

GENERAL DESCRIPTION

The LW65XX is a 40V low-power high accuracy LDO regulator. The 2.5 μ A power consumption makes it ideal for most HV power-saving systems. The maximum operating voltage can be as high as 40V. The output accuracy is as excellent as $\pm 1.0\%$.

The other features include low dropout voltage, current limiting protection and thermal shutdown protection.

The LW65XX is available in SOT23, SOT23-3L, SOT23-5L and SOT89-3L packages.

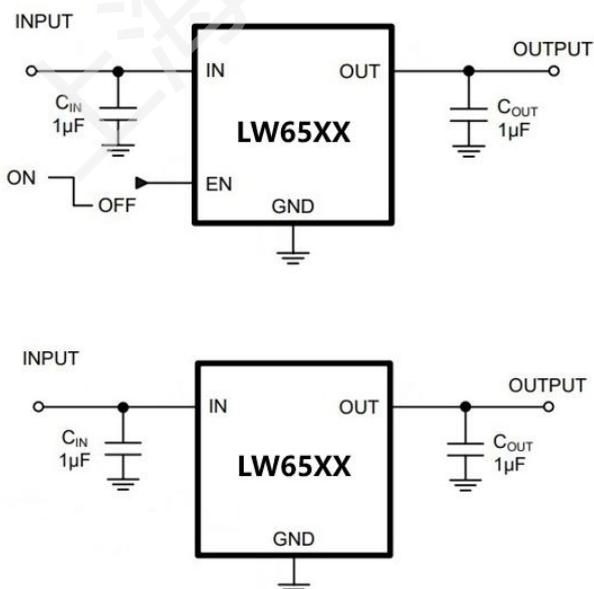
FEATURES

- Operating Voltage Range: from 2.5V to 40V
- Output Voltage Range: from 1.5V to 5.0V
- Maximum Output Current: 150mA
- Output Accuracy: $\pm 1.0\%$
- Low Dropout Voltage: 700mV@150mA/3.3V
- High PSRR: 81dB@1KHz, 10mA
- Current Limiting Protection
- Output Short-Circuit Protection
- Over-Temperature Protection
- Fast Discharge Function
- Stable with 1 μ F Output Capacitor

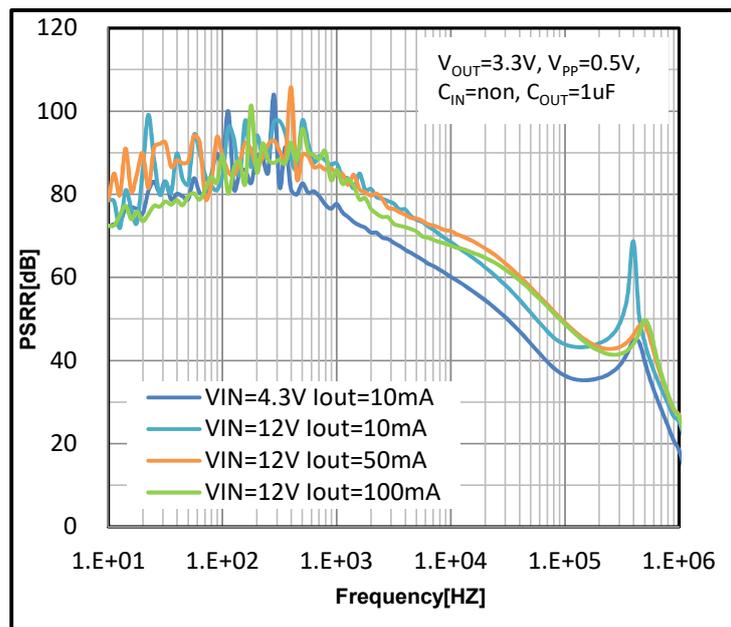
APPLICATIONS

- Battery Supplied Systems
- Telecom Systems
- Audio & Video Devices

TYPICAL APPLICATION CIRCUIT



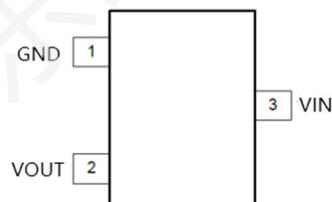
TYPICAL PERFORMANCE CHARACTERISTICS



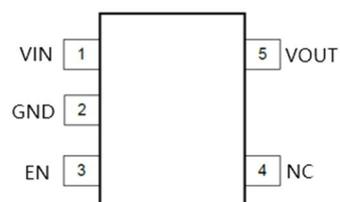
PIN DESCRIPTION:

PIN No				SYMBOL	DESCRIPTION
SOT23/ SOT23-3L	SOT23-5L Type-A	SOT89-3L Type-A	SOT89-3L Type-B		
3	1	2、TAB	3	VIN	Input pin. For best transient response and to minimize input impedance, use the recommended value or larger ceramic capacitor from IN to ground as listed in the Recommended Operating Conditions table and the Input and Output Capacitor Requirements section. Place the input capacitor as close to the output of the device as possible.
1	2	1	2、TAB	GND	Ground pin.
--	3	--	--	EN	Enable pin. Drive EN greater than $V_{EN(HI)}$ to turn on the regulator. Drive EN less than $V_{EN(LO)}$ to put the low-dropout regulator (LDO) into shutdown mode.
--	4	--	--	NC	No internal connection. Ground this pin for better thermal performance.
2	5	3	1	VOUT	Regulated output voltage pin. Connect a low-equivalent series resistance (ESR) capacitor to this pin. For best transient response, use the nominal recommended value or larger capacitor from OUT to GND. An internal pulldown resistor prevents a charge from remaining on OUT when the regulator is in shutdown mode ($V_{EN} < V_{EN(LO)}$).

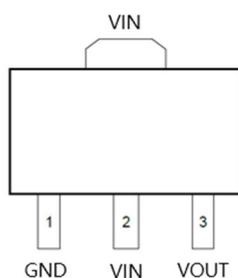
PIN ASSIGNMENT:



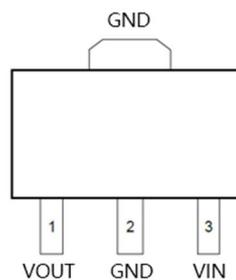
SOT23/SOT23-3L



SOT23-5L(Type-A)



SOT89-3L(Type-A)



SOT89-3L(Type-B)

MARK INFORMATION:**SOT23, SOT23-3L, SOT23-5L, SOT89-3L****XX: VOLTAGE****YY: DATE CODE**

LW65XX
YYYY

ABSOLUTE MAXIMUM RATINGS ⁽¹⁾:

($T_A = 25^\circ\text{C}$, unless otherwise specified.)

SYMBOL	ITEM	RATING	UNIT	
V_{IN}	Supply Voltage	-0.3~44	V	
V_{EN}	EN Pin Voltage	-0.3~44	V	
V_{OUT}	V_{OUT} Pin Voltage	-0.3~ 6.0	V	
$V_{(ESD)}$	ESD Susceptibility, HBM ⁽²⁾	± 2000	V	
P_D	Maximum Power Dissipation ⁽³⁾	SOT23	0.48	W
		SOT23-3L	0.50	
		SOT23-5L	0.51	
		SOT89-3L(Type-A)	1.04	
		SOT89-3L(Type-B)	1.32	
$R_{\theta JA}$	Junction-to-ambient Thermal Resistance ⁽³⁾	SOT23	260	$^\circ\text{C}/\text{W}$
		SOT23-3L	250	
		SOT23-5L	246	
		SOT89-3L(Type-A)	120	
		SOT89-3L(Type-B)	95	
T_J	Junction Temperature Range	-40~150	$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-40~150	$^\circ\text{C}$	
T_{SOLDER}	Lead Temperature (Soldering)	260 $^\circ\text{C}$, 10s		

Note:

1. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability

2. per ANSI/ESDA/JEDEC JS-001

3. Device mounted on FR-4 PCB

RECOMMENDED OPERATING RANGE:

SYMBOL	ITEM	VALUE	UNIT
V_{IN}	V_{IN} Supply Voltage	2.5~40	V
V_{EN}	EN Pin Voltage	0~40	V
V_{OUT}	V_{OUT} Pin Voltage	1.5~5.0	V
I_{OUT}	Output Current	0~150	mA
T_J	Junction Temperature Range	-40~125	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS:

