WL2848E

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Low Noise, High PSRR, High Speed, CMOS LDO

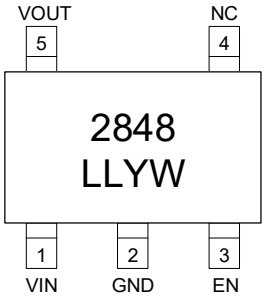
Descriptions

The WL2848E series are high accuracy, low noise, high speed, high PSRR, low dropout CMOS Linear regulators with high ripple rejection. The devices offer a new level of cost effective performance in cellular phones, laptops, notebook computers, and other portable devices.

The WL2848E series support the soft-start which prevents input inrush current. The series also have the fold-back maximum output current which depends on the output voltage. The current limit function serves both as a short circuit protection and as an output current limiter.

The WL2848E regulators are available in a standard SOT-23-5L package. Standard products are Pb-free and Halogen-free.

Figure 1 SOT-23-5L (Package)



2848 = Device code

LL = Voltage code

Y = Year code

W = Week code

Figure 2 Marking of the WL2848E28-5/TR (Top View)

For markings of other WL2848E products, see Order Information.

Features

- Input voltage range: 1.9 V~5.5 V
- Output voltage range: 1.2 V~3.3 V
- Output current: 300 mA
- Quiescent current: typical 58 μA
- Shut-down current: < 1 μA
- Dropout voltage: 168 mV at I_{OUT} = 0.3 A
- PSRR: 74 dB at 1 kHz, V_{OUT} = 2.8 V
- Low output voltage noise: 15×V_{OUT} μV_{RMS}
- V_{OUT} accuracy: ±1.5% at V_{OUT} > 2 V
- Recommended output capacitor: 1 μF
- Thermal overload and short-circuit protection

Applications

- MP3 and MP4 players
- Cellphones, radiophones, digital cameras
- Bluetooth, wireless handsets
- Others portable electronic devices

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Order Information

Table 1

Device	Vout (V)	Package	Operation Temperature	Marking	Shipping
WL2848E12-5/TR	1.2	SOT-23-5L	-40~+85°C	2848 LEYW	Tape and Reel, 3000
WL2848E13-5/TR	1.3	SOT-23-5L	-40~+85°C	2848 LFYW	Tape and Reel, 3000
WL2848E15-5/TR	1.5	SOT-23-5L	-40~+85°C	2848 LGYW	Tape and Reel, 3000
WL2848E18-5/TR	1.8	SOT-23-5L	-40~+85°C	2848 LHYW	Tape and Reel, 3000
WL2848E25-5/TR	2.5	SOT-23-5L	-40~+85°C	2848 LEYW	Tape and Reel, 3000
WL2848E27-5/TR	2.7	SOT-23-5L	-40~+85°C	2848 LYYW	Tape and Reel, 3000
WL2848E28-5/TR	2.8	SOT-23-5L	-40~+85°C	2848 LLYW	Tape and Reel, 3000
WL2848E29-5/TR	2.9	SOT-23-5L	-40~+85°C	2848 LgYW	Tape and Reel, 3000
WL2848E30-5/TR	3.0	SOT-23-5L	-40~+85°C	2848 LMYW	Tape and Reel, 3000
WL2848E33-5/TR	3.3	SOT-23-5L	-40~+85°C	2848 LNYW	Tape and Reel, 3000

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Pin Information

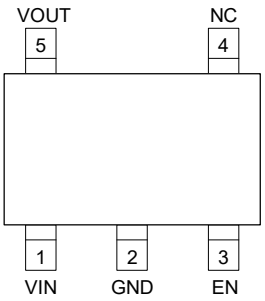

Figure 3 Pin Information(Top View)

Table 2

Pin	Symbol	Description
1	V_{IN}	Unregulated input supply. A 1-μF or larger capacitor improves source impedance, noise, and PSRR.
2	GND	Ground.
3	EN	Driving the pin high turns on the regulator. Driving the pin low makes the regulator operate in the shutdown mode. The EN pin must not be left floating and needs to be connected to the V_{IN} if not used.
4	NC	No connection. Tie the pin to ground to improve thermal dissipation.
5	V_{OUT}	Regulator output. A 1-μF or larger capacitor is required for stability.

