GENERAL DESCRIPTION

The LW67XX series is a group 70V high accuracy LDO regulator. The 3.0μA power consumption makes it ideal for most HV power-saving systems. The maximum operating voltage can be as high as 70V. The LW67XX can deliver 100mA output current.

The other features include current limiting protection, short circuit protection and thermal shutdown protection.

The LW67XX is available in ESOP-8, DFN2x2-6L, SOT89-3L and TO-252 packages.

FEATURES

- Low Power Consumption: 3.0μA
- Operating Voltage Range: from 3.5V to 70V
- Output Voltage Range: from 1.5V to 15V
- Output Current: 100mA
- Output Accuracy: ±1.0%
- High PSRR: 80dB@1kHz
- ESD Rating(HBM): ±2KV
- Low Temperature Coefficient
- Built-in Current Limiting, Short-Circuit and Over-Temperature Protection

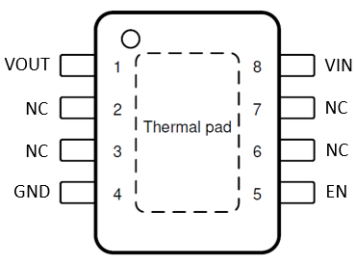
APPLICATIONS

- Battery Supplied Systems
- Telecom Systems
- Portable Audio & Video Equipment
- Ultra-Low Power Microcontroller

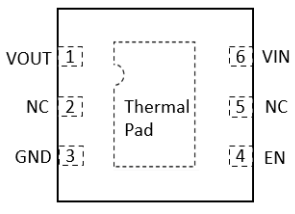
PIN DESCRIPTION:

PIN No				SYMBOL	DESCRIPTTION
ESOP-8	DFN2x2-6L	SOT89-3L	TO-252		
8	6	1	1	VIN	Power Supply Input
4	3	2	2	GND	Ground
5	4	--	--	EN	Chip Enable
2,3,6,7	2,5	--	--	NC	Not Connected
1	1	3	3	VOUT	Output
Thermal pad	Thermal pad	--	--	Pad	Connect the thermal pad to a large area GND plane for improved thermal performance.

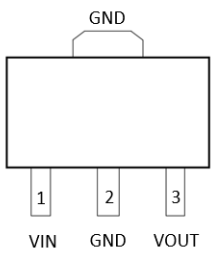
PIN ASSIGNMENT



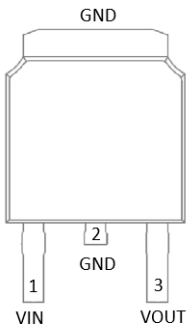
ESOP-8



DFN2x2-6L



SOT89-3L



TO-252

MARK INFORMATION:

TO-252/SOT89-3L

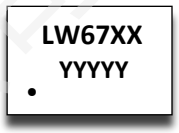
XX: VOLTAGE

Y: DATE CODE

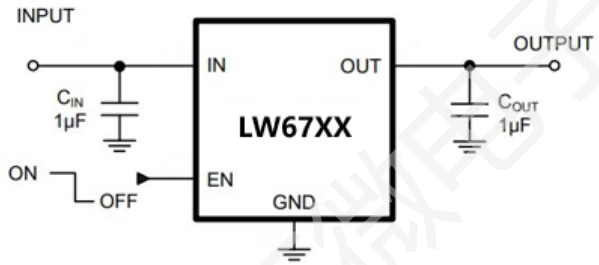
ESOP-8/ DFN2x2-6L

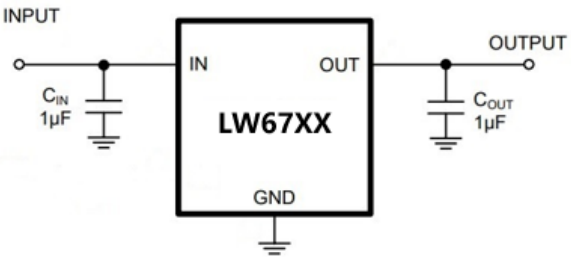
XX: VOLTAGE

YY: DATE CODE



TYPICAL APPLICATION CIRCUIT





ABSOLUTE MAXIMUM RATINGS (1):

Symbol	Item		Rating	Unit
V_{IN}	Supply Voltage		-0.3~80	V
V_{EN}	EN pin to GND Voltage		-0.3~80	V
V_{OUT}	V_{OUT} pin to GND Voltage		-0.3~15	V
$V_{(ESD)}$	ESD Susceptibility, Human-body model(2)		+/-2000	V
$R_{\theta JA}$	Junction-to-ambient Thermal Resistance(3)	ESOP-8	45	℃/W
		DFN2x2-6L	60	℃/W
		SOT89-3L	53	℃/W
		TO-252	35	℃/W
T_J	Junction Temperature Range		-40~150	℃
T_{STG}	Storage Temperature Range		-40~150	℃
T_{SOLDER}	Lead Temperature (Soldering)		260℃, 10s	

Note:

1. Absolute Maximum Ratings are threshold limit values that must not be exceeded even for an instant under any condition. Moreover, such values for any two items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are stress ratings only and do not necessarily imply functional operation below these limits.

2. per ANSI/ESDA/JEDEC JS-001

3. Device mounted on FR-4 PCB

RECOMMANDED OPERATING RANGE:

Symbol	Item	Rating	Unit
V_{IN}	V_{IN} Supply Voltage	3.5~70	V
V_{EN}	EN Pin Voltage	0~70	V
V_{OUT}	V_{OUT} Pin Voltage	1.5~15	V
I_{OUT}	Output Current	0~100	mA
T_J	Junction Temperature Range	-40~125	℃

ELECTRICAL CHARACTERISTICS:

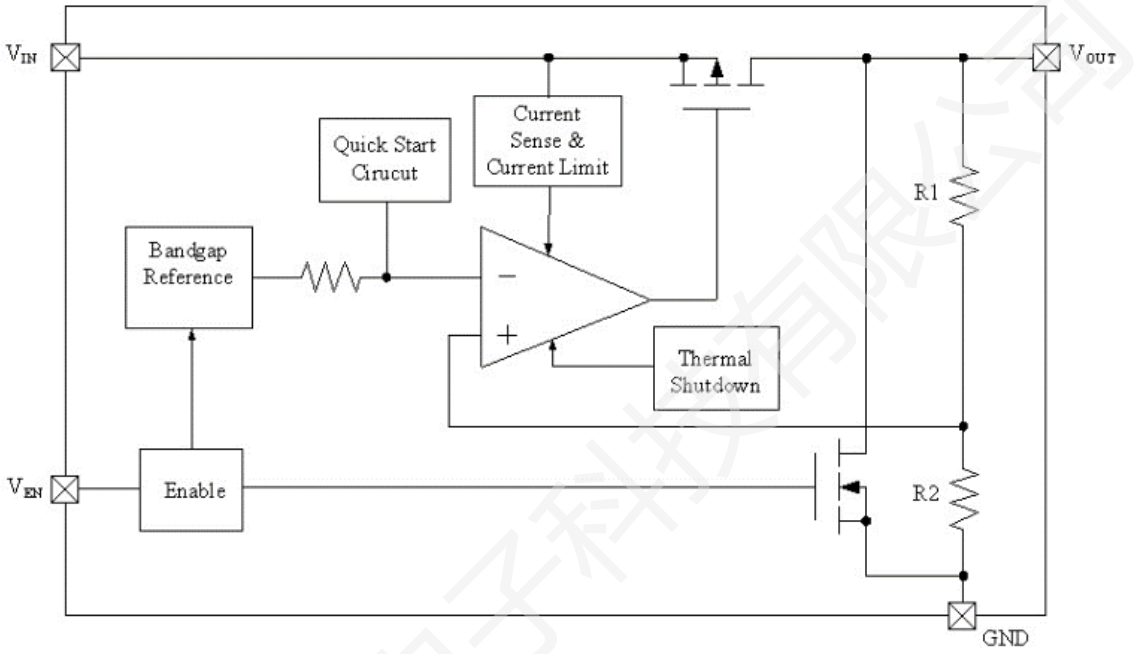
(V_{IN}=V_{OUT}+1V or 2V, whichever is greater, V_{OUT} =3.3V, C_{IN}=C_{OUT}=1uF, T_A =25℃, unless otherwise specified.)