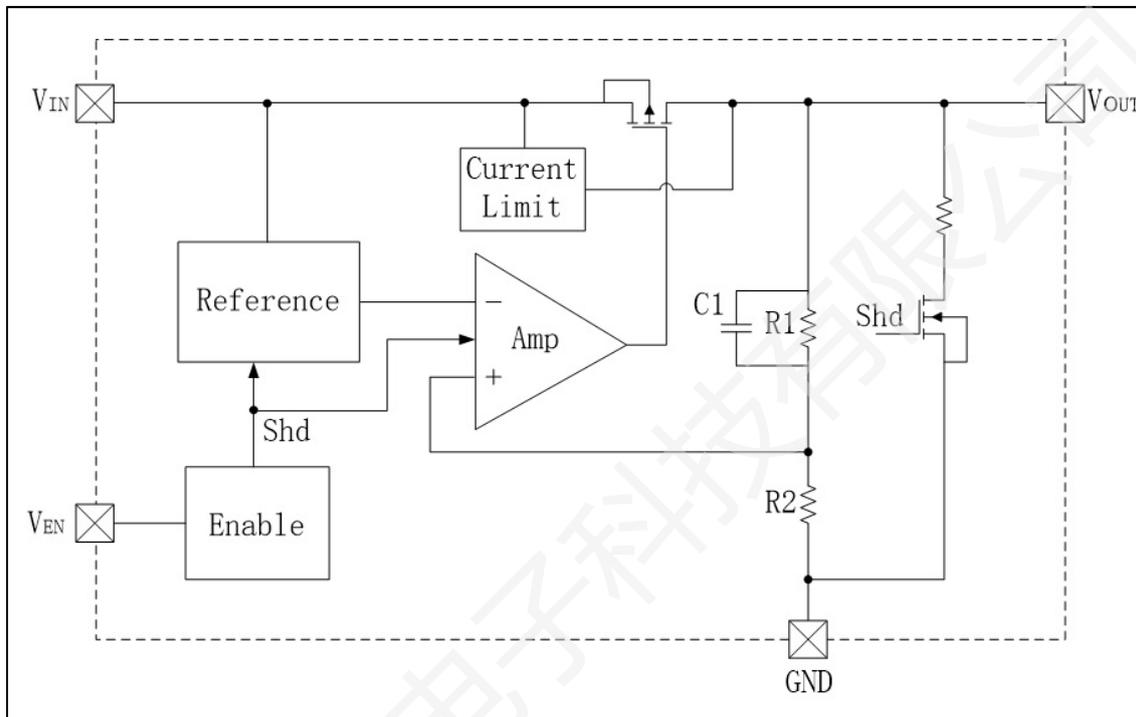
($V_{IN}=V_{OUT(NOM)}+1V$ or $2V$, whichever is greater, $C_{IN}=C_{OUT}=1\mu F$, unless otherwise specified, typical values are at $T_A = 25^\circ C$.)

Symbol	Parameter	Test Conditions	MIN	TYP	MAX	Unit
V_{IN}	Input Voltage		2.5		40	V
V_{OUT}	Output Accuracy	$I_{OUT}=1mA$	-1.0		+1.0	%
I_{LIM}	Current Limit ⁽¹⁾		150	210		mA
I_Q	Quiescent Current	$V_{IN}=V_{EN}=V_{OUT}+1V$, No Load	$V_{OUT}<1.8V$	3.0	4.0	μA
			$V_{OUT}\geq 1.8V$	2.5	3.5	
I_{SHD}	Shutdown Current	$V_{IN}=12V, V_{EN}=0V$		0.1	0.2	μA
V_{DROP}	Dropout Voltage ⁽¹⁾⁽²⁾	$I_{OUT}=150mA$	$V_{OUT}=1.8V$	1260		mV
		$I_{OUT}=150mA$	$V_{OUT}=3.3V$	700		
		$I_{OUT}=150mA$	$V_{OUT}=5.0V$	590		
$\frac{\Delta V_{OUT}}{(\Delta V_{IN} * V_{OUT(NOM)})}$	Line Regulation	$V_{IN}=V_{OUT}+1.0V$ to $40V, I_{OUT}=1mA$		0.01	0.04	%/V
ΔV_{OUT}	Load Regulation	$1mA \leq I_{OUT} \leq 150mA$		20	40	mV
I_{SHORT}	Short Current ⁽¹⁾	$V_{OUT}=0V$		15		mA
V_{ENH}	EN High Voltage	$V_{IN}=2.5V$ to $40V, I_{OUT}=1mA$	1.5			V
V_{ENL}	EN Low Voltage				0.5	V
PSRR	Power Supply Rejection Ratio	$V_{IN}=4.3V,$ $V_{OUT}=3.3V$ $V_{PP}=0.5V, C_{IN}=\text{None},$ $I_{OUT}=10mA$	$f=217Hz$	86		dB
			$f=1KHz$	81		
			$f=10KHz$	64		
			$f=100KHz$	40		
e_n	Output Voltage Noise	$f=10Hz$ to $100kHz,$ $V_{IN}=4.3V, V_{OUT}=3.3V$	$I_{OUT}=0mA$	80		μV_{RMS}
			$I_{OUT}=10mA$	177		
T_{SD}	Thermal Shutdown	Temperature rising		160		$^\circ C$
ΔT_{SD}	TSD Hysteresis	Temperature falling		25		$^\circ C$
R_{DSCHG}	R_{ON} of Discharge MOSFET	$V_{IN}=12V, V_{OUT}=5.0V, V_{EN}=0V$		130		Ω

NOTES:

1. Guaranteed by design
2. The dropout voltage is defined as $V_{IN} - V_{OUT}$, when $V_{OUT} = 95% * V_{OUT(NOM)}$

SIMPLIFIED BLOCK DIAGRAM:



DETAIL OPERATION DESCRIPTION:

The LW65XX Series is a low power consumption low drop-out voltage regulator. It consists of a current limiter circuit, a driver transistor, a precision voltage reference and an error correction circuit, and is compatible with low ESR ceramic capacitors. The current limiter's fold-back circuit operates as a short circuit protection as well as the output current limiter.

Current Limiting and Short-Circuit Protection

The current limit circuitry prevents damage to the MOSFET switch and the hub downstream port but can deliver load current up to the current limit threshold through the switch. When a heavy load or short circuit is applied to an enabled switch, a large transient current may flow until the current limit circuitry responds. Once this current limit threshold is exceeded the device enters constant current mode until the thermal shutdown occurs or the fault is removed.

TYPICAL OPERATING CHARACTERISTICS:

(Tested under $T_A = 25^\circ\text{C}$, $C_{IN} = C_{OUT} = 1\mu\text{F}$, unless otherwise specified)

