

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.

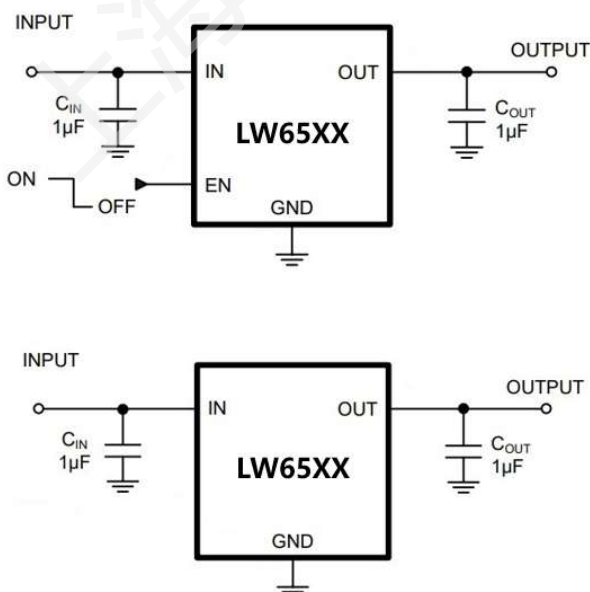
FEATURES

- Operating Voltage Range: from 2.5V to 40V
- Output Voltage Range: from 1.5V to 5.0V
- Maximum Output Current: 150mA
- Output Accuracy: $\pm 1.0\%$ @+25°C
- 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

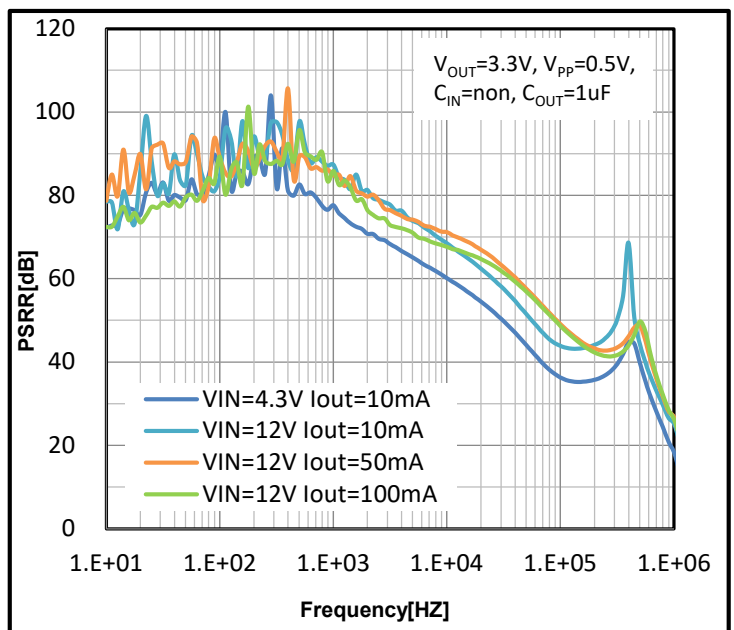
APPLICATIONS

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

TYPICAL APPLICATION CIRCUIT



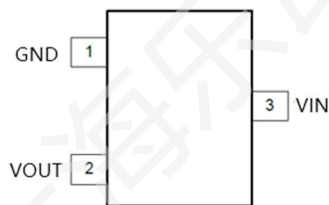
TYPICAL PERFORMANCE CHARACTERISTICS



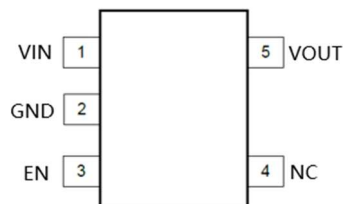
PIN DESCRIPTION:

PIN No					SYMBOL	DESCRIPTION
SOT23/ SOT23-3L	SOT23-5L (Type-A)	SOT23-5L (Type-B)	SOT89-3L (Type-A)	SOT89-3L (Type-B)		
3	1	2	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	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	4, 5	--	--	NC	No internal connection. Ground this pin for better thermal performance.
2	5	3	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 ($V_{EN} < V_{EN(LOW)}$).

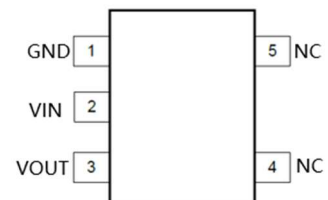
PIN ASSIGNMENT:



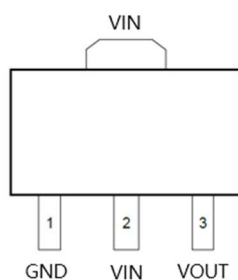
SOT23/SOT23-3L



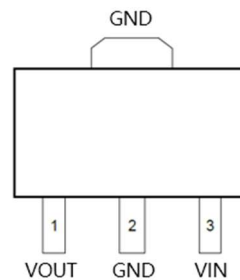
SOT23-5L(Type-A)



SOT23-5L(Type-B)



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℃, 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
R _{θJA}	Junction-to-ambient Thermal Resistance ⁽³⁾	SOT23	270	℃/W
		SOT23-3L	260	
		SOT23-5L(Type-A)	245	
		SOT23-5L(Type-B)	260	
		SOT89-3L(Type-A)	120	
		SOT89-3L(Type-B)	98	
T _J	Junction Temperature Range		-40~150	℃
T _{STG}	Storage Temperature Range		-40~150	℃
T _{SOLDER}	Lead Temperature (Soldering)		260℃, 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, Refer to JESD51-3 for detailed information on the board construction

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	℃

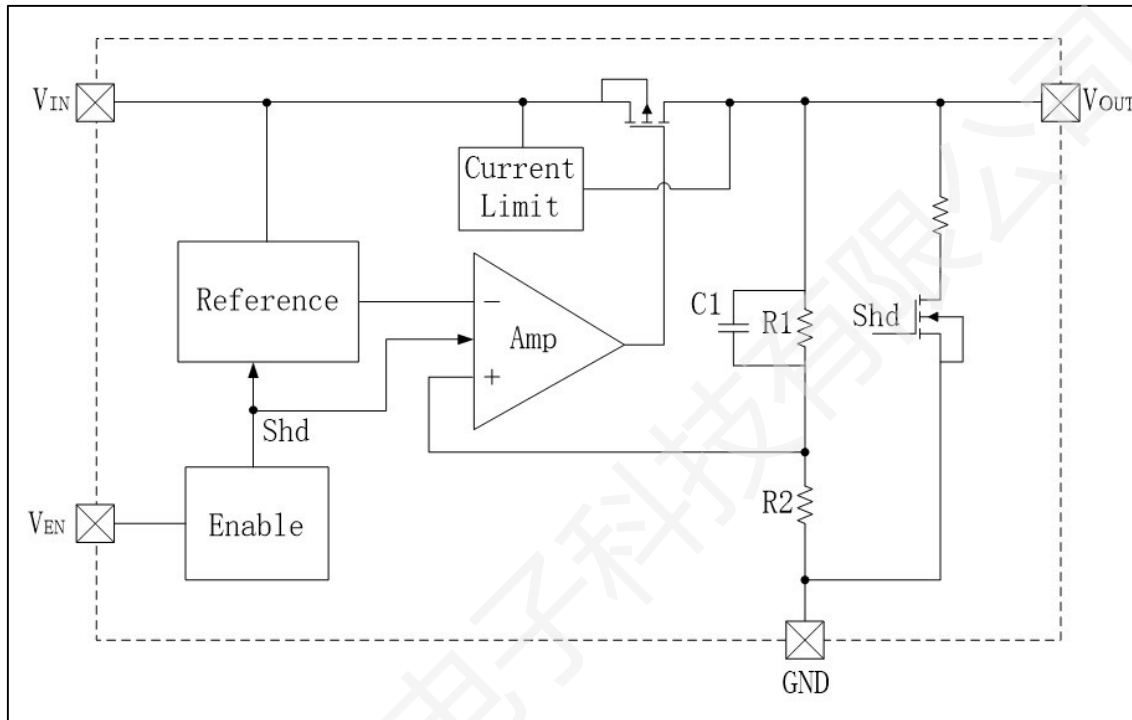
ELECTRICAL CHARACTERISTICS:

($V_{IN}=V_{OUT(NOM)}+1V$ 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	$V_{EN}=0V$			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		
$\Delta V_{OUT}/$ ($\Delta V_{IN}\cdot V_{OUT(NOM)}$)	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	$V_{IN}=4.3V, V_{OUT}=3.3V$ $V_{PP}=0.5V$, $C_{IN}=None$, $I_{OUT}=10mA$	$f=217Hz$		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}	Output discharge resistance	$V_{IN}=12V$, $V_{EN}=0V$			130		Ω

NOTES:

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

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)

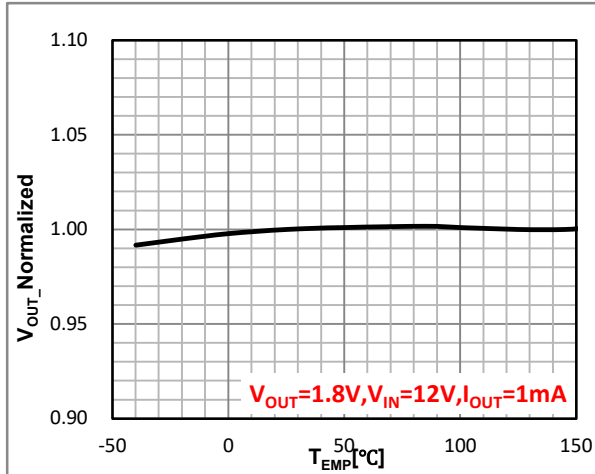


Figure 1. V_{OUT} vs Temperature

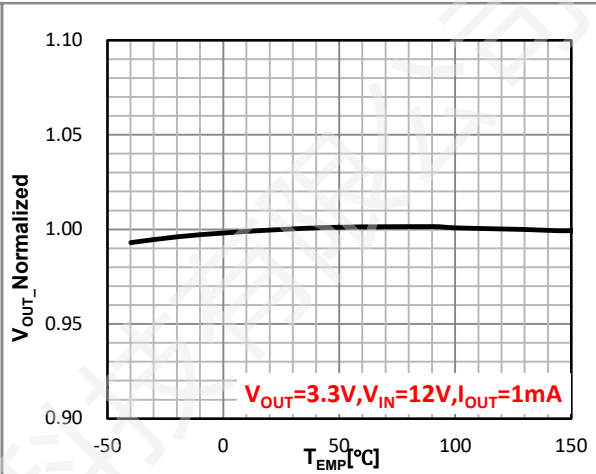


Figure 2. V_{OUT} vs Temperature

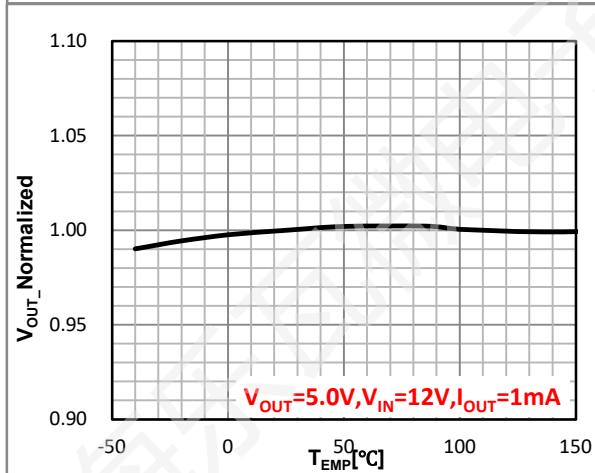