Symbol	Parameter	Test Conditions		MIN	TYP	MAX	Units
V_{IN}	Input Voltage			3.5		70	V
V_{OUT}	Output Accuracy	I_{OUT}= 1mA		-1.0		+1.0	%
I_{LIM}	Current Limit	V_{OUT} =3.3V		100	150		mA
I_Q	Quiescent Current	V_{IN}= V_{EN}=V_{OUT}+1V, No Load	V_{OUT}≤6.0V		3.0	5.0	μA
			V_{OUT}>6.0V		4.0	6.0	
I_{SHD}	Shutdown Current	V_{EN}=0V			0.35	1.0	μA
V_{DROP}	Dropout Voltage(1)	I_{OUT}=10mA, V_{OUT}=3.3V			60		mV
		I_{OUT}=50mA, V_{OUT}=3.3V			320		
		I_{OUT}=100mA, V_{OUT}=3.3V			640		
S_{LINE}	Line Regulation	V_{IN}= V_{OUT} +1V to 70V, I_{OUT}=1mA			0.01	0.02	%/V
S_{LOAD}	Load Regulation	V_{IN}= V_{OUT} +1V, 1mA≤I_{OUT}≤100mA			0.015	0.03	%/mA
I_{SHORT}	Short Current	V_{OUT}=0V			15		mA
V_{ENH}	EN High Voltage	V_{IN}=3.5V to 70V, I_{OUT}=1mA		1.5			V
V_{ENL}	EN Low Voltage					0.5	V
PSRR	Power Supply Rejection Ratio	V_{IN}= 4.3V, V_{PP}=0.5V C_{IN} =None, I_{OUT}=10mA	f=217Hz		81		dB
			f=1KHz		80		
			f=10KHz		77		
			f=100KHz		58		
T_{SD}	Overheat Protection	Temperature rising			160		℃
△T_{SD}	TSD Hysteresis	Temperature falling			25		℃
R_{DSCHG}	R_{ON} of V_{OUT} Discharge MOSFET	V_{IN}= 4.3V, V_{EN}=0V			80		Ω

NOTES:

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

SIMPLIFIED BLOCK DIAGRAM:



DETAIL OPERATION DESCRIPTION:

The LW67XX Series is a low power consumption low drop-out voltage regulator. It consists of a current limiter circuit, a driver transistor, a precision reference voltage 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 of typically 100mA 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.

APPLICATION INFORMATION:

- **Input Capacitor Selection**

Like any low-dropout regulator, the external capacitors used with the LW67XX Series must be carefully selected for regulator stability and performance. Using a capacitor whose value is >=1μF on the LW67XX Series input and the amount of capacitance can be increased without limit. The input capacitor must be located a distance of not more 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.

- **Output Capacitor Selection**

The output capacitor must meet both requirements for minimum amount of capacitance and ESR in all LDOs application. The LW67XX 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 1μF on the LW67XX Series output ensures stability. Output capacitor of larger capacitance can reduce noise and improve load transient response, stability, and PSRR. The output capacitor should be located not more than 0.5 inch from the VOUT pin of the LW67XX Series and returned to a clean analog ground.

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- **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.

TYPICAL OPERATING CHARACTERISTICS:

（*Tested under* T_A *=25*°C, unless otherwise specified）

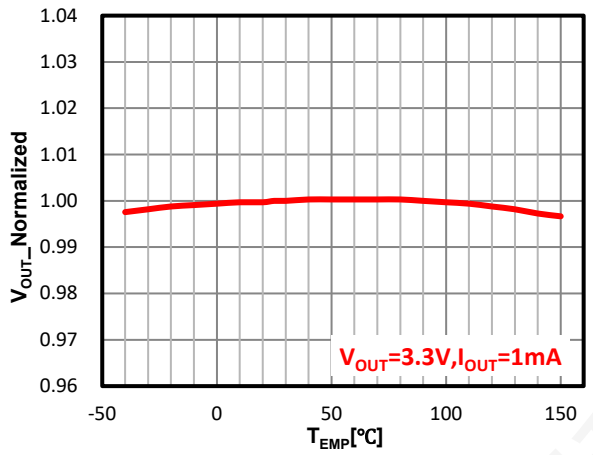


Figure 1. V_{OUT} vs Temperature

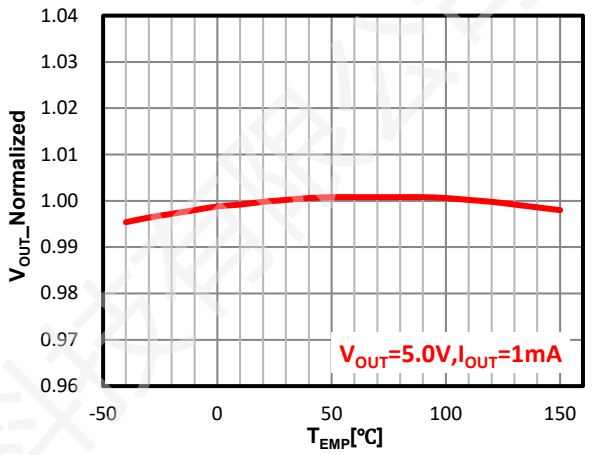


Figure 2. V_{OUT} vs Temperature

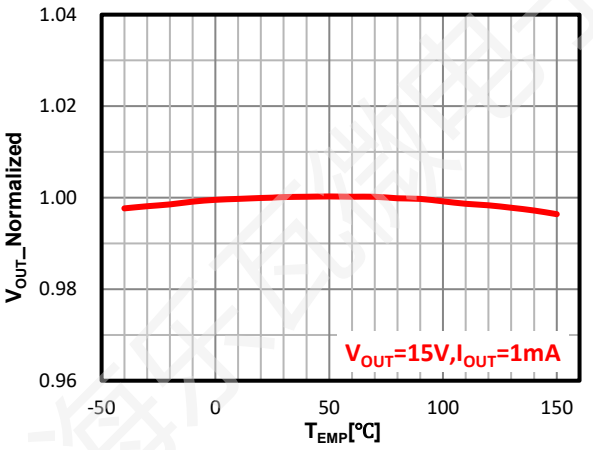


Figure 3. V_{OUT} vs Temperature

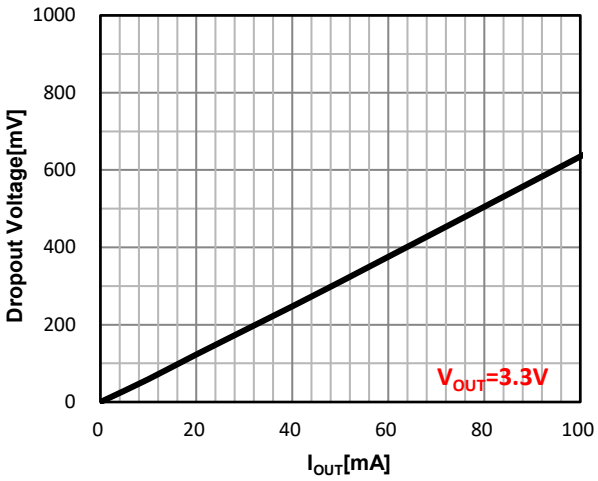


Figure 4. Dropout Voltage VS I_{OUT}

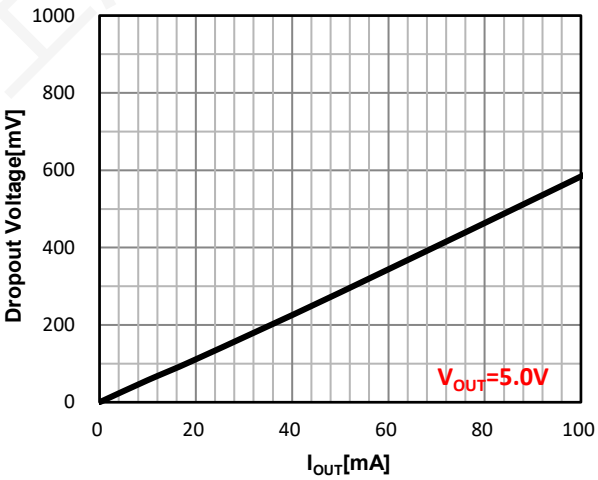


Figure 5. Dropout Voltage VS I_{OUT}

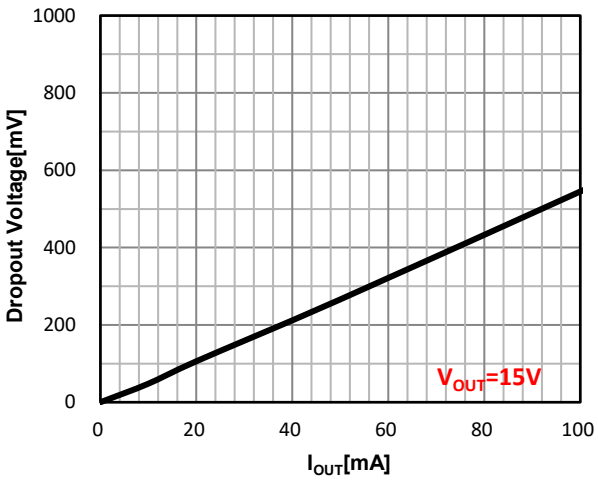


Figure 6. Dropout Voltage VS I_{OUT}

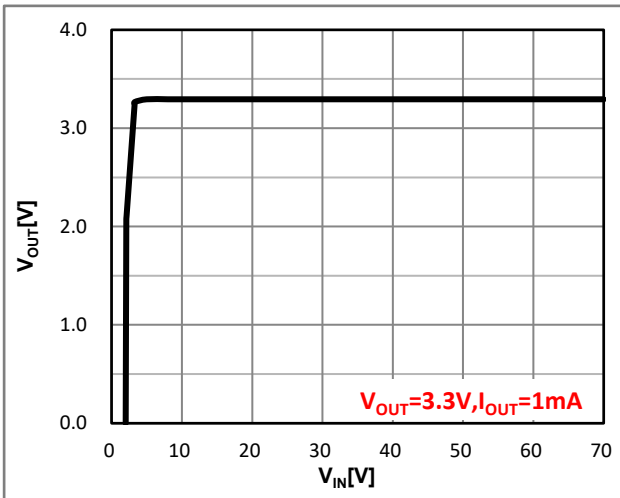


Figure 7. V_{OUT} vs V_{IN}

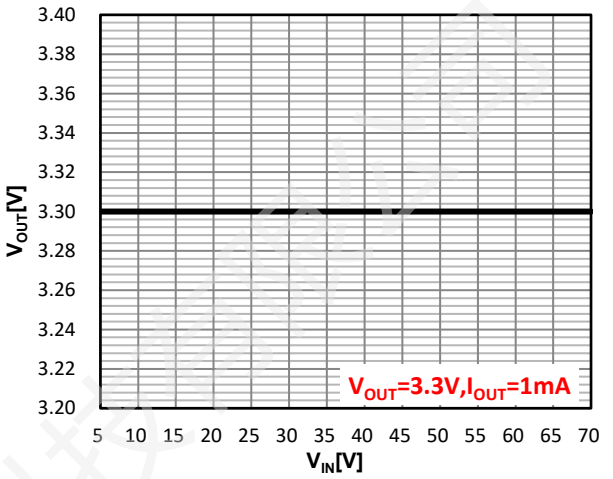


Figure 8. Line Regulation

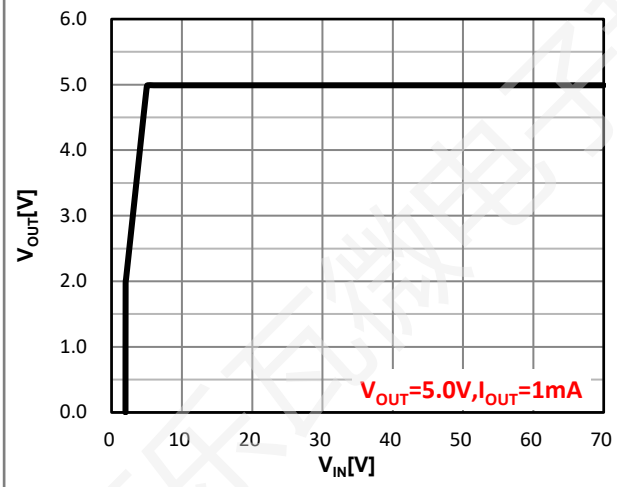