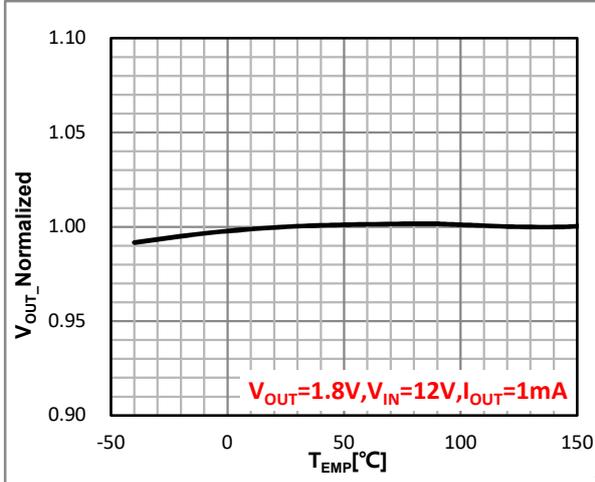


Figure 1. V_{OUT} vs Temperature

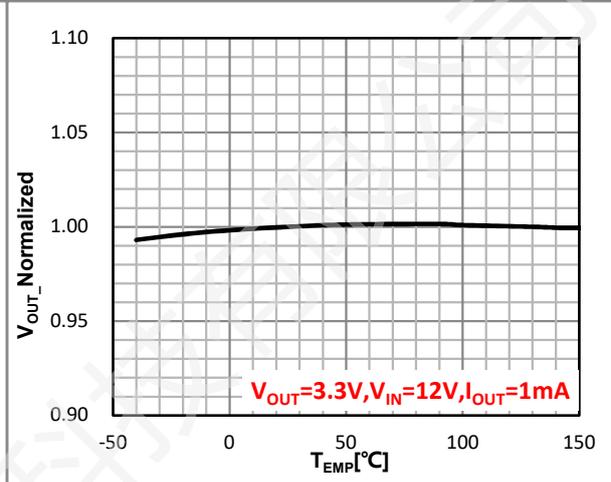


Figure 2. V_{OUT} vs Temperature

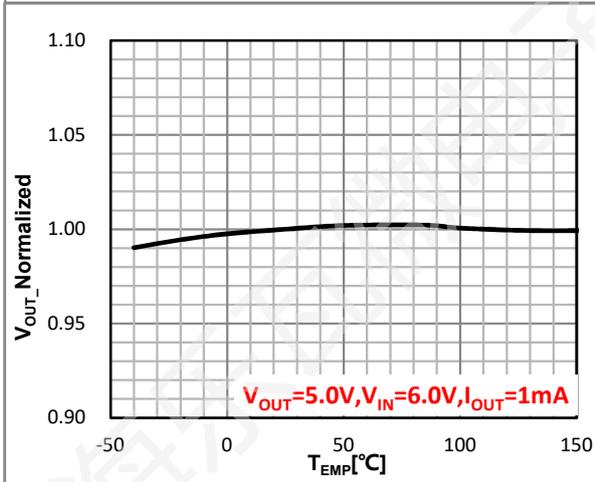


Figure 3. V_{OUT} vs Temperature

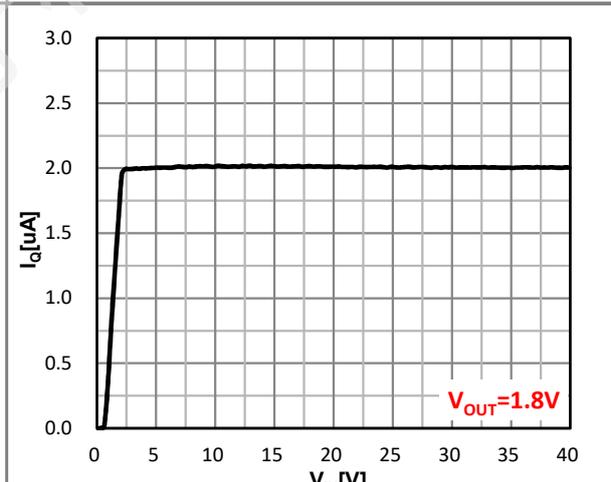


Figure 4. I_{Q} vs V_{IN}

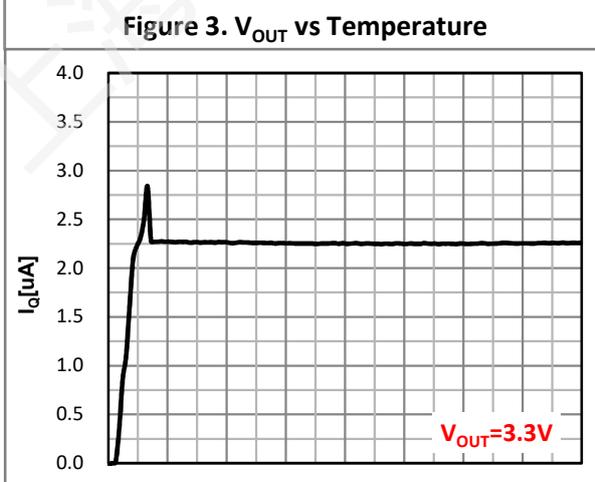


Figure 5. I_{Q} vs V_{IN}

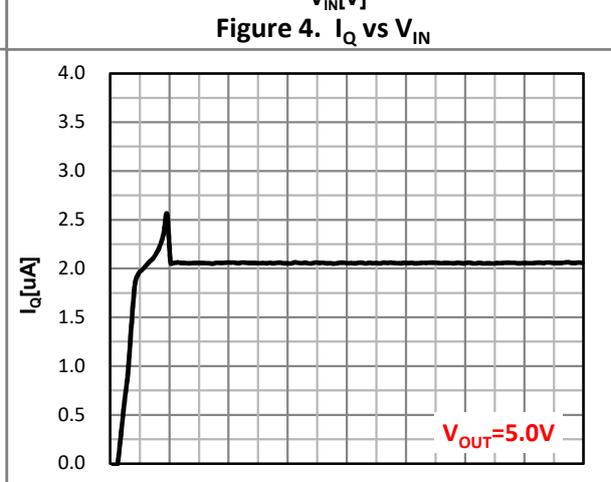


Figure 6. I_{Q} vs V_{IN}

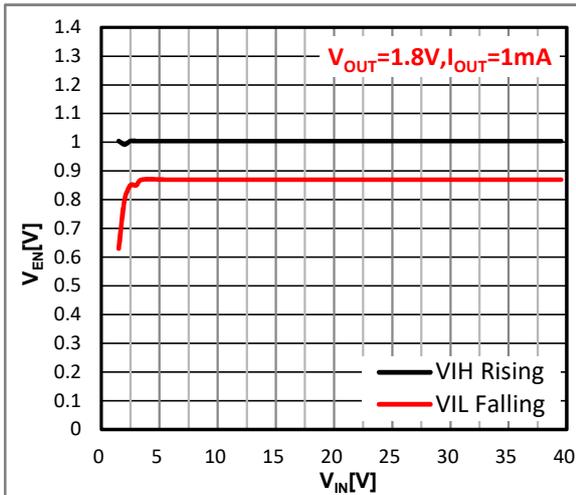


Figure 7. V_{EN} VS V_{IN}

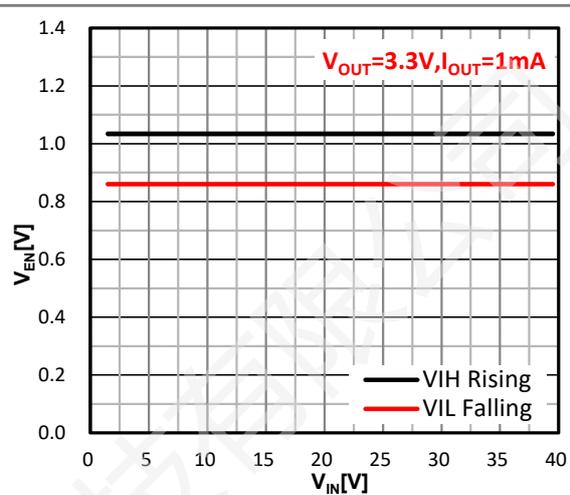


Figure 8. V_{EN} VS V_{IN}