Figure 3. V_{OUT} vs Temperature

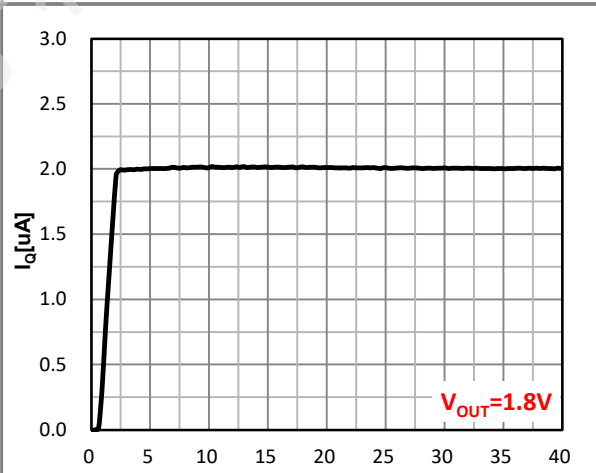


Figure 4. I_Q vs V_{IN}

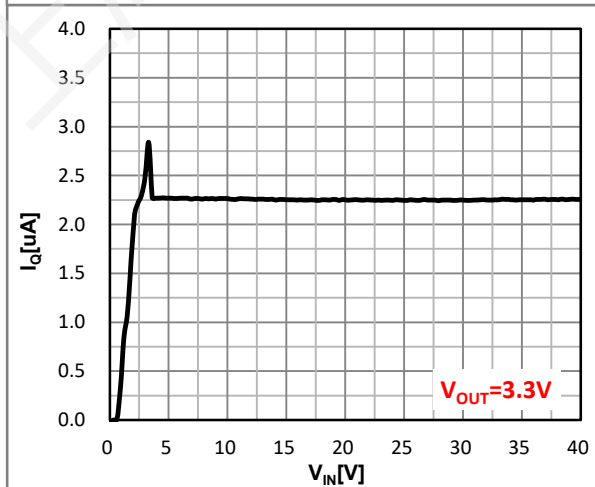


Figure 5. I_Q vs V_{IN}

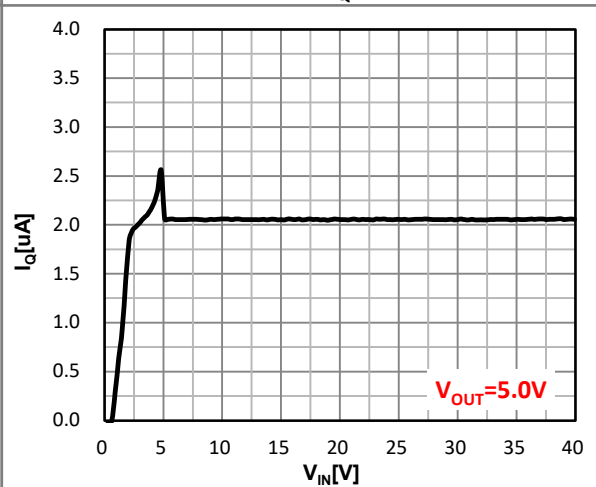


Figure 6. I_Q vs V_{IN}

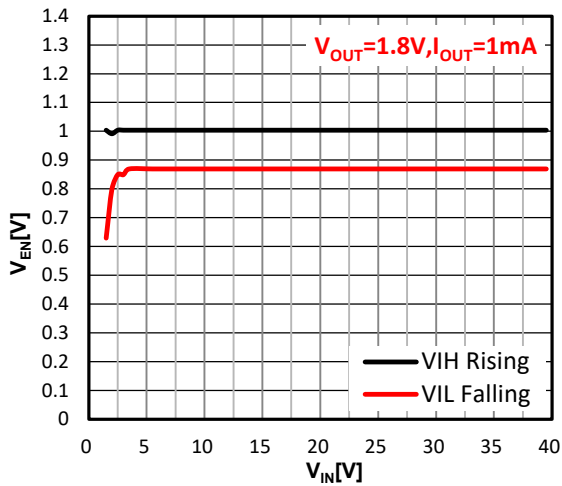


Figure 7. V_{EN} VS V_{IN}

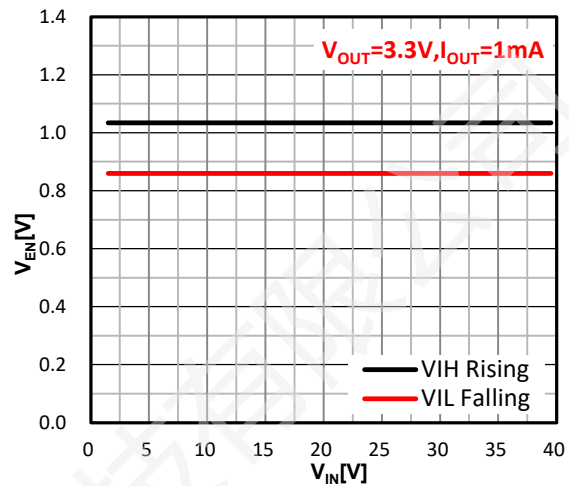


Figure 8. V_{EN} VS V_{IN}

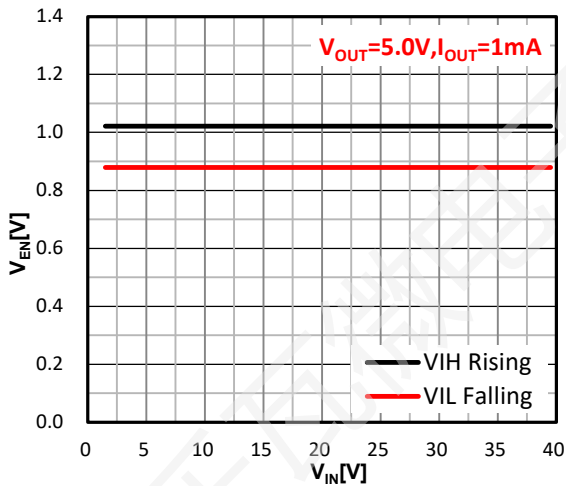


Figure 9. V_{EN} VS V_{IN}

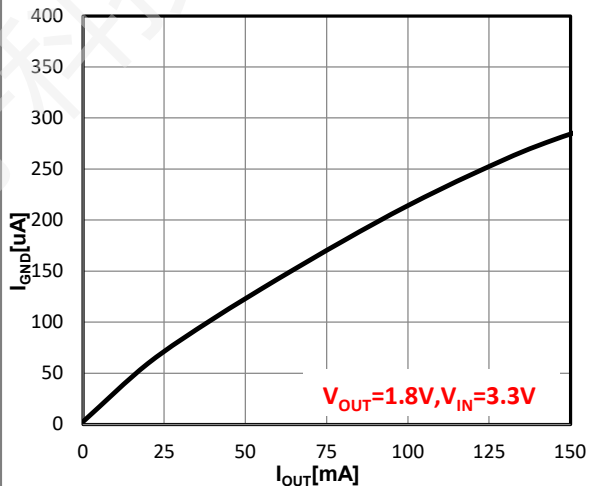


Figure 10. I_{GND} vs I_{OUT}

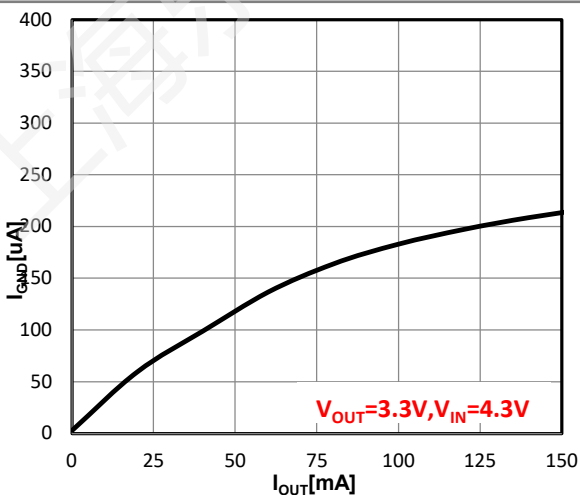


Figure 11. I_{GND} vs I_{OUT}

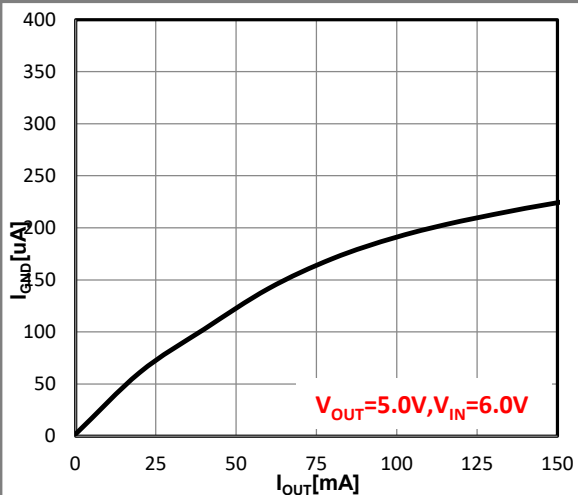


Figure 12. I_{GND} vs I_{OUT}

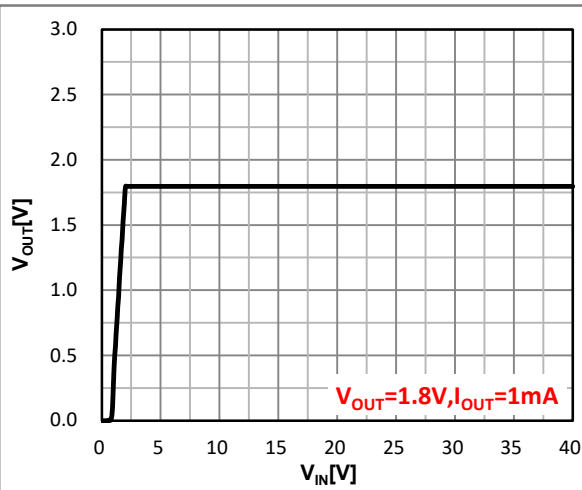


Figure 13. V_{OUT} vs V_{IN}

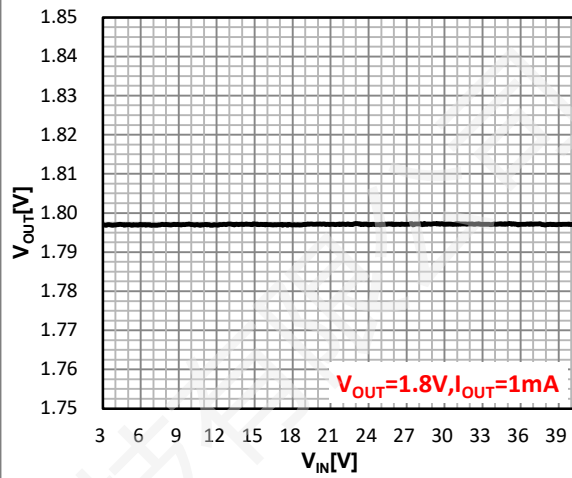