Figure 9. V_{OUT} vs V_{IN}

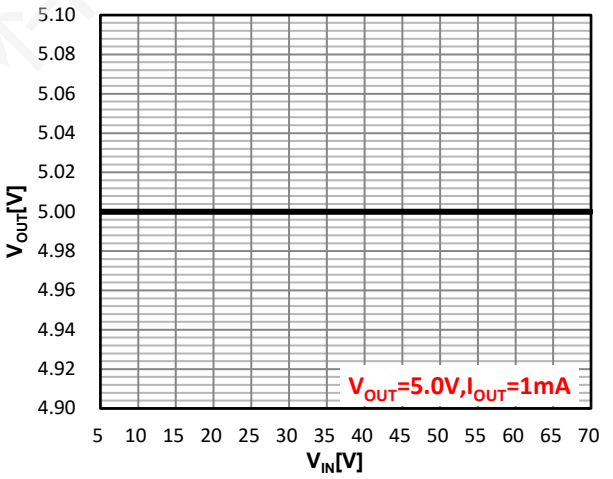


Figure 10. Line Regulation

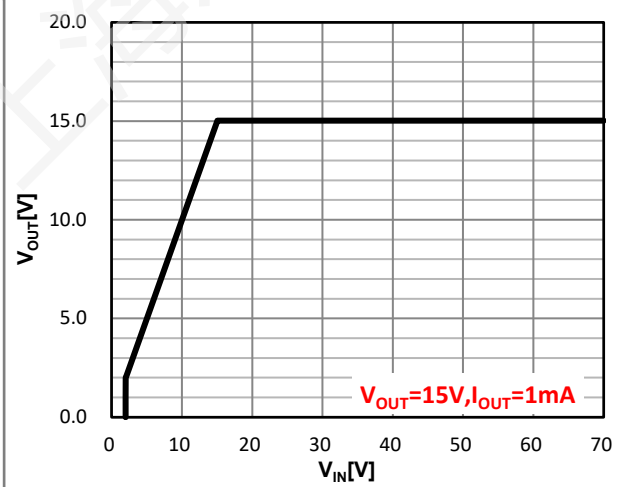


Figure 11. V_{OUT} vs V_{IN}

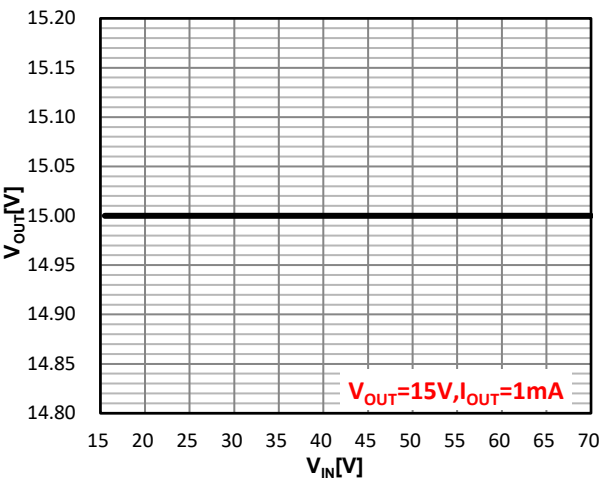


Figure 12. Line Regulation

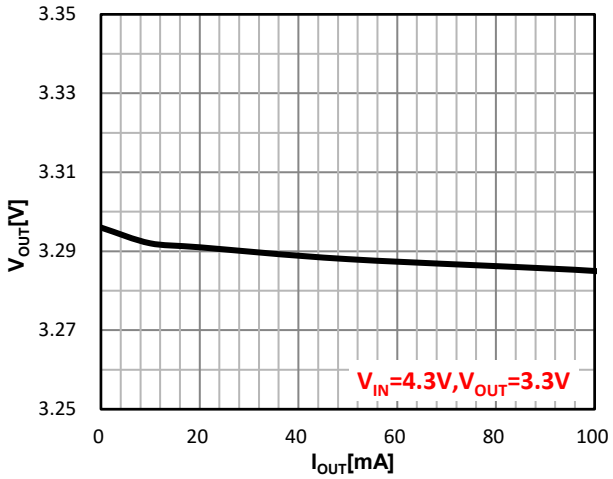


Figure 13. Load Regulation

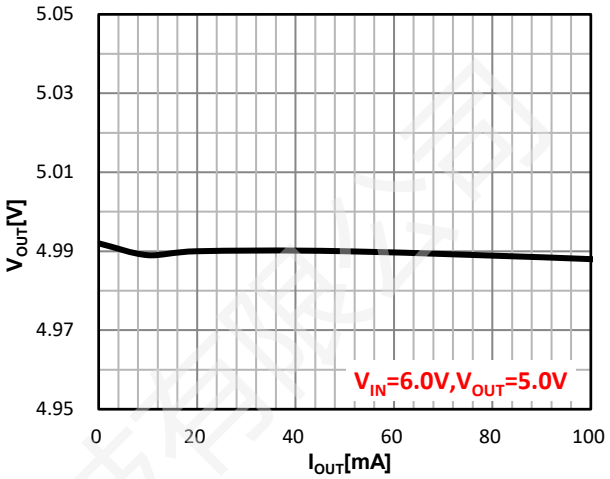


Figure 14. Load Regulation

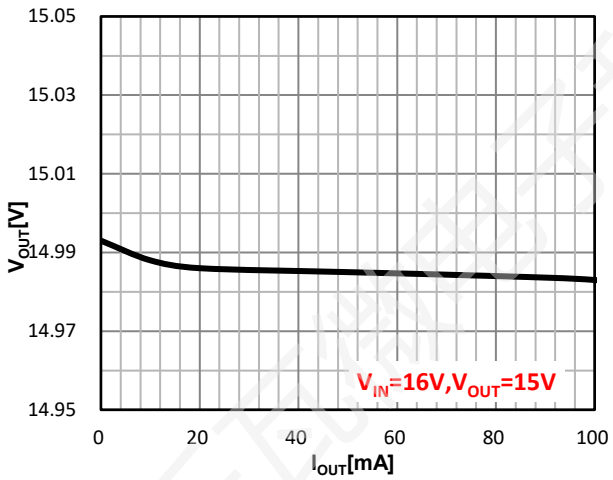


Figure 15. Load Regulation

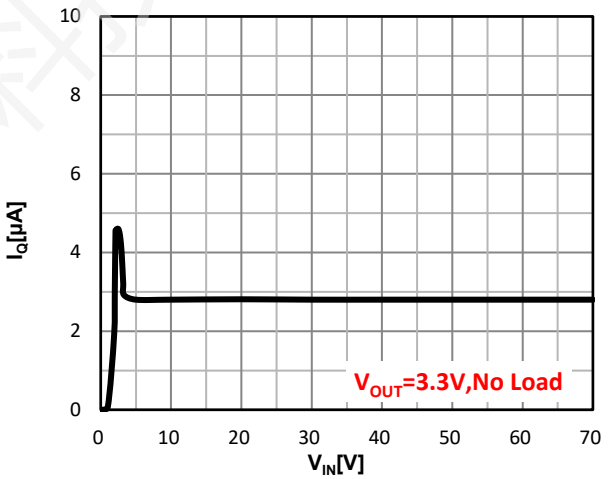


Figure 16. I_Q VS V_{IN}

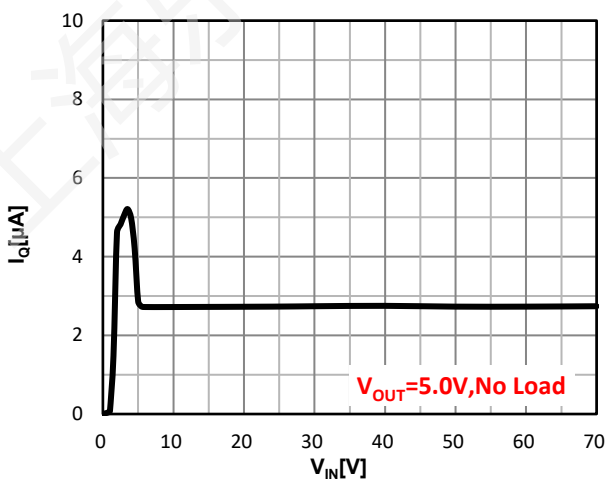


Figure 17. I_Q VS V_{IN}

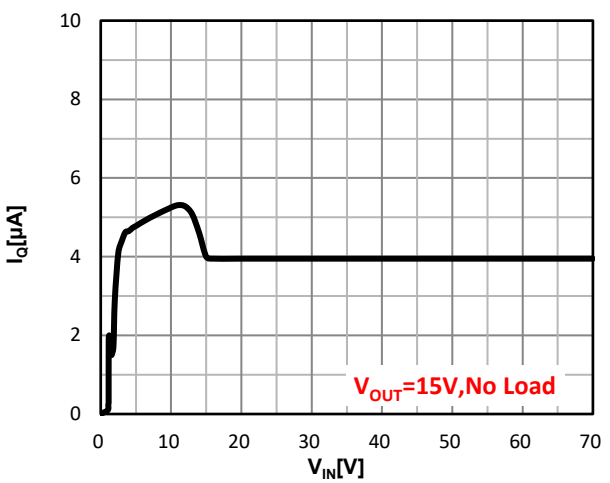
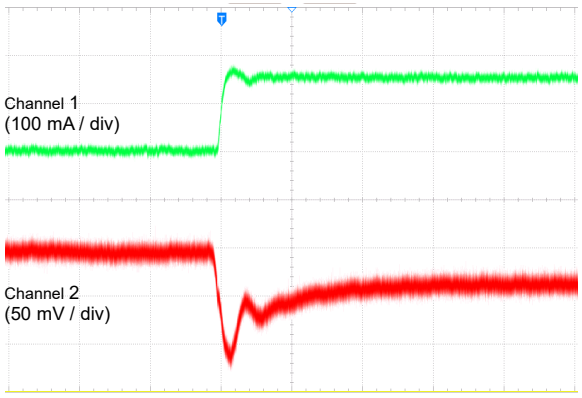


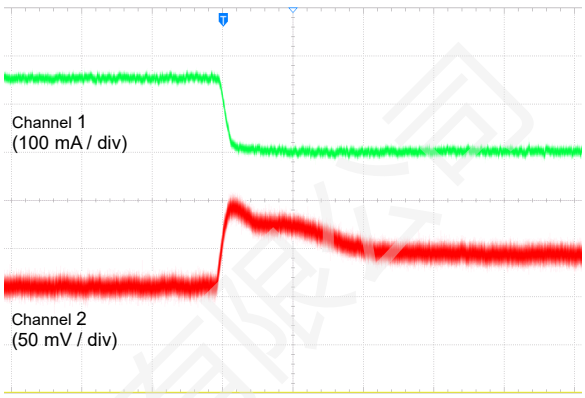