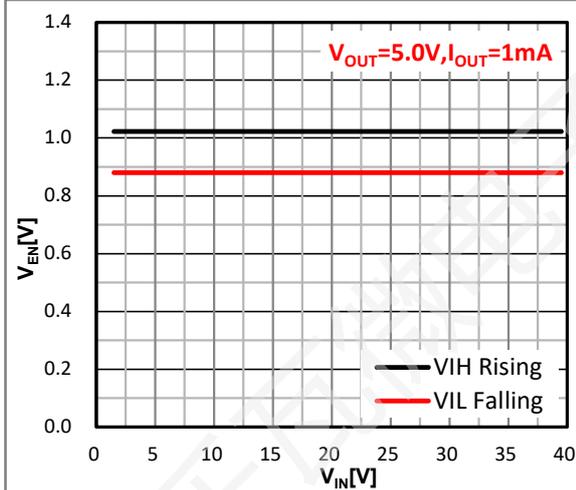


Figure 9. V_{EN} VS V_{IN}

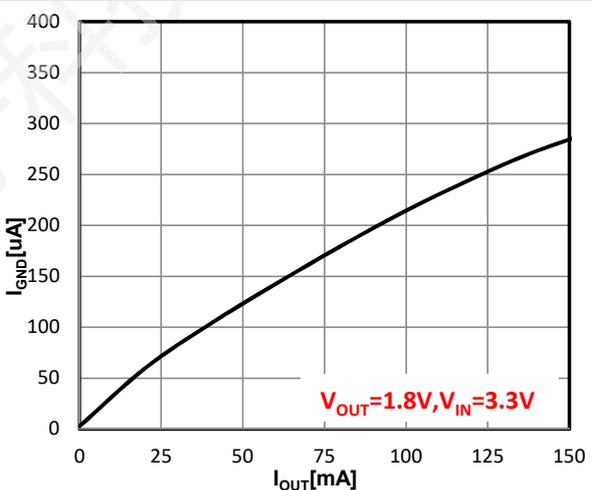


Figure 10. I_{GND} VS I_{OUT}

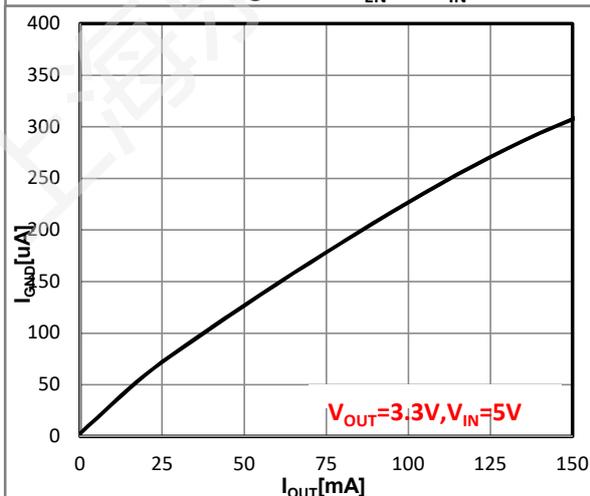


Figure 11. I_{GND} VS I_{OUT}

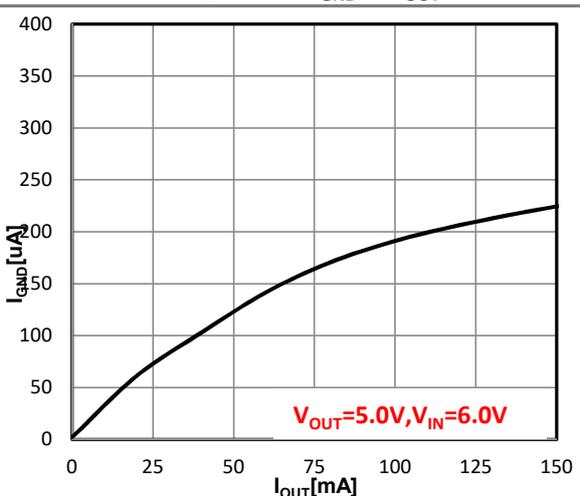


Figure 12. I_{GND} VS I_{OUT}

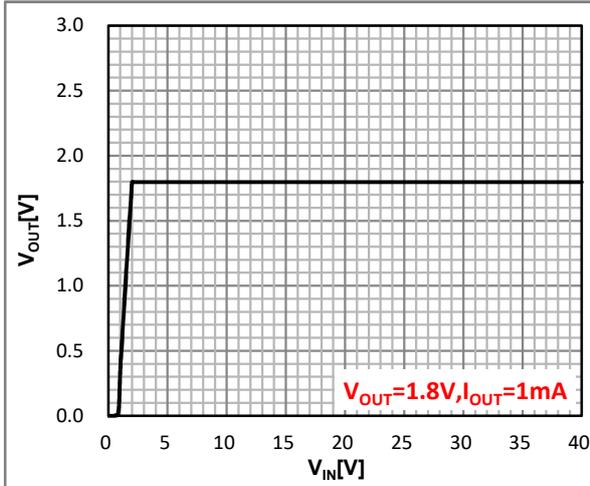


Figure 13. V_{OUT} vs V_{IN}

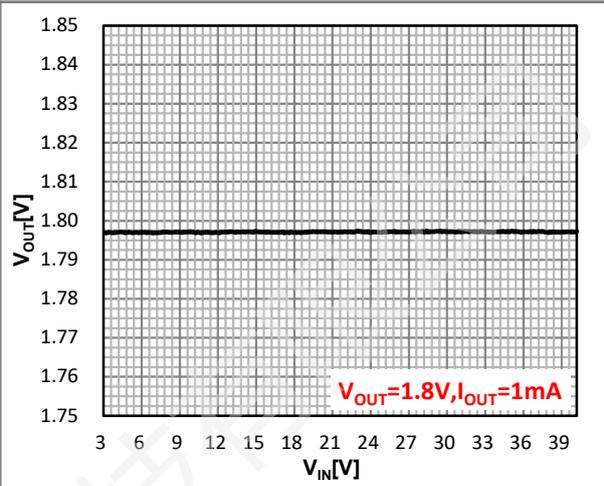


Figure 14. Line Regulation

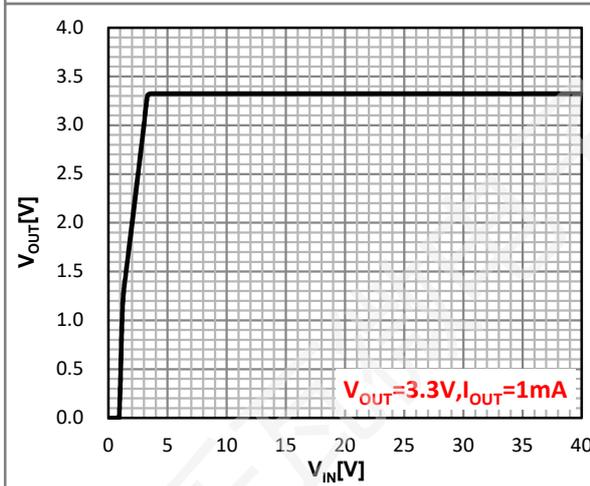


Figure 15. V_{OUT} vs V_{IN}

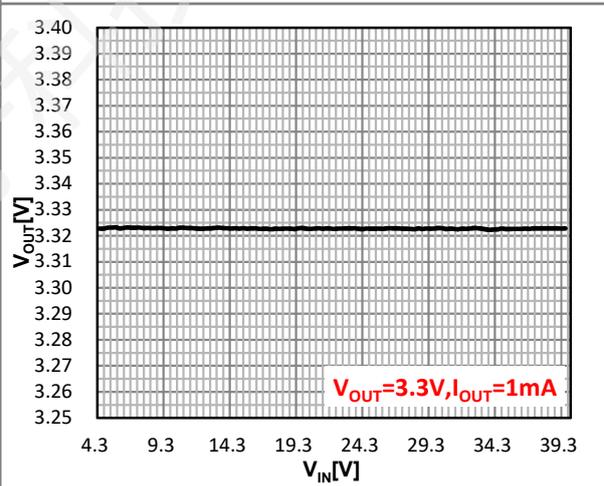


Figure 16. Line Regulation