Figure 14. Line Regulation

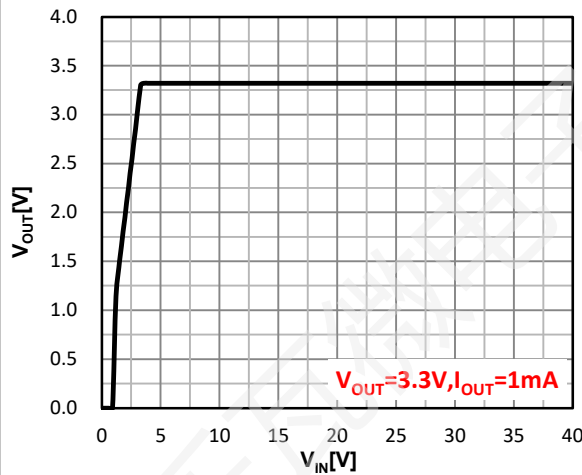


Figure 15. V_{OUT} vs V_{IN}

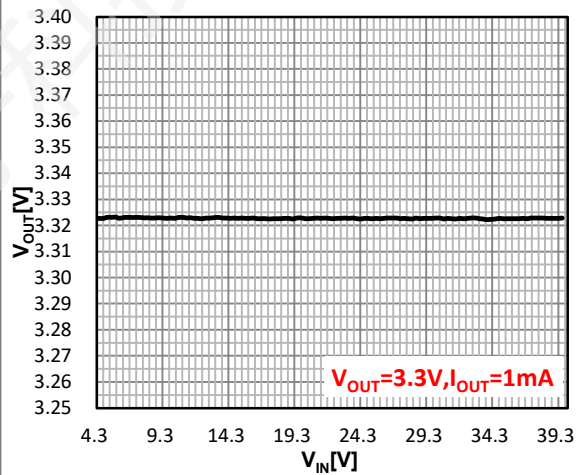


Figure 16. Line Regulation

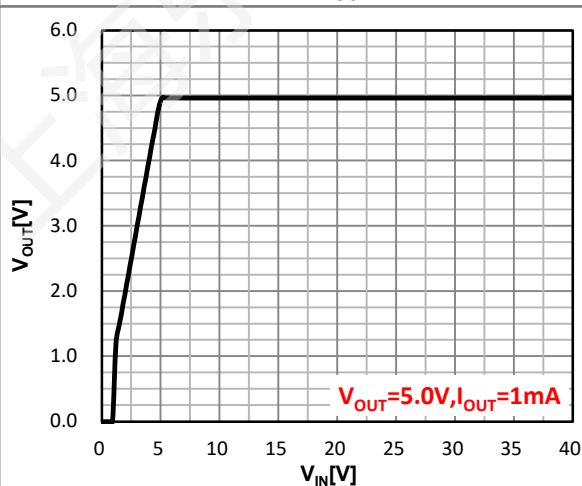


Figure 17. V_{OUT} vs V_{IN}

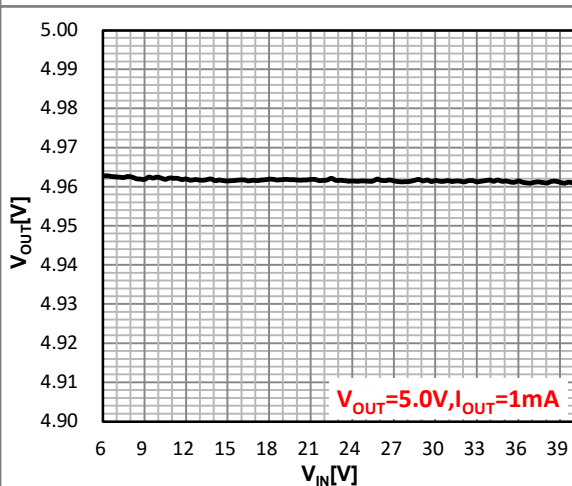


Figure 18. Line Regulation

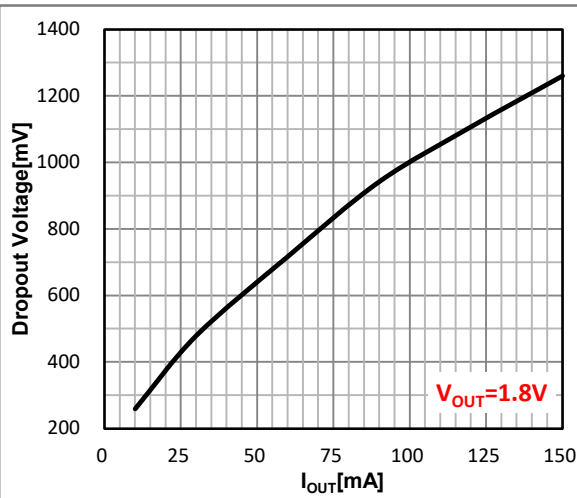


Figure 19. Dropout Voltage VS I_{OUT}

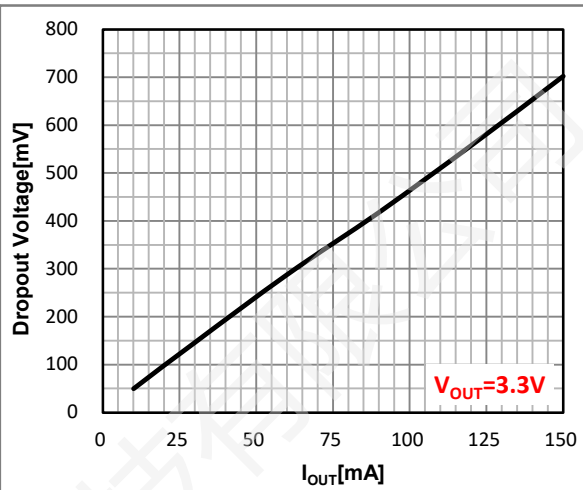


Figure 20. Dropout Voltage VS I_{OUT}

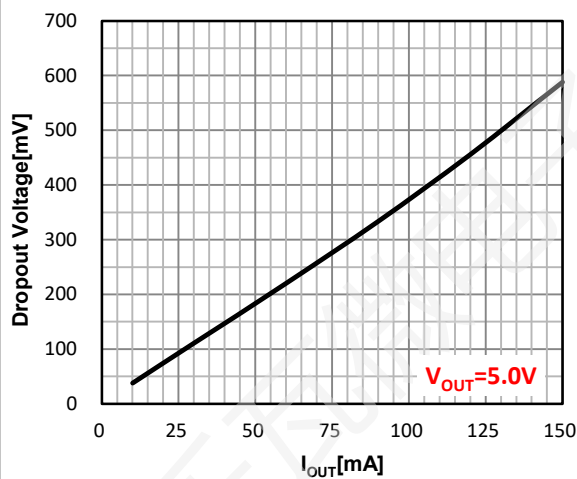


Figure 21. Dropout Voltage VS I_{OUT}

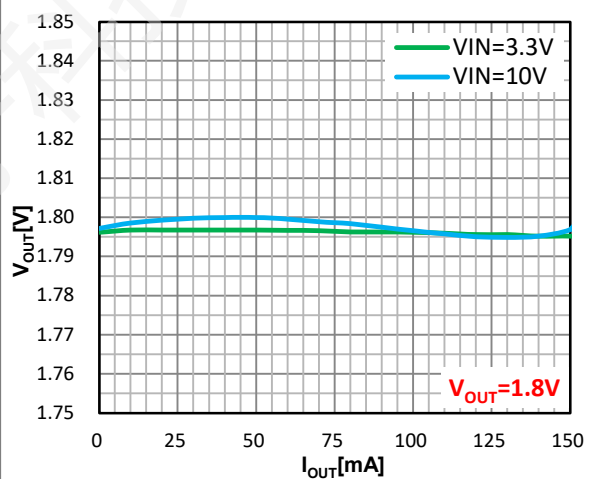


Figure 22. Load Regulation

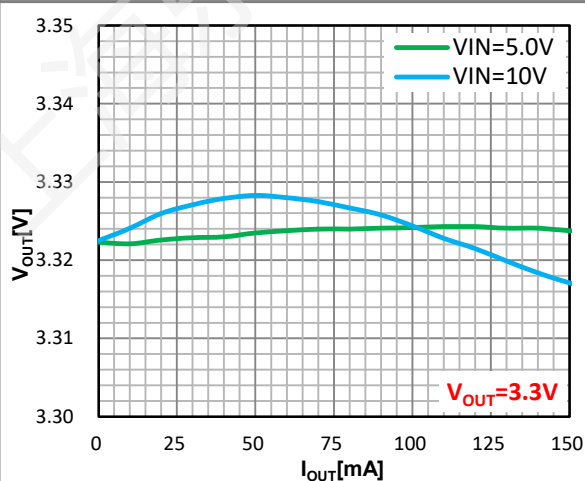


Figure 23. Load Regulation

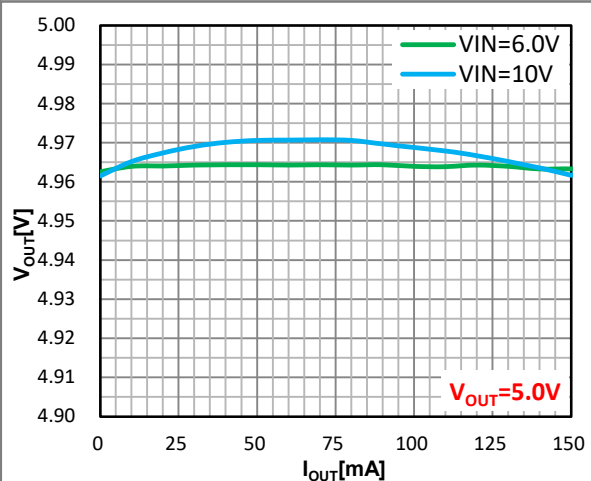
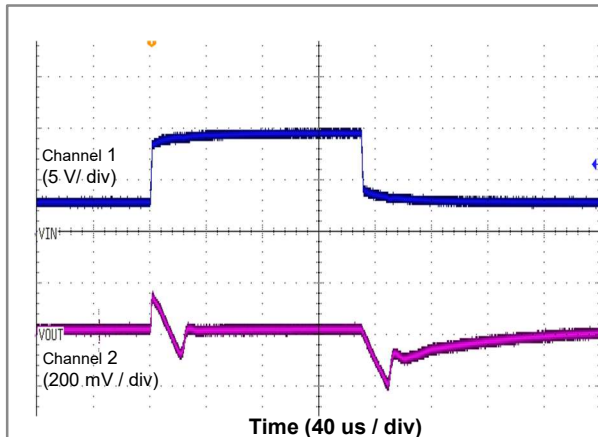