Figure 18. I_Q VS V_{IN}



Time (100 us / div)

Channel 1 = I_{OUT}, channel 2 =V_{OUT}, V_{IN}=4.3V, V_{OUT}=3.3V

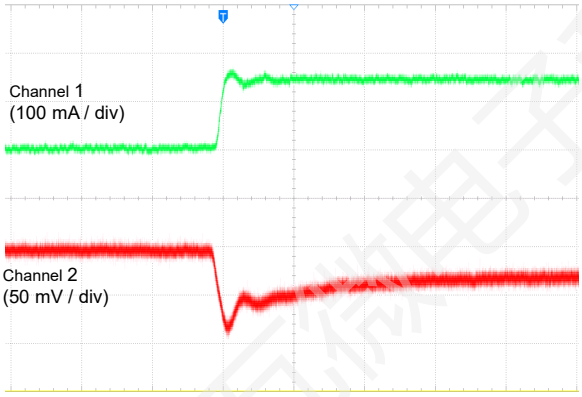
Figure 19. Load Transient (1 mA to 150 mA)



Time (100 us / div)

Channel 1 = I_{OUT}, channel 2 =V_{OUT}, V_{IN}=4.3V, V_{OUT}=3.3V

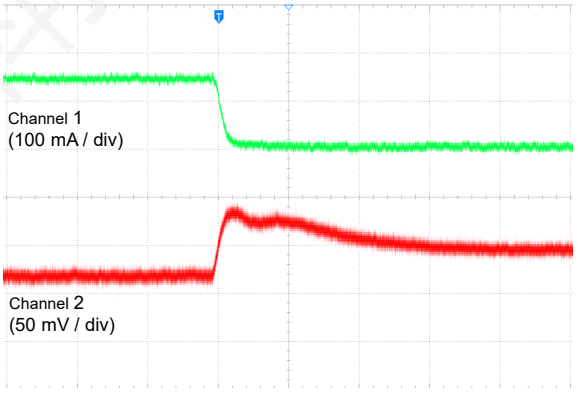
Figure 20. Load Transient (150 mA to 1 mA)



Time (100 us / div)

Channel 1 = I_{OUT}, channel 2 =V_{OUT}, V_{IN}=6.0V, V_{OUT}=5.0V

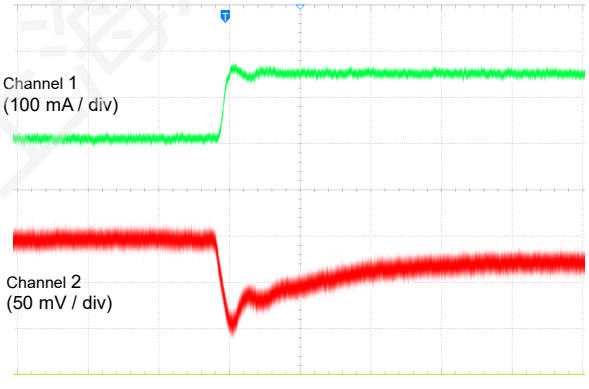
Figure 21. Load Transient (1 mA to 150 mA)



Time (100 us / div)

Channel 1 = I_{OUT}, channel 2 =V_{OUT}, V_{IN}=6.0V, V_{OUT}=5.0V

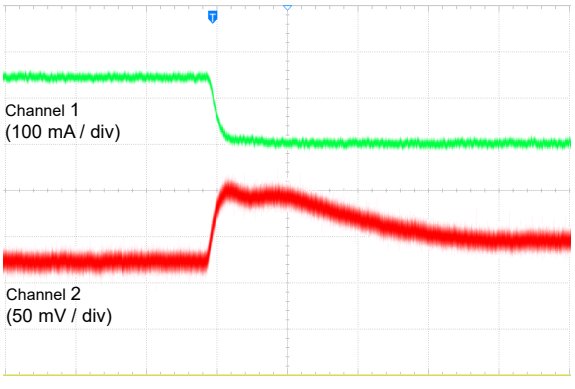
Figure 22. Load Transient (150 mA to 1 mA)