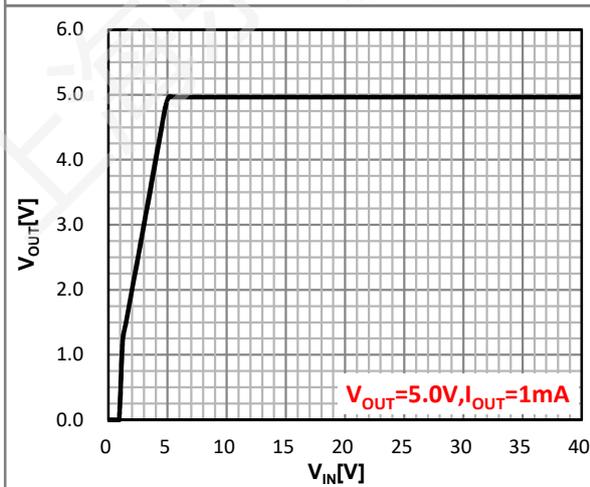


Figure 17. V_{OUT} vs V_{IN}

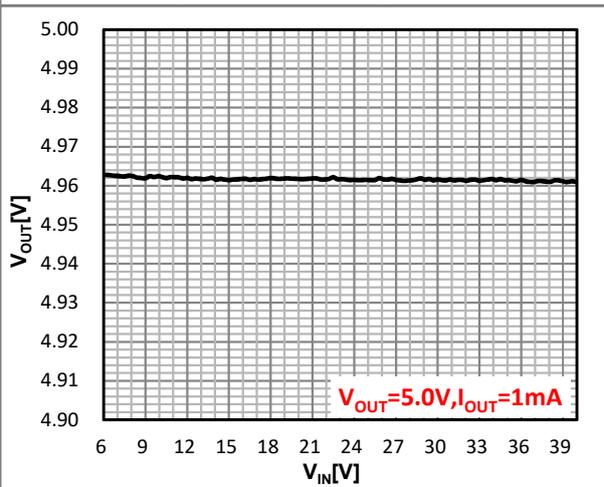


Figure 18. Line Regulation

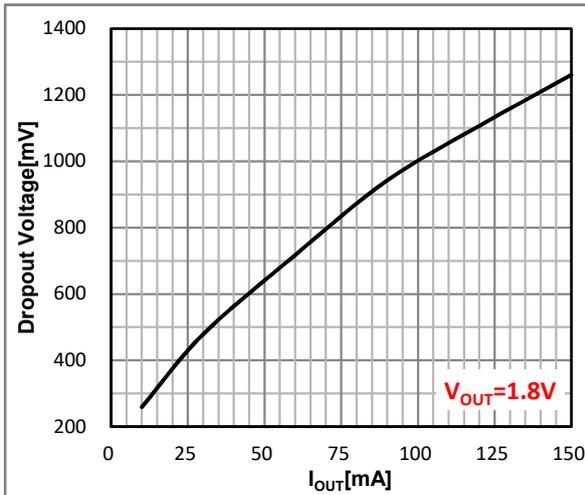


Figure 19. Dropout Voltage VS I_{OUT}

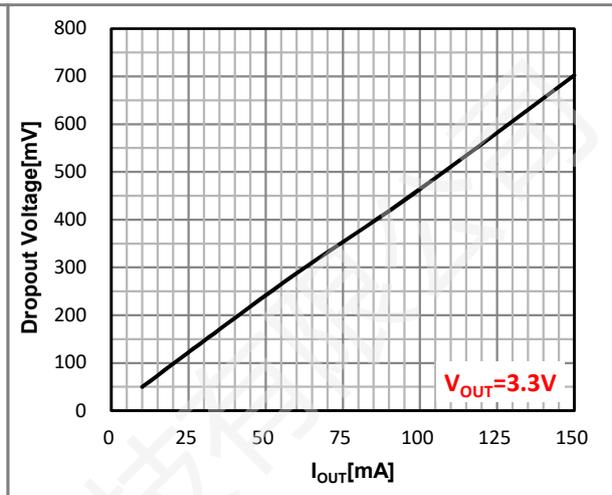


Figure 20. Dropout Voltage VS I_{OUT}

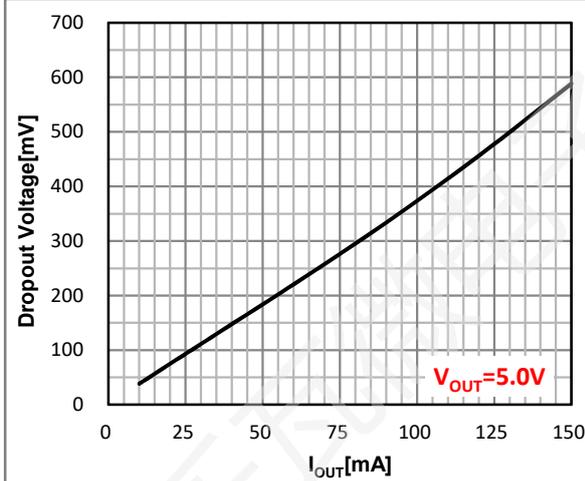


Figure 21. Dropout Voltage VS I_{OUT}

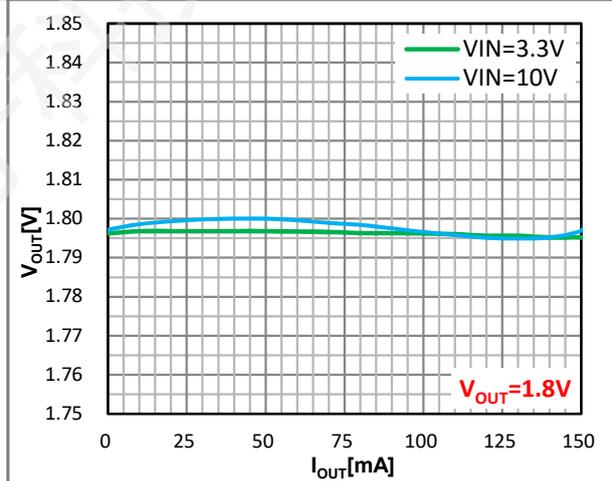


Figure 22. Load Regulation

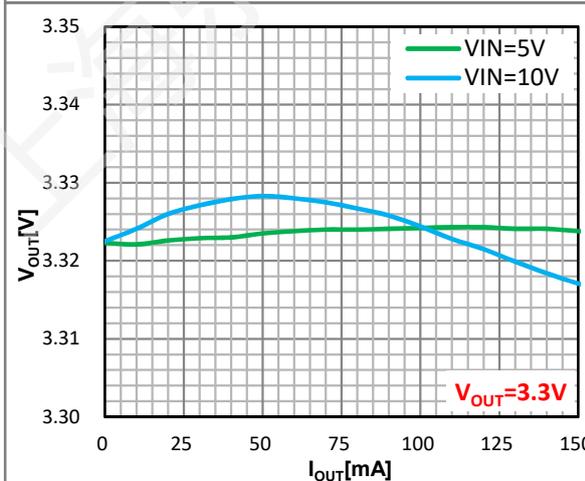


Figure 23. Load Regulation

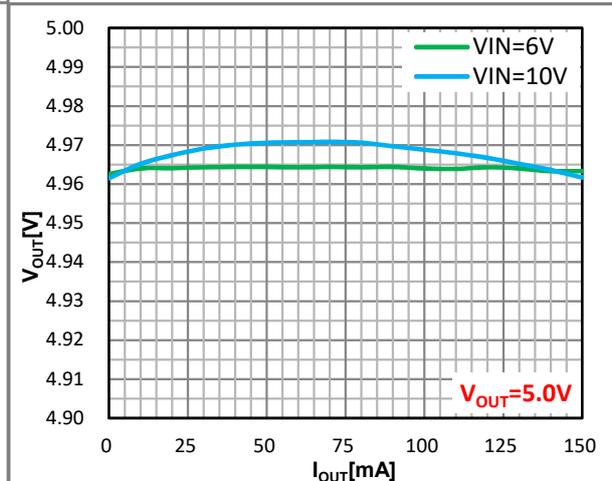