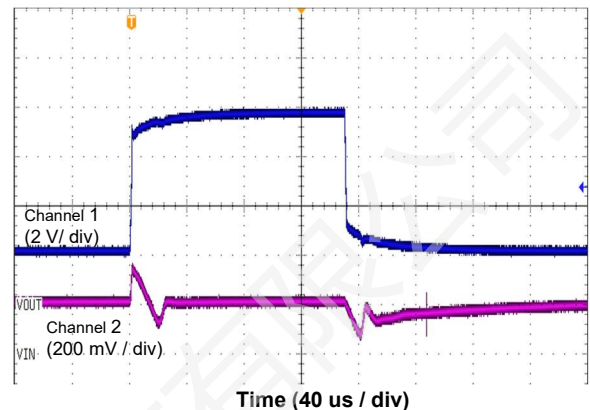


Figure 24. Load Regulation



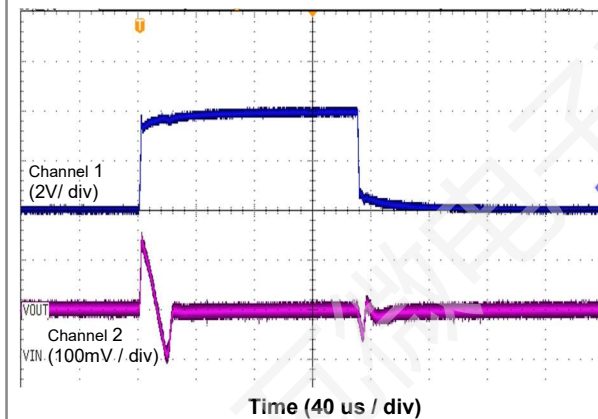
Channel 1 = V_{IN} , Channel 2 = V_{OUT} , $V_{IN}=3.3V \rightarrow 10V$,
 $T_r=T_f=1\mu s$, $V_{OUT}=1.8V$, $I_{OUT}=10mA$

Figure 25. Line Transient



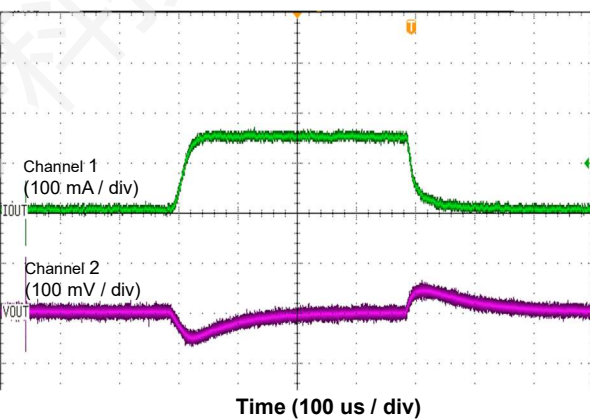
Channel 1 = V_{IN} , Channel 2 = V_{OUT} , $V_{IN}=4.3V \rightarrow 10V$,
 $T_r=T_f=1\mu s$, $V_{OUT}=3.3V$, $I_{OUT}=10mA$

Figure 26. Line Transient



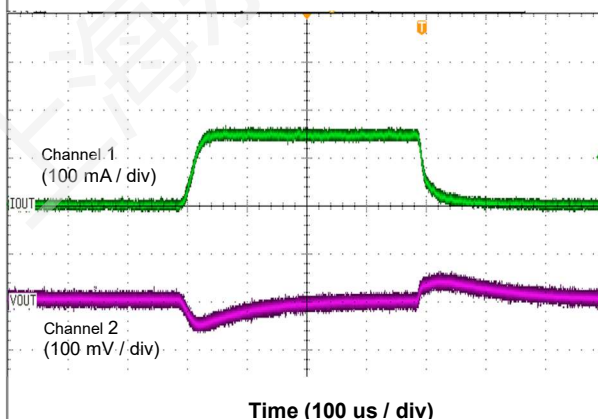
Channel 1 = V_{IN} , Channel 2 = V_{OUT} , $V_{IN}=6.0V \rightarrow 10V$,
 $T_r=T_f=1\mu s$, $V_{OUT}=5.0V$, $I_{OUT}=10mA$

Figure 27. Line Transient



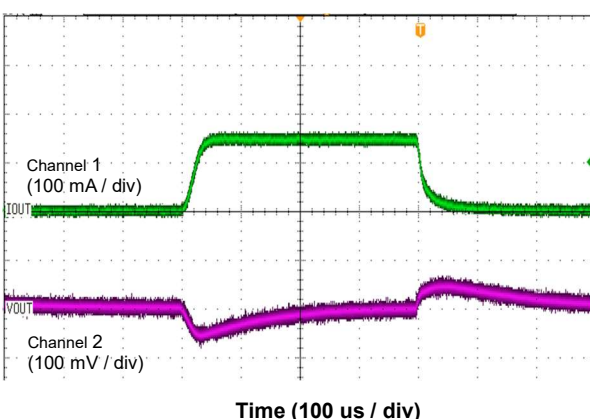
Channel 1 = I_{OUT} , Channel 2 = V_{OUT} , $V_{IN}=3.3V$, $V_{OUT}=1.8V$,
 $C_{IN}=C_{OUT}=1\mu F$