Time (100 us / div)

Channel 1 = I_{OUT}, channel 2 =V_{OUT}, V_{IN}=16V, V_{OUT}=15V

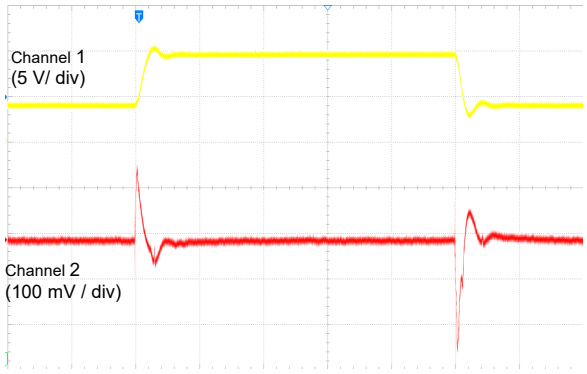
Figure 23. Load Transient (1 mA to 150 mA)



Time (100 us / div)

Channel 1 = I_{OUT}, channel 2 =V_{OUT}, V_{IN}=16V, V_{OUT}=15V

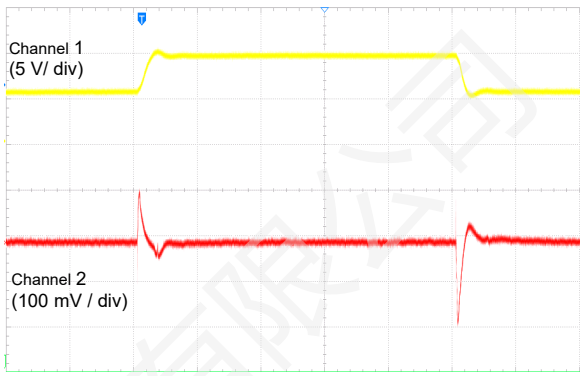
Figure 24. Load Transient (150 mA to 1 mA)



Time (20 us / div)

Channel 1 = V_{IN}, channel 2 =V_{OUT}, V_{IN}=4.3V→10V, Tr=Tf=5us, V_{OUT}=3.3V

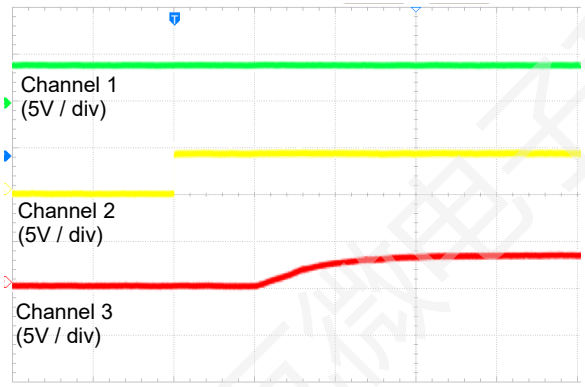
Figure 25. Line Transient



Time (20 us / div)

Channel 1 = V_{IN}, channel 2 =V_{OUT}, V_{IN}=6.0V→10V, Tr=Tf=5us, V_{OUT}=5.0V

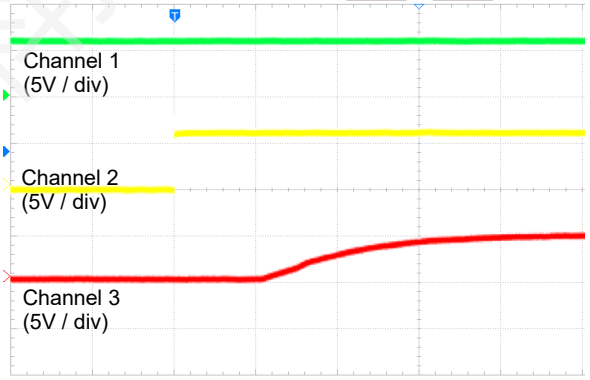
Figure 26. Line Transient



Time (200 us / div)

Channel 1 = V_{IN}, Channel 2 = EN, channel 3 =V_{OUT}, V_{IN}=4.3V, EN=0→4.3V, V_{OUT}=3.3V, No Load

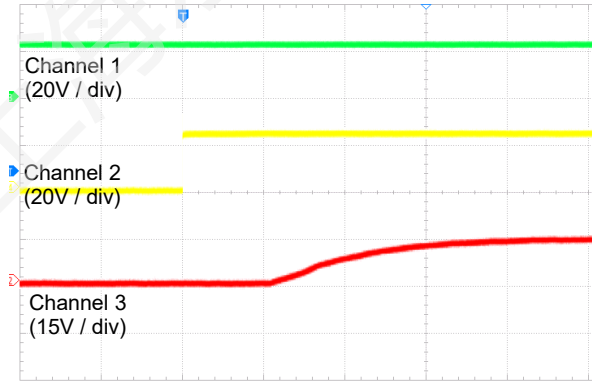
Figure 27. Power-Up with Enable



Time (200 us / div)

Channel 1 = V_{IN}, Channel 2 = EN, channel 3 =V_{OUT}, V_{IN}=6V, EN=0→6V, V_{OUT}=5.0V, No Load

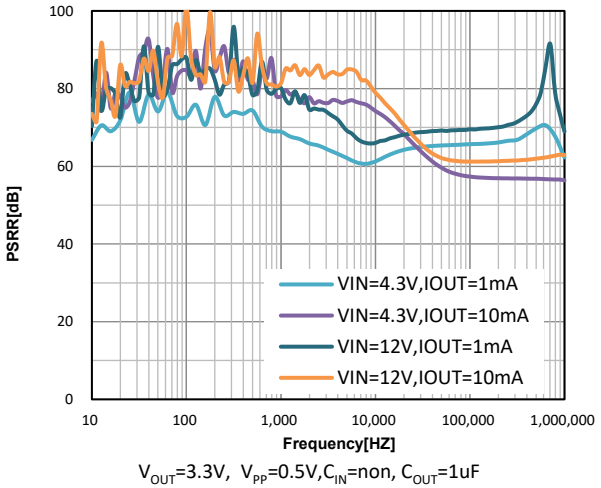
Figure 28. Power-Up with Enable



Time (200 us / div)

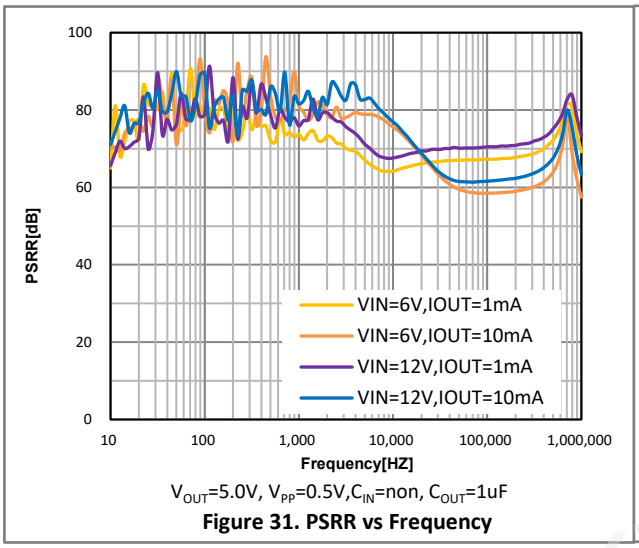
Channel 1 = V_{IN}, Channel 2 = EN, channel 3 =V_{OUT}, V_{IN}=24V, EN=0→24V, V_{OUT}=15V, No Load