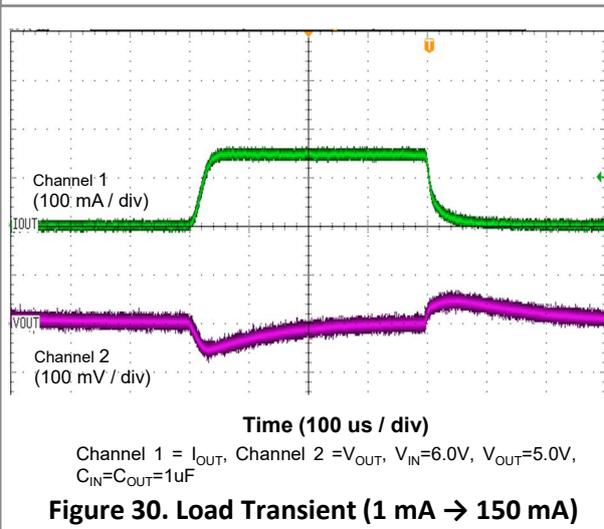
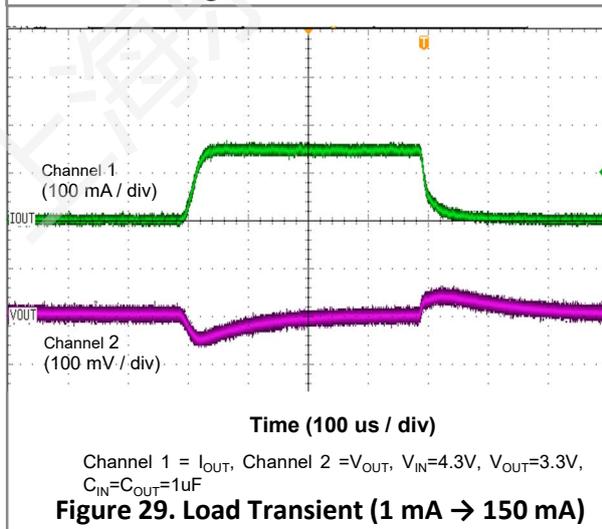
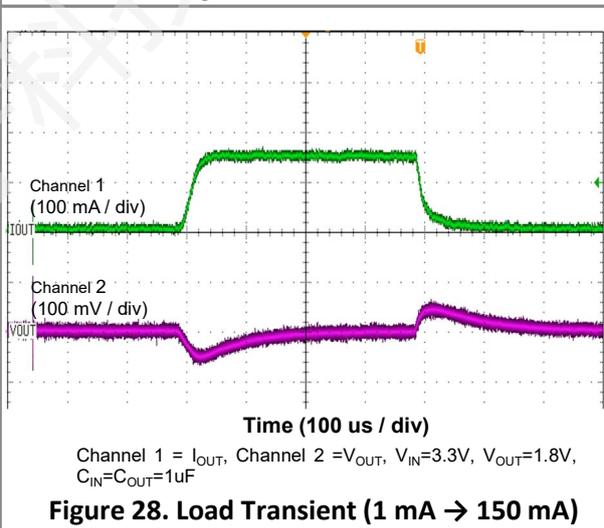
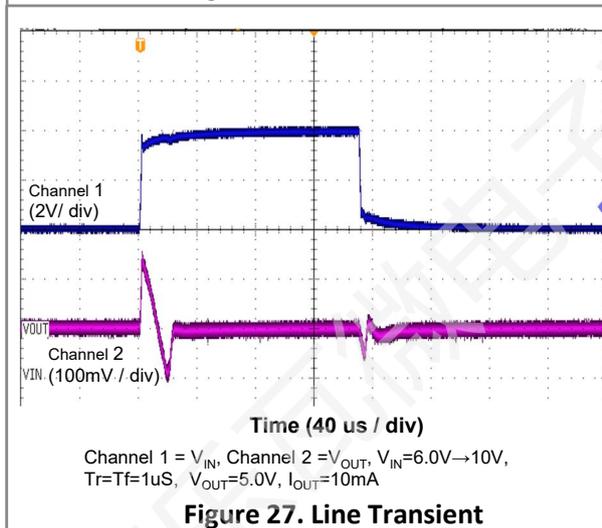
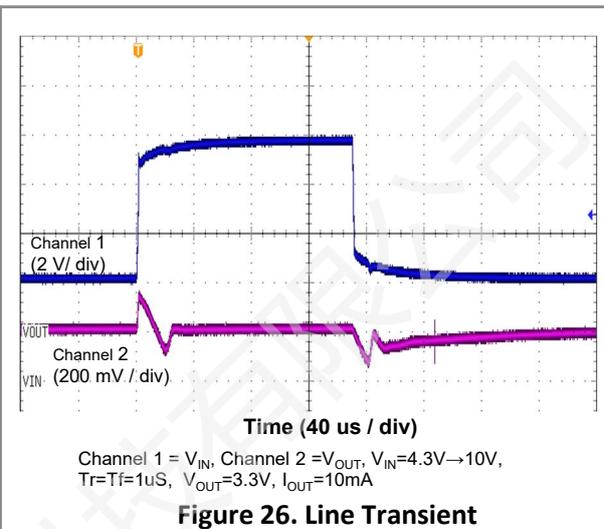
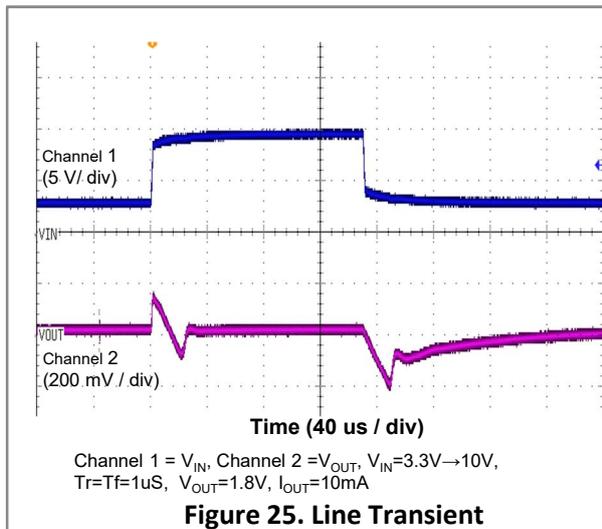
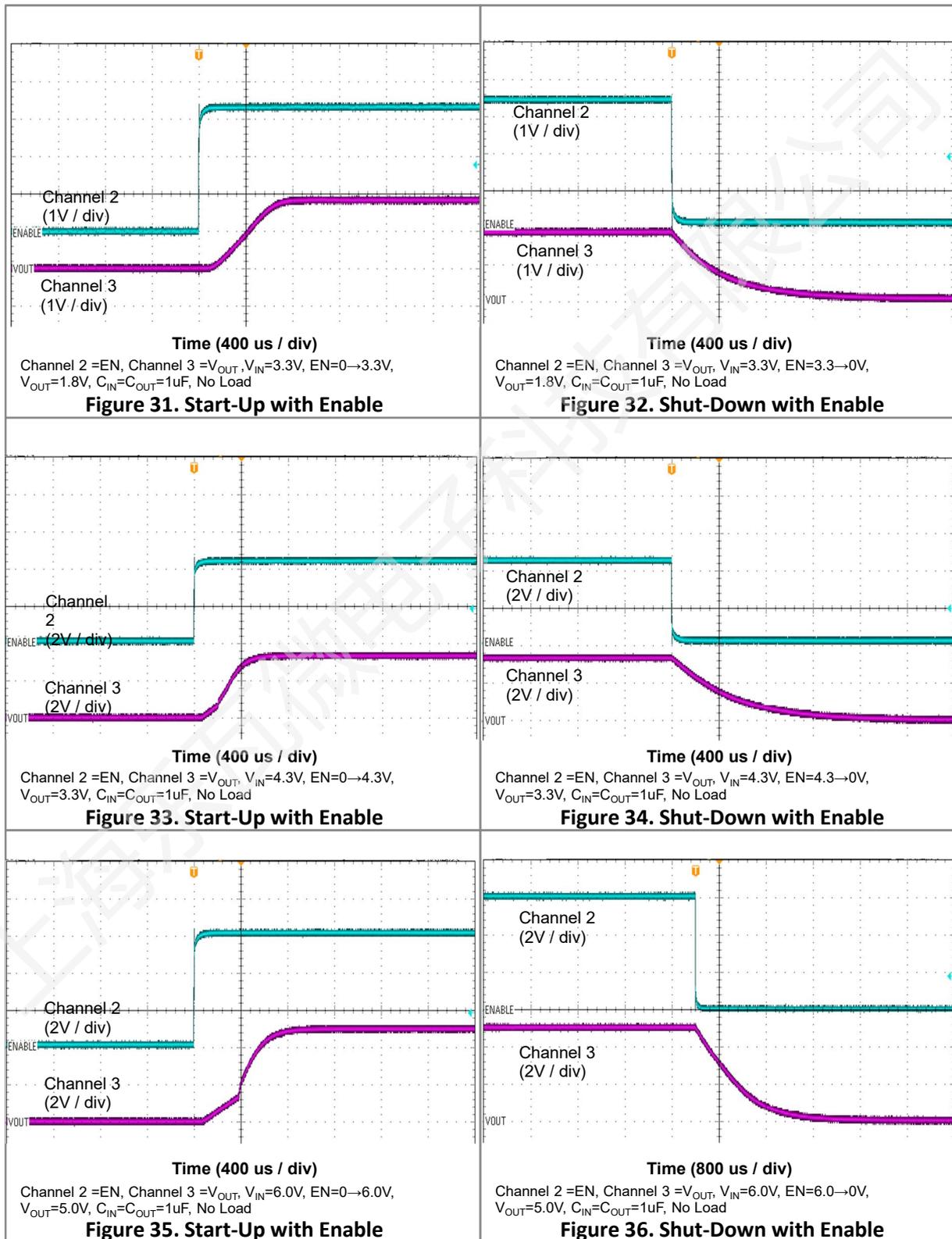
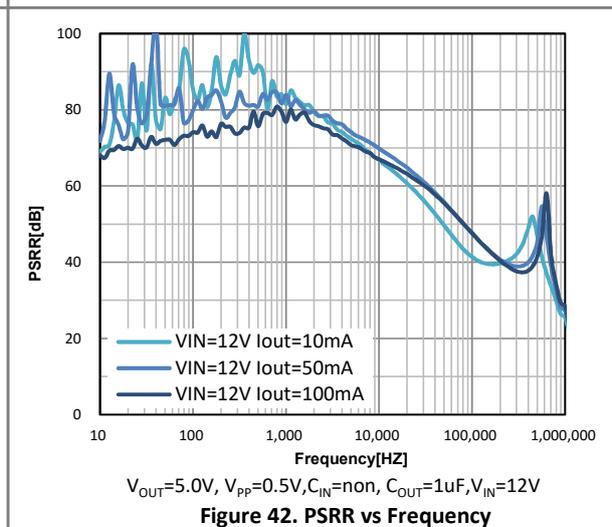
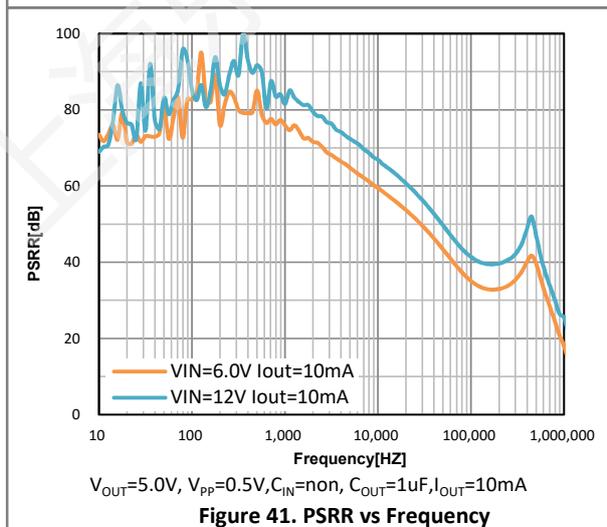
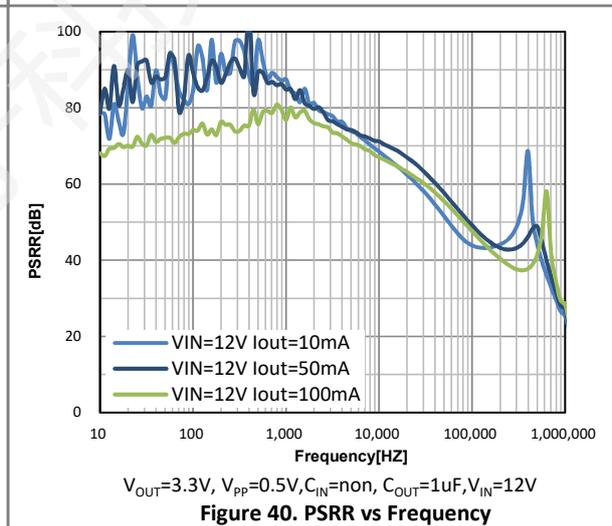
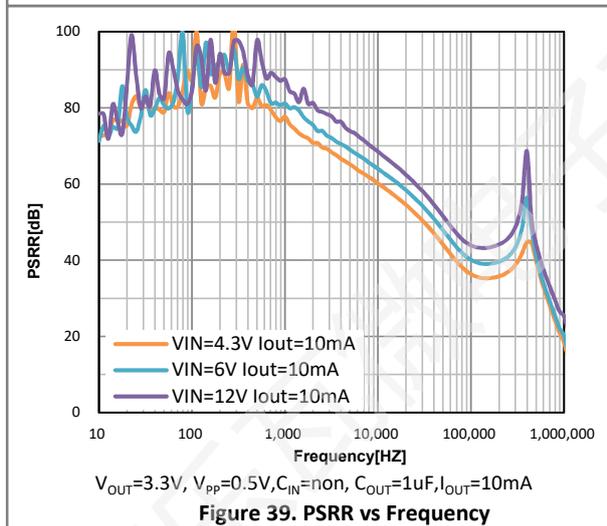
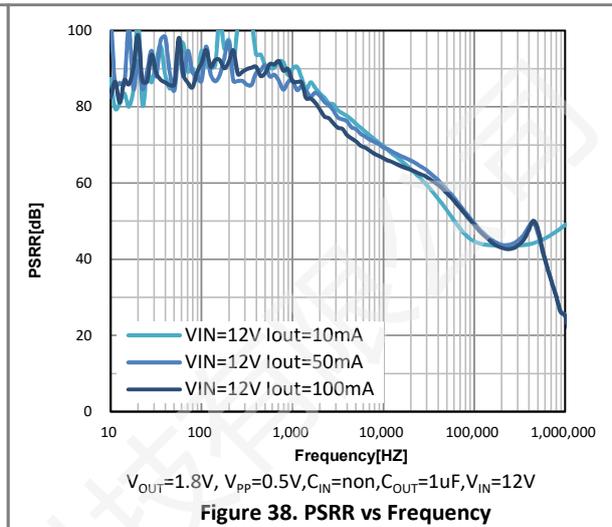
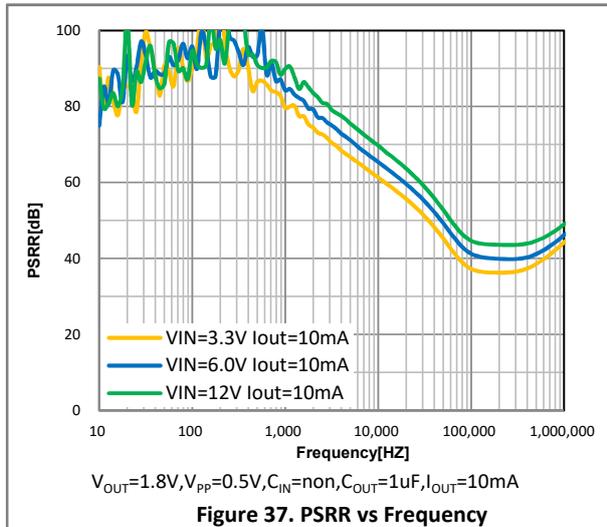
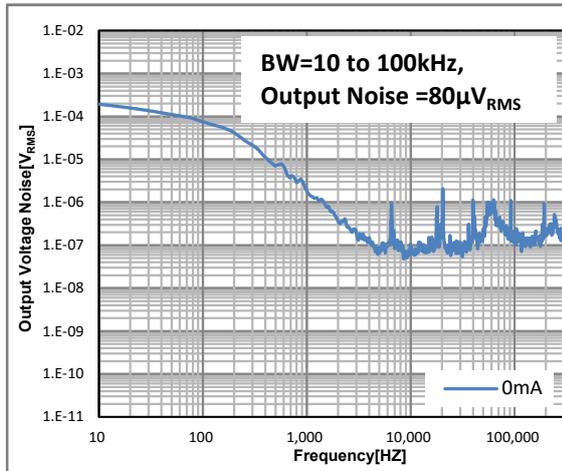