Figure 28. Load Transient (1 mA $\rightarrow$ 150 mA)



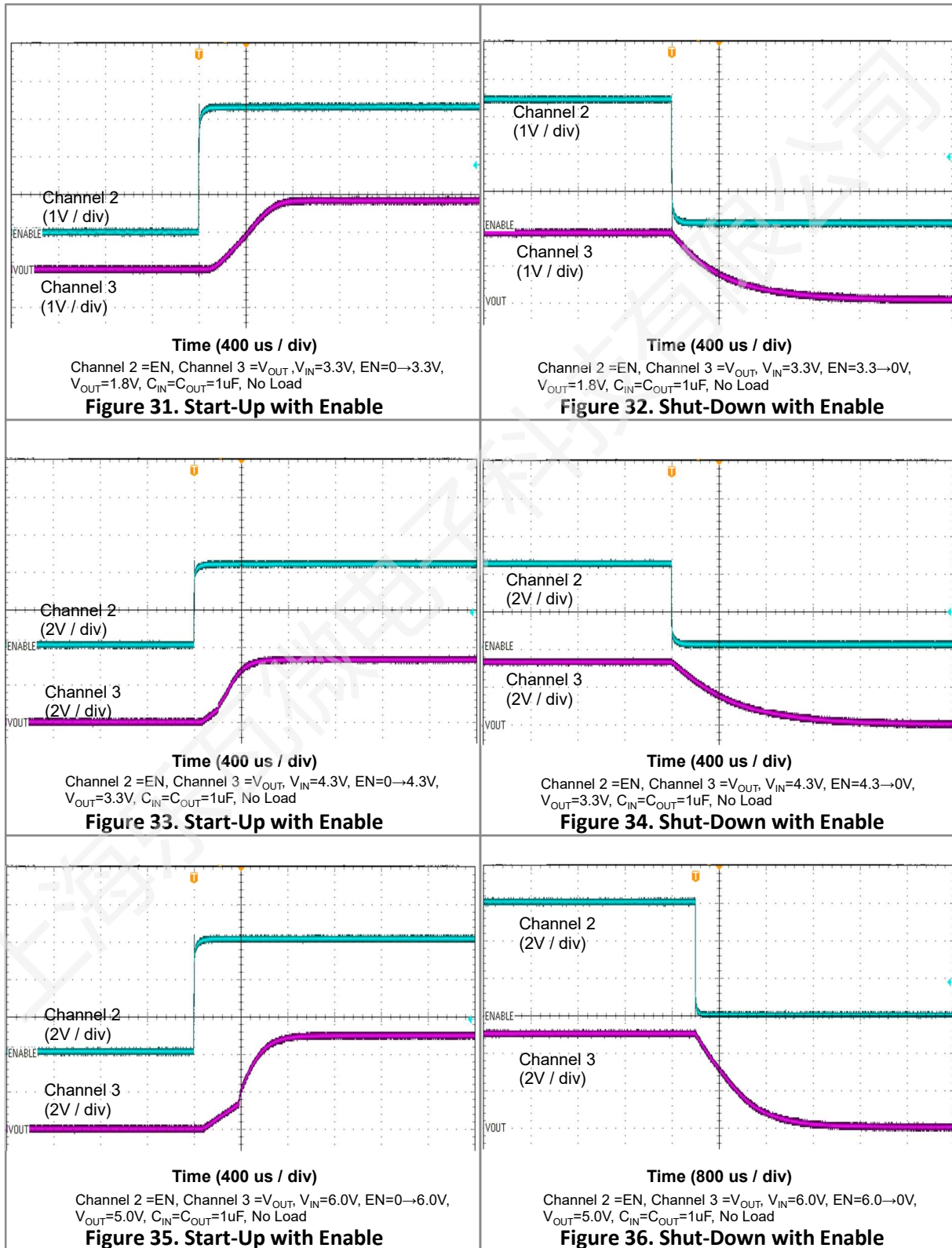
Channel 1 = I_{OUT} , Channel 2 = V_{OUT} , $V_{IN}=4.3V$, $V_{OUT}=3.3V$,
 $C_{IN}=C_{OUT}=1\mu F$

Figure 29. Load Transient (1 mA $\rightarrow$ 150 mA)



Channel 1 = I_{OUT} , Channel 2 = V_{OUT} , $V_{IN}=6.0V$, $V_{OUT}=5.0V$,
 $C_{IN}=C_{OUT}=1\mu F$

Figure 30. Load Transient (1 mA $\rightarrow$ 150 mA)