Figure 29. Power-Up with Enable



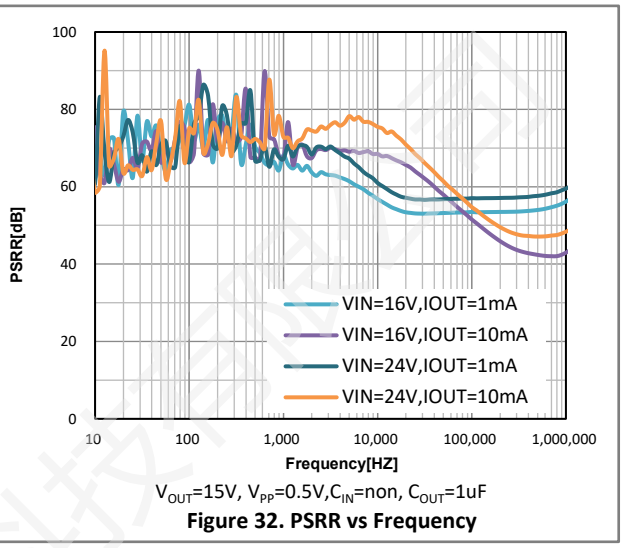
V_{OUT}=3.3V, V_{PP}=0.5V,C_{IN}=non, C_{OUT}=1uF

Figure 30. PSRR vs Frequency



V_{OUT}=5.0V, V_{PP}=0.5V,C_{IN}=non, C_{OUT}=1uF

Figure 31. PSRR vs Frequency



V_{OUT}=15V, V_{PP}=0.5V,C_{IN}=non, C_{OUT}=1uF

Figure 32. PSRR vs Frequency

ORDER INFORMATION:

LW67①②③④⑤⑥

Designator	Item	Symbol	Description
①②	Output Voltage	15~A5	e.g.2.8V→①=2,②=8
③④⑤⑥	Packages	ES8H	ESOP-8
		N22G	DFN2x2-6L(Type-N)
		C89C	SOT89-3L(Type-C)
		A52B	TO-252

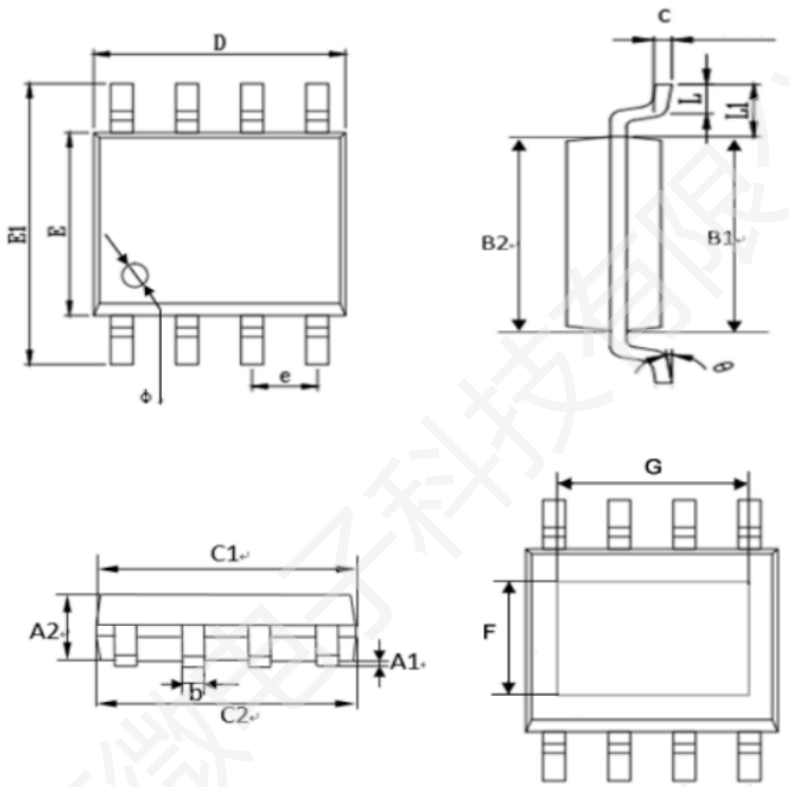
Part #	Output Voltage	Package	Shipping
LW6715ES8H	1.5V	ESOP-8	4000 Pcs / Tape & Reel
LW6718ES8H	1.8V		
LW6725ES8H	2.5V		
LW6730ES8H	3.0V		
LW6733ES8H	3.3V		
LW6736ES8H	3.6V		
LW6740ES8H	4.0V		
LW6750ES8H	5.0V		
LW67A2ES8H	12V		
LW67A5ES8H	15V		
LW6715N22G	1.5V	DFN2x2-6L	3000 Pcs/ Tape & Reel
LW6718N22G	1.8V		
LW6725N22G	2.5V		
LW6730N22G	3.0V		
LW6733N22G	3.3V		
LW6736N22G	3.6V		
LW6740N22G	4.0V		
LW6750N22G	5.0V		
LW67A2N22G	12V		
LW67A5N22G	15V		

Part #	Output Voltage	Package	Shipping
LW6715C89C	1.5V	SOT89-3L	1000 Pcs / Tape & Reel
LW6718C89C	1.8V		
LW6725C89C	2.5V		
LW6730C89C	3.0V		
LW6733C89C	3.3V		
LW6736C89C	3.6V		
LW6740C89C	4.0V		
LW6750C89C	5.0V		
LW67A2C89C	12V		
LW67A5C89C	15V		
LW6715A52B	1.5V	TO-252	2500 Pcs / Tape & Reel
LW6718A52B	1.8V		
LW6725A52B	2.5V		
LW6730A52B	3.0V		
LW6733A52B	3.3V		
LW6736A52B	3.6V		
LW6740A52B	4.0V		
LW6750A52B	5.0V		
LW67A2A52B	12V		
LW67A5A52B	15V		

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

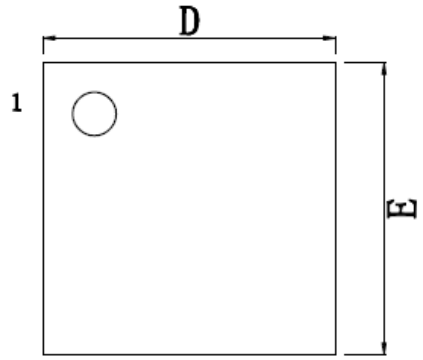
PACKAGE OUTLINE:

ESOP-8 Package

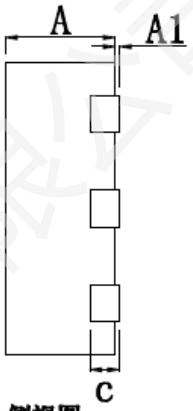


Symbol	TPYE	MIN	MAX
A1	0.11	0.04	0.18
A2	1.4	1.3	1.5
B1	3.9	3.8	4
B2	3.85	3.75	3.95
b	0.42	0.37	0.47
C1	4.85	4.65	5.05
C2	4.9	4.7	5.1
c	0.21	0.18	0.24
D	4.9	4.7	5.1
E	3.9	3.7	4.1
E1	6	5.8	6.2
e	1.27	1.24	1.3
L	0.5	0.4	0.6
L1	1.05	0.99	1.11
G	3.35	3.2	3.5
F	2.35	2.2	2.5

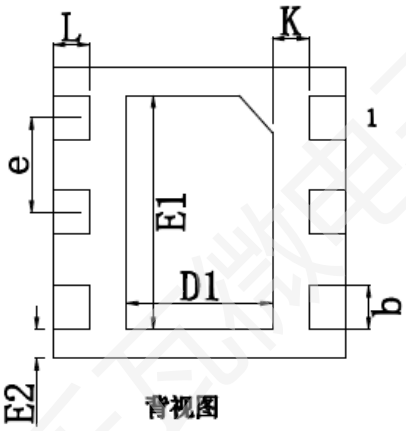
DFN2x2-6L Package



俯视图



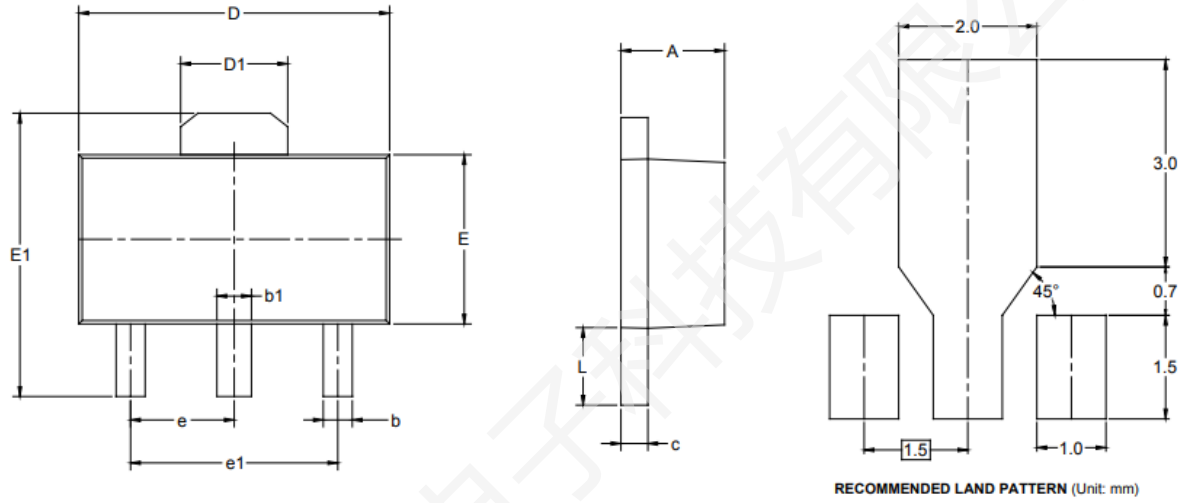
侧视图



背视图

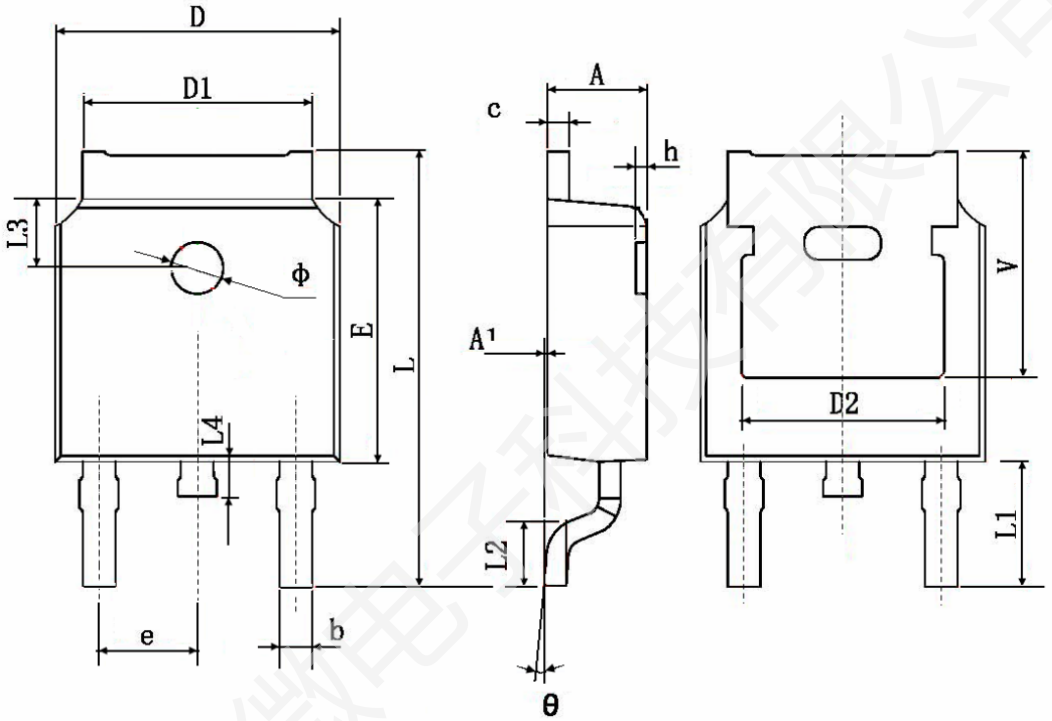
SYMBOL	MILLMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	—	0.05
b	0.25	0.30	0.35
c	0.203 TYP		
D	1.95	2.00	2.05
D1	0.90	1.00	1.10
E	1.95	2.00	2.05
E1	1.55	1.60	1.65
E2	0.20 REF		
e	0.65 BSC		
K	0.25 REF		
L	0.20	0.25	0.30

SOT89-3L Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

TO-252 Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.83 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

Revision History:

Revision	Date	Descriptions
Rev 0.1	Nov.2022	Initial Version
Rev 0.2	Sep.2023	Adjust product definition
Rev 1.0	Jan.2024	Formal Version
Rev 1.1	Oct.2024	Add Package DFN2x2-6L
Rev 1.2	Aug.2025	Distinguish I_Q under different conditions in Ectable

DISCLAIMER:

The information in this document is believed to be accurate and reliable. However, no responsibility is assumed by LW-Micro for its use. All operating parameters must be designed, validated and tested to ensure they meet the requirements of your application. LW-Micro reserves the right to make any specification and/or circuitry changes without prior notification. Before starting a brand-new project, please contact LW-Micro Sales to get the most recent relevant information.

Mailing Address: Unit 02&04&05, 10th Floor, Building 5, No.666 Shengxia Road, No.122 Yindong Road,
China (Shanghai) Pilot Free Trade Zone
Shanghai Lewa Micro-electronics Technology Co., Ltd