Figure 24. Load Regulation



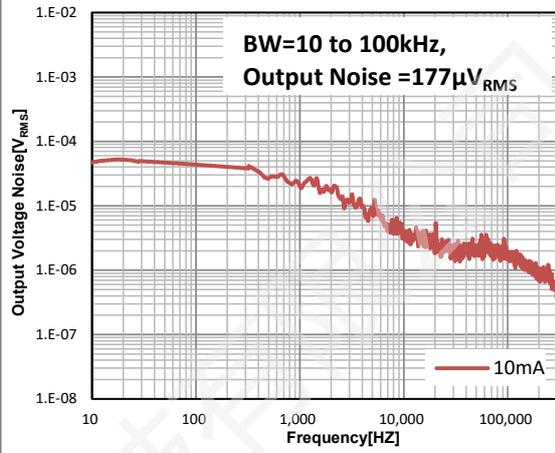






$V_{in}=4.3V, V_{OUT}=3.3V, C_{IN}=C_{OUT}=1\mu F, I_{OUT}=0mA$

Figure 43. Noise vs Frequency



$V_{in}=4.3V, V_{OUT}=3.3V, C_{IN}=C_{OUT}=1\mu F, I_{OUT}=10mA$

Figure 44. Noise vs Frequency

APPLICATION INFORMATION:**● Input Capacitor Selection**

Like any low-dropout regulator, the external capacitors used with the LW65XX Series must be carefully selected for regulator stability and performance. Using a capacitor whose value is $\geq 1\mu\text{F}$ on the LW65XX Series input and the amount of capacitance can be increased without limit. The input capacitor must be located a distance less than 0.5 inch from the input pin of the IC and returned to a clean analog ground. Any good quality ceramic or tantalum can be used for this capacitor. The capacitor with larger value and lower ESR (equivalent series resistance) provides better PSRR and line-transient response.

● Layout considerations

To improve ac performance such as PSRR, output noise, and transient response, it is recommended that the PCB be designed with separate ground planes for VIN and VOUT, with each ground plane connected only at the GND pin of the device.

● Output Capacitor Selection

The output capacitor must meet both requirements for minimum amount of capacitance and ESR in all LDOs application. The LW65XX Series is designed specifically to work with low ESR ceramic output capacitor in space-saving and performance consideration. Using a ceramic capacitor whose value is at least $1\mu\text{F}$ on the LW65XX Series output ensures stability. An appropriate output capacitor can reduce noise and improve load transient response and PSRR. The output capacitor should be located not more than 0.5 inch from the VOUT pin of the LW65XX Series and returned to a clean analog ground.

ORDER INFORMATION:

LW65①②③④⑤⑥

Designator	Item	Symbol	Description
①②	Output Voltage	18~50	e.g. 2.8V → ①=2, ②=8
③④⑤⑥	Packages	N23C	SOT23
		A23D	SOT23-3L
		A23E	SOT23-5L
		A89C	SOT89-3L(Type-A)
		B89C	SOT89-3L(Type-B)

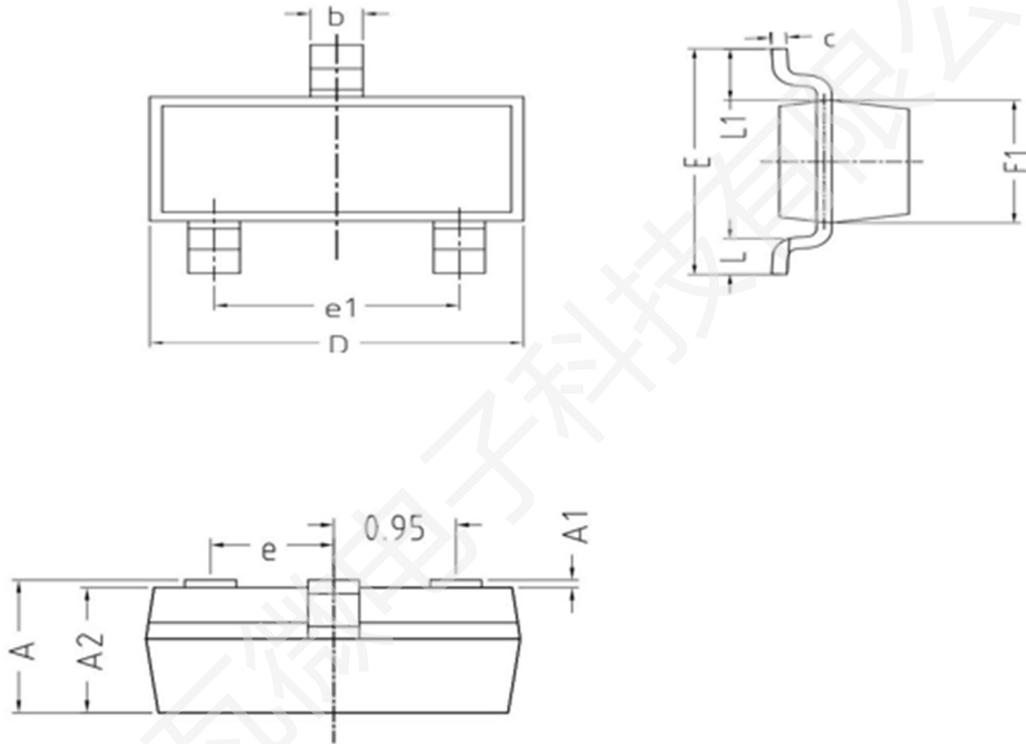
Part #	Output Voltage	Package	Shipping
LW6518N23C	1.8V	SOT23	3000 Pcs/ Tape & Reel
LW6525N23C	2.5V		
LW6530N23C	3.0V		
LW6533N23C	3.3V		
LW6536N23C	3.6V		
LW6540N23C	4.0V		
LW6542N23C	4.2V		
LW6550N23C	5.0V		
LW6518A23D	1.8V	SOT23-3L	3000 Pcs/ Tape & Reel
LW6525A23D	2.5V		
LW6530A23D	3.0V		
LW6533A23D	3.3V		
LW6536A23D	3.6V		
LW6540A23D	4.0V		
LW6542A23D	4.2V		
LW6550A23D	5.0V		
LW6518A23E	1.8V	SOT23-5L	3000 Pcs/ Tape & Reel
LW6525A23E	2.5V		
LW6530A23E	3.0V		
LW6533A23E	3.3V		
LW6536A23E	3.6V		
LW6540A23E	4.0V		
LW6542A23E	4.2V		
LW6550A23E	5.0V		

Part #	Output Voltage	Package	Shipping
LW6518A89C	1.8V	SOT89-3L(Type-A)	1000 Pcs / Tape & Reel
LW6525A89C	2.5V		
LW6530A89C	3.0V		
LW6533A89C	3.3V		
LW6536A89C	3.6V		
LW6540A89C	4.0V		
LW6542A89C	4.2V		
LW6550A89C	5.0V		
LW6518B89C	1.8V	SOT89-3L(Type-B)	1000 Pcs / Tape & Reel
LW6525B89C	2.5V		
LW6530B89C	3.0V		
LW6533B89C	3.3V		
LW6536B89C	3.6V		
LW6540B89C	4.0V		
LW6542B89C	4.2V		
LW6550B89C	5.0V		

If customers have special output voltage requirements, please contact us.