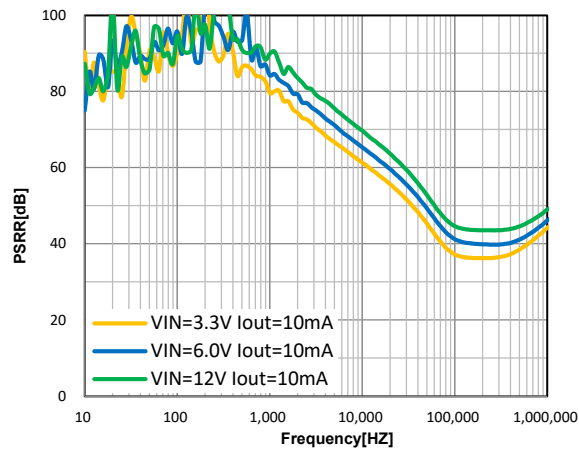


Figure 37. PSRR vs Frequency

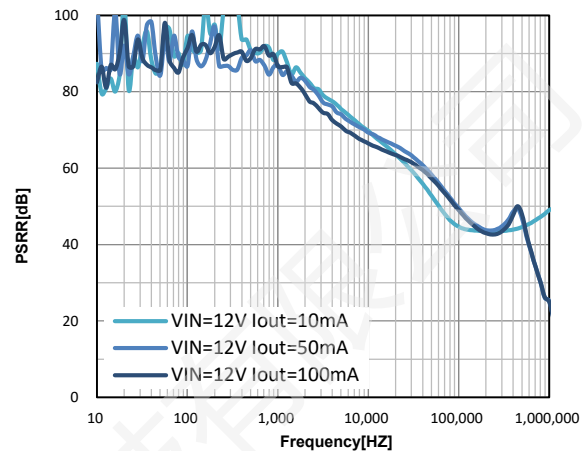


Figure 38. PSRR vs Frequency

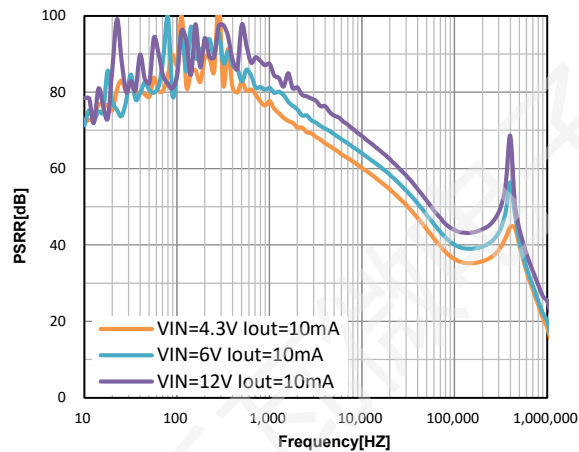


Figure 39. PSRR vs Frequency

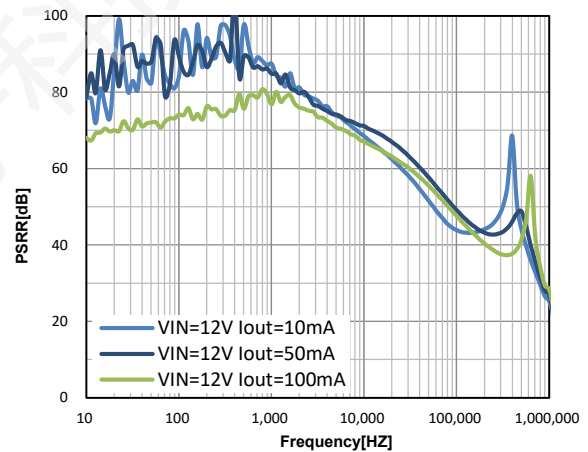


Figure 40. PSRR vs Frequency

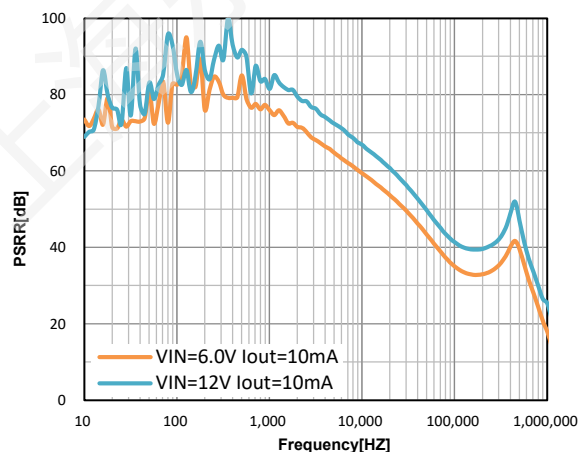


Figure 41. PSRR vs Frequency

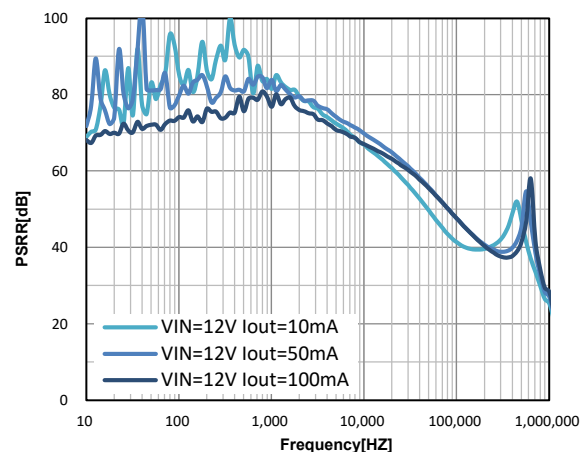


Figure 42. PSRR vs Frequency

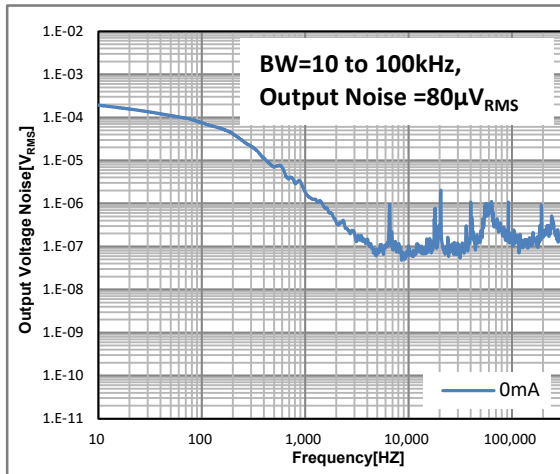


Figure 43. Noise vs Frequency

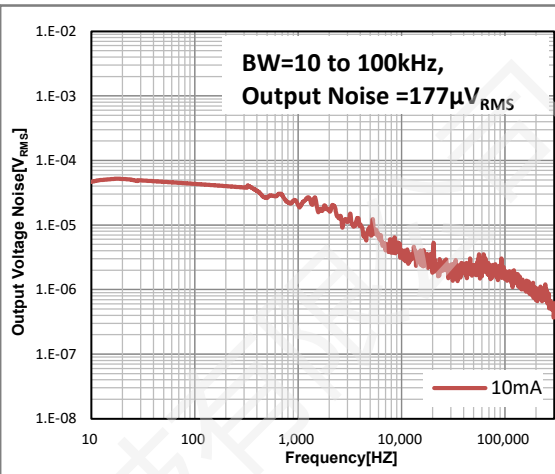


Figure 44. Noise vs Frequency

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:

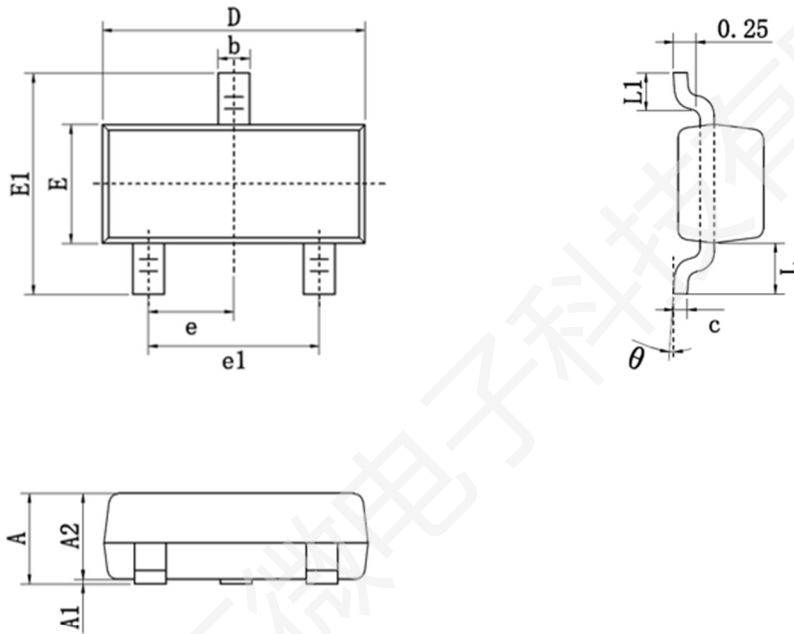
LW65①②③④⑤⑥

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(Type-A)
		B23E	SOT23-5L(Type-B)
		A89C	SOT89-3L(Type-A)
		B89C	SOT89-3L(Type-B)

