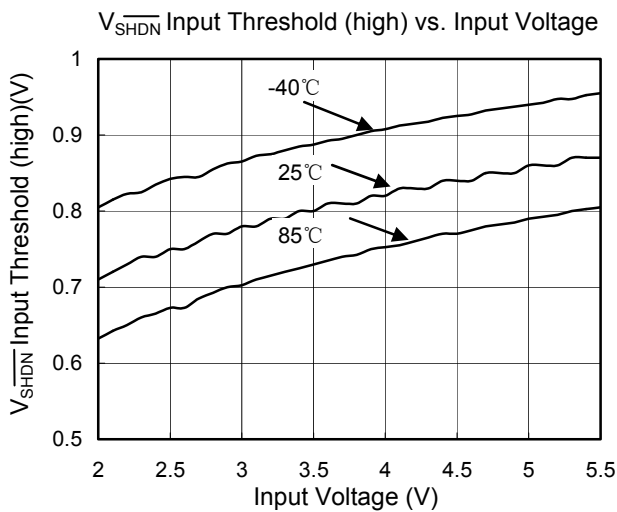
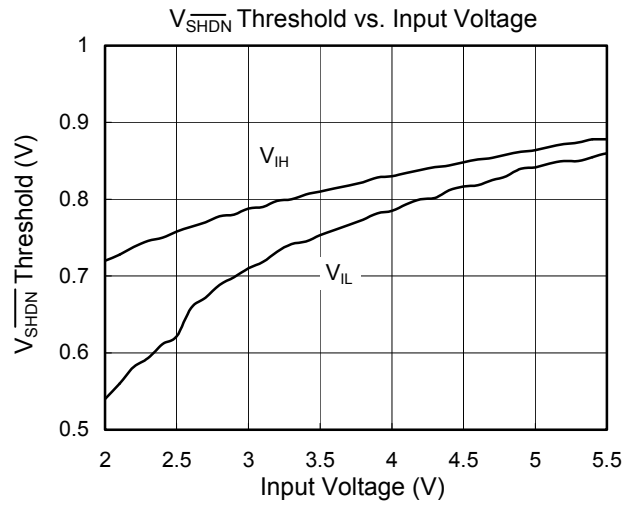
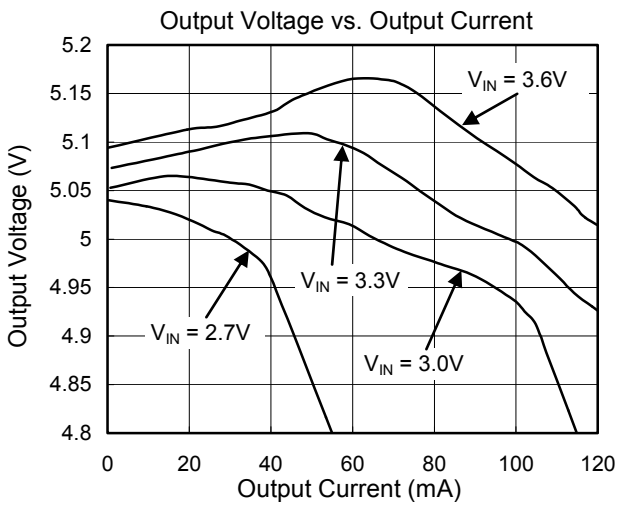
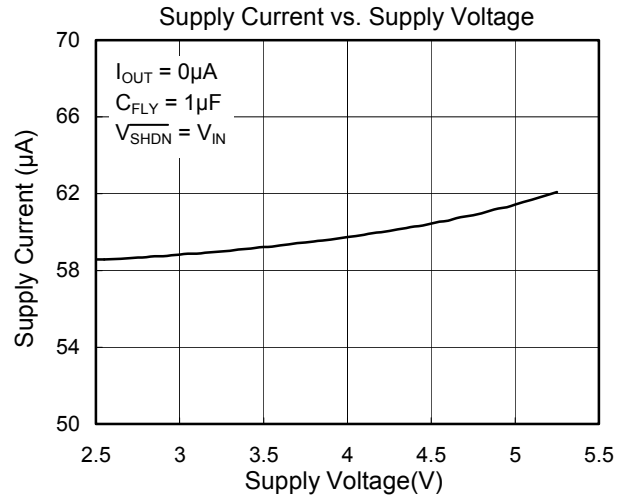
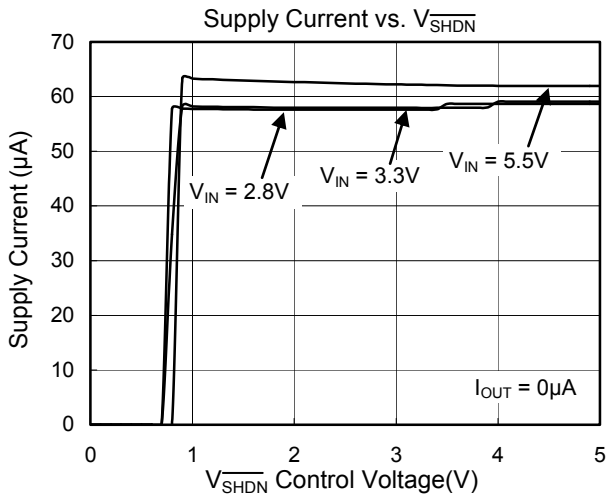