PACKAGE OUTLINE:

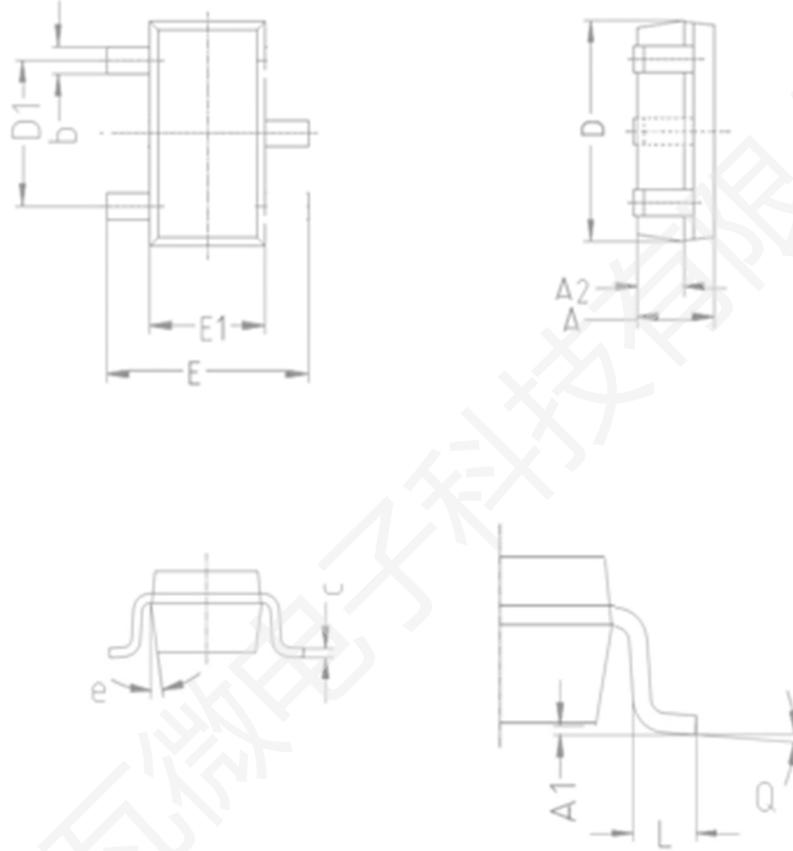
SOT23 Package



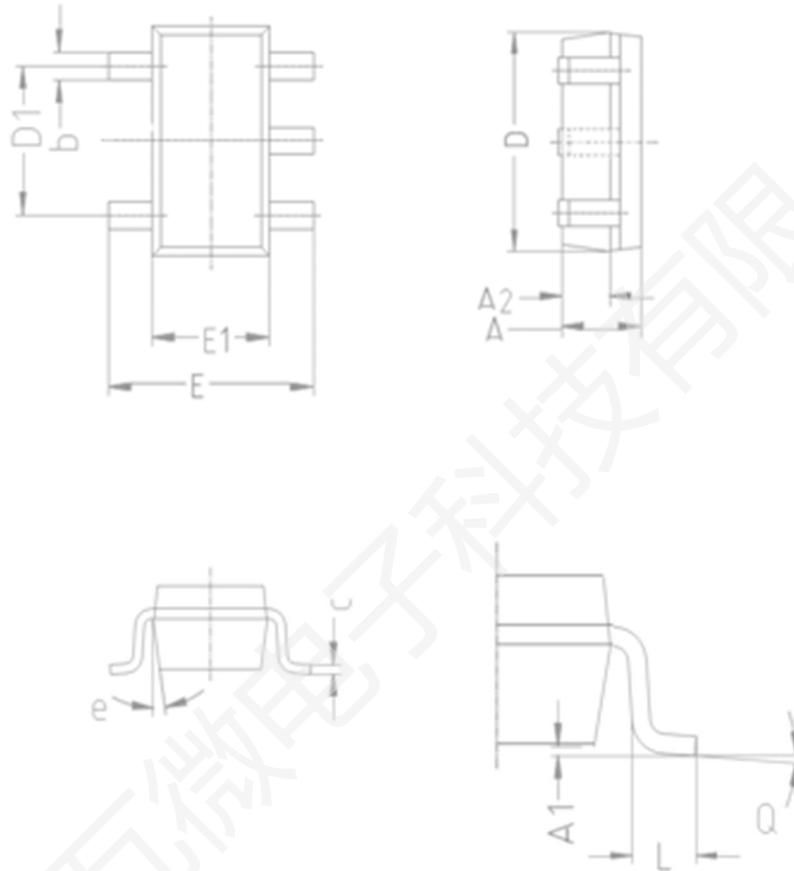
COMMON IN DIMENSION (MM)

Symbol	Min.	Nom.	Max.
A	0.900	1.050	1.150
A1	0.000	0.050	0.100
A2	0.900	1.000	1.050
b	0.300	0.400	0.500
C	0.100	0.175	0.250
D	2.800	2.900	3.000
E	2.250	2.400	2.550
E1	1.200	1.300	1.400
e	0.950 TYP		
e1	1.800	1.900	2.000
L	0.290	0.395	0.500
L1	0.550REF		

SOT23-3L Package

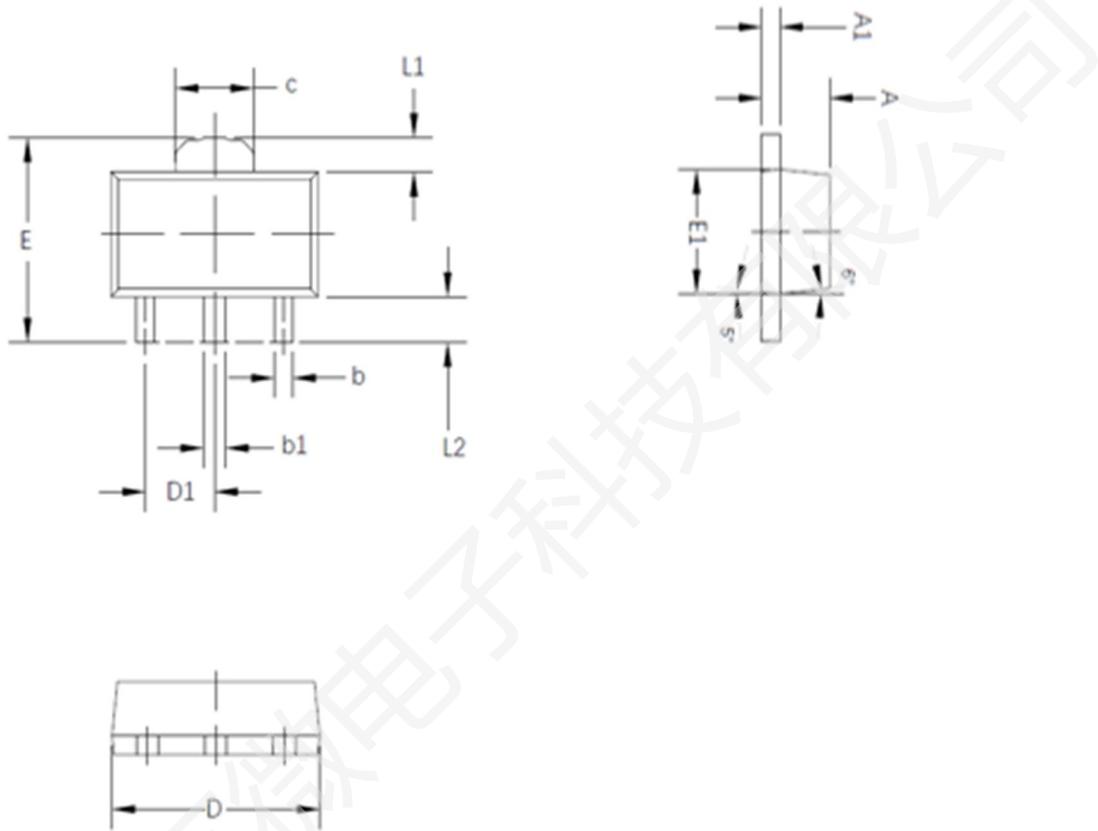


COMMON DIMENSION (MM)			
PKG	SOT23-3L		
Symbol	MIN	NOM	MAX
A	1.050	1.100	1.150
A1	0.010	0.060	0.150
A2	0.640	0.670	0.700
b	0.300	0.350	0.400
c	0.125	0.150	0.175
D	2.870	2.925	2.980
D1	1.800	1.900	2.000
E	2.650	2.825	3.000
E1	1.550	1.610	1.670
L	0.300	0.450	0.600
e	8°		
Q	0°	4°	8°

SOT23-5L Package


COMMON DIMENSION (MM)			
PKG	SOT23-5L		
Symbol	MIN	NOM	MAX
A	1.050	1.100	1.150
A1	0.010	0.060	0.150
A2	0.640	0.670	0.700
b	0.300	0.350	0.400
c	0.125	0.150	0.175
D	2.870	2.925	2.980
D1	1.800	1.900	2.000
E	2.650	2.800	2.950
E1	1.550	1.610	1.670
L	0.300	0.450	0.600
e	8°		
Q	0°	4°	8°

SOT89-3L Package



COMMON DIMENSION (MM)			
PKG	SOT89-3L		
Symbol	MIN	NOM	MAX
A	1.450	1.500	1.550
A1	0.350	0.400	0.450
b	0.350	0.430	0.500
b1	0.430	0.500	0.570
C	1.650	1.700	1.750
D	4.450	4.550	4.700
D1	1.470	1.500	1.550
E	4.100	4.200	4.300
E1	2.450	2.550	2.650
L1	0.630	0.700	0.770
L2	0.900	0.950	1.000

Revision History:

Revision	Date	Descriptions
Rev 0.1	Dec.2022	Initial Version
Rev 0.2	Jun.2023	Update Electrical Characteristics
Rev 1.0	Nov.2023	Formal Version Release
Rev 1.1	Dec.2025	Update Increase package
Rev 1.2	Feb.2026	Update Electrical Characteristics
Rev 1.3	Feb.2026	Update Electrical Characteristics & Package Outline

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