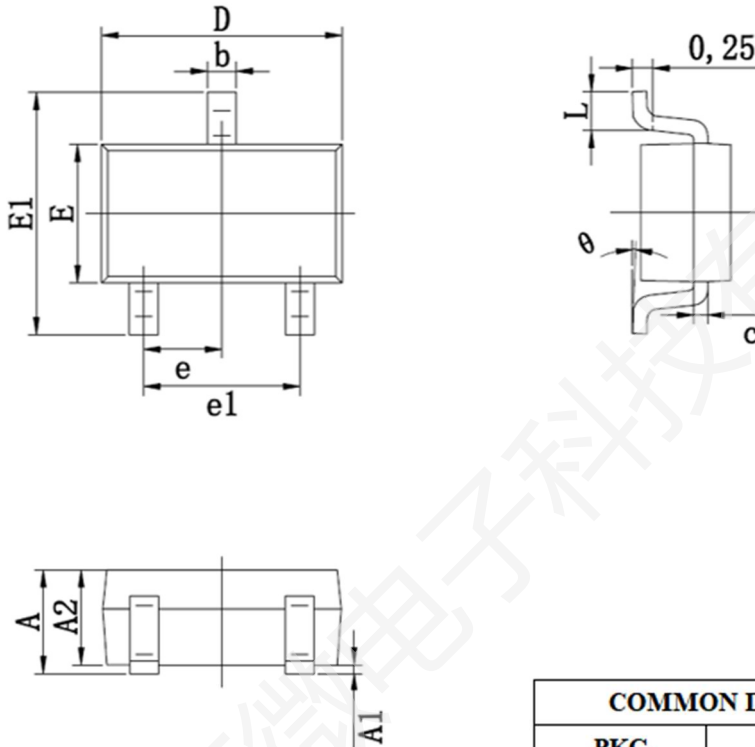
Part #	Output Voltage	Package	Shipping
LW6518N23C	1.8V	SOT23	3000 Pcs/ Tape & Reel
LW6525N23C	2.5V		
LW6530N23C	3.0V		
LW6533N23C	3.3V		
LW6536N23C	3.6V		
LW6540N23C	4.0V		
LW6542N23C	4.2V		
LW6550N23C	5.0V		
LW6518A23D	1.8V	SOT23-3L	3000 Pcs/ Tape & Reel
LW6525A23D	2.5V		
LW6530A23D	3.0V		
LW6533A23D	3.3V		
LW6536A23D	3.6V		
LW6540A23D	4.0V		
LW6542A23D	4.2V		
LW6550A23D	5.0V		
LW6518A23E	1.8V	SOT23-5L(Type-A)	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
LW6518B23E	1.8V	SOT23-5L(Type-B)	3000 Pcs / Tape & Reel
LW6525B23E	2.5V		
LW6530B23E	3.0V		
LW6533B23E	3.3V		
LW6536B23E	3.6V		
LW6540B23E	4.0V		
LW6542B23E	4.2V		
LW6550B23E	5.0V		
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		

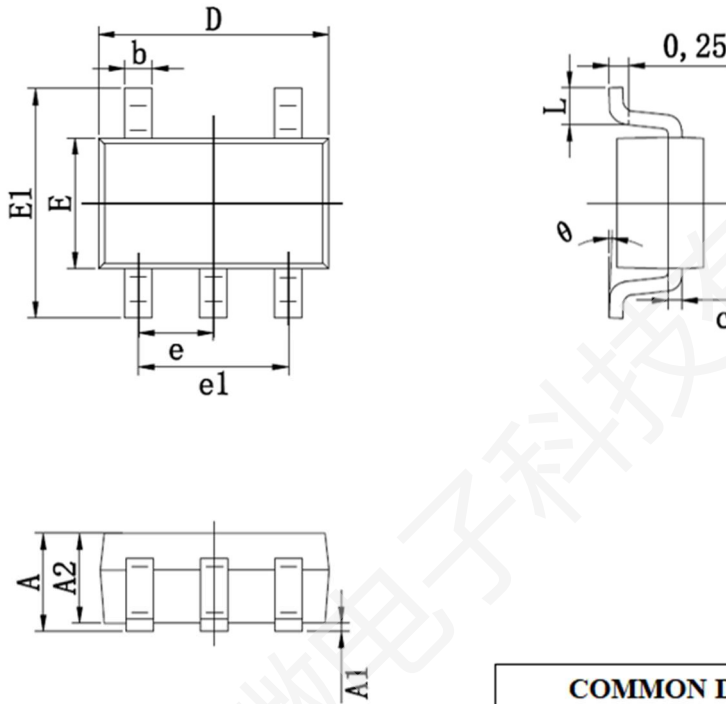
If customers have special output voltage requirements, please contact us.

PACKAGE OUTLINE:
SOT23 Package


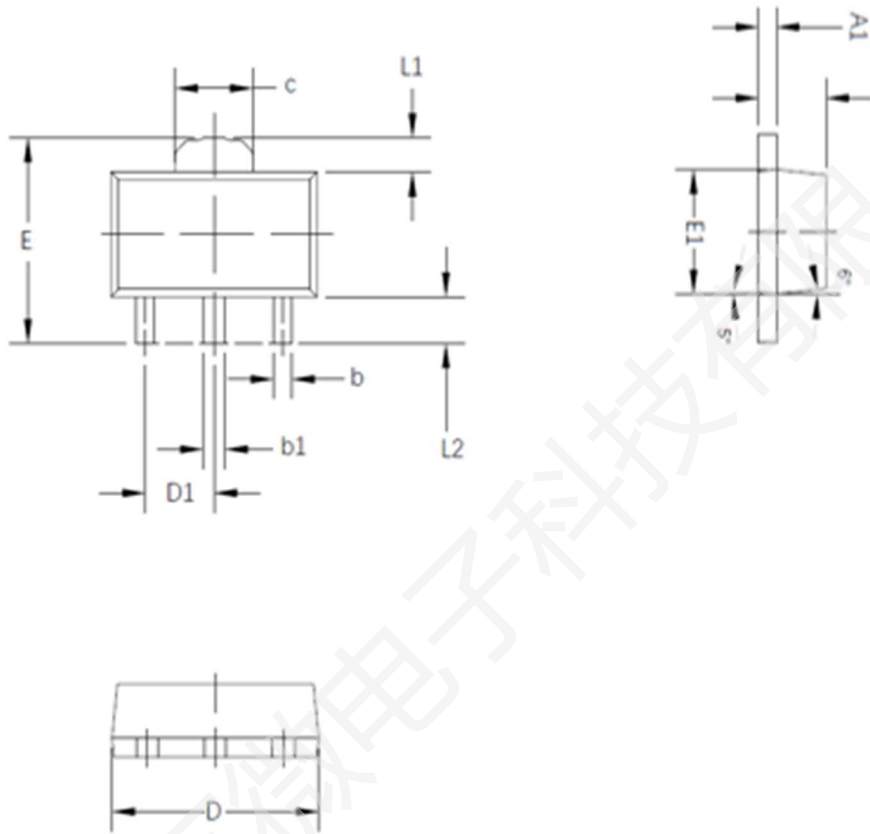
COMMON IN DIMENSION (MM)			
Symbol	Min.	Nom.	Max.
A	—	—	1.150
A1	0.000	—	0.100
A2	0.900	0.950	1.050
b	0.300	0.400	0.500
c	0.100	0.150	0.200
D	2.800	2.900	3.000
E	1.200	1.300	1.400
E1	2.250	2.400	2.550
e	0.950 TYP		
e1	1.800	1.900	2.000
L	0.550 REF		
L1	0.290	—	0.500

SOT23-3L Package


COMMON DIMENSION (MM)			
PKG	SOT23-3L		
Symbol	MIN	NOM	MAX
A	—	—	1.300
A1	0.010	—	0.150
A2	1.050	1.100	1.150
b	0.300	0.350	0.400
c	0.125	0.150	0.175
D	2.870	2.920	2.980
E	1.550	1.610	1.670
E1	2.650	2.850	3.000
e	0.95 BSC		
e1	1.800	1.900	2.000
L	0.300	0.450	0.600
θ	0°	4°	8°

SOT23-5L Package


COMMON DIMENSION (MM)			
PKG	SOT23-5L		
Symbol	MIN	NOM	MAX
A	—	—	1.300
A1	0.010	—	0.150
A2	1.050	1.100	1.150
b	0.300	0.350	0.400
c	0.125	0.150	0.175
D	2.870	2.920	2.980
E	1.550	1.610	1.670
E1	2.650	2.850	3.000
e	0.95 BSC		
e1	1.800	1.900	2.000
L	0.300	0.450	0.600
θ	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
Rev 1.4	Jun.2026	Add New Package

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