Load Transient Response for 100mA



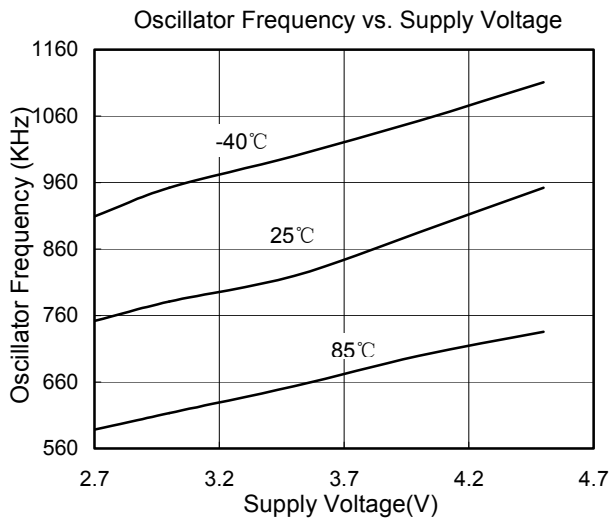
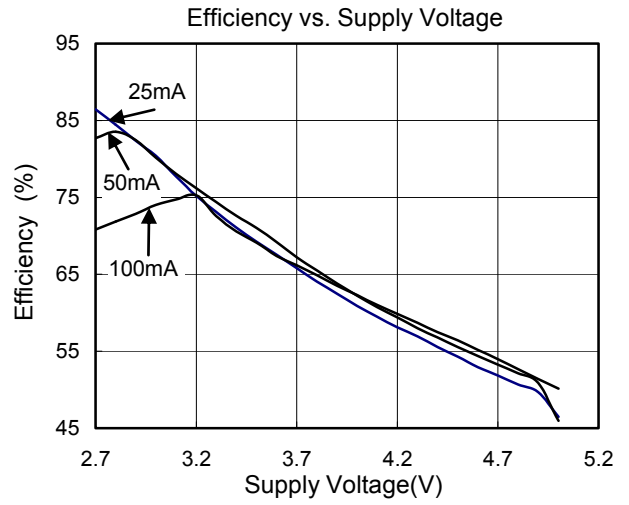
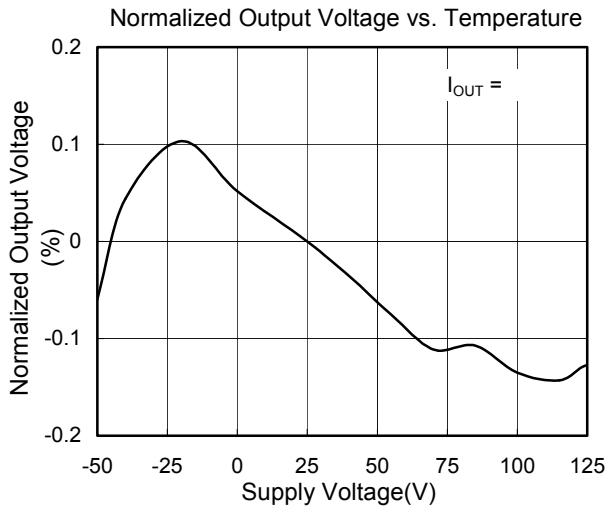
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At  $V_S = +5.0V$ ,  $T_A = +25^\circ C$ ,  $V_{IN} = 3V$ ,  $C_{IN} = C_{OUT} = 10\mu F$ ,  $C_{FLY} = 1\mu F$ , unless otherwise noted.



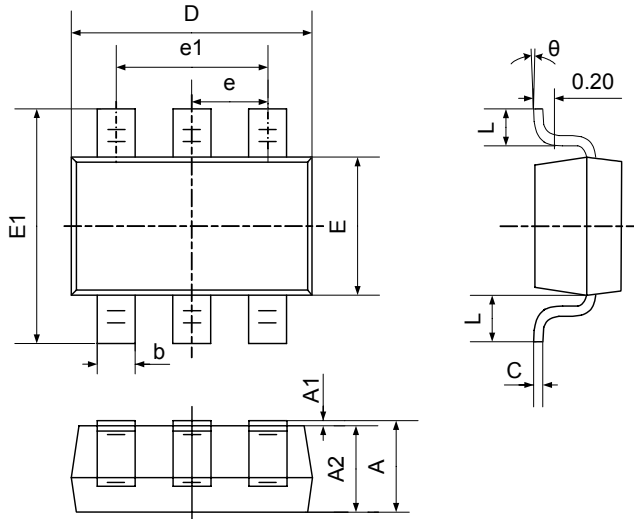
# TYPICAL PERFORMANCE CHARACTERISTICS

At  $V_S = +5.0V$ ,  $T_A = +25^\circ C$ ,  $V_{IN} = 3V$ ,  $C_{IN} = C_{OUT} = 10\mu F$ ,  $C_{FLY} = 1\mu F$ , unless otherwise noted.



# PACKAGE OUTLINE DIMENSIONS

## SOT23-6



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	0.400	0.012	0.016
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	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°