Block Diagram

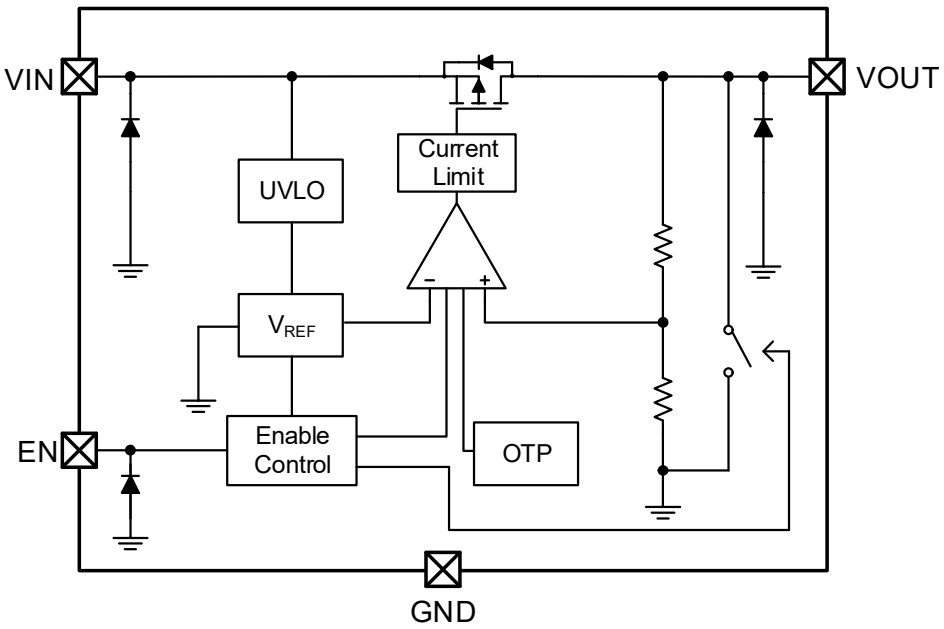

Figure 4 Block Diagram

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Typical Applications

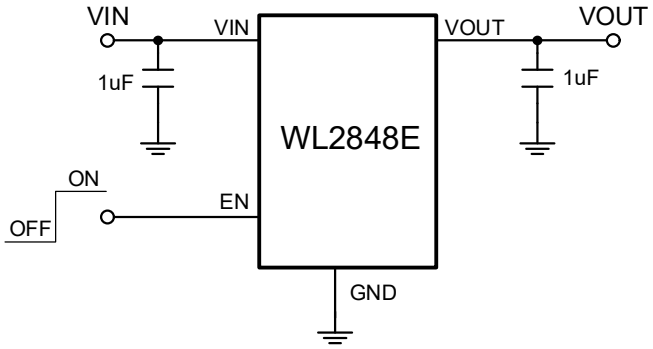

Figure 5 Typical Applications

Note: A 1-uF or larger capacitor is required for stability both in the input and output side. The effective capacitance needs to take the DC-Bias characteristic, tolerance, and temperature into consideration.

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Absolute Maximum Ratings

Stresses exceeding those listed in Table 3 might damage the device.

Table 3

Parameter	Symbol	Min.	Max.	Unit
Input Voltage	V_{IN}	-0.3	6.0	V
Output Voltage	V_{OUT}	-0.3	V_{IN}	V
Enable input voltage	V_{EN}	-0.3	V_{IN}	V
Output Current	I_{OUT}	Internally limited		A
Lead Temperature Range	T_L		260	°C
Storage Temperature Range	T_{STG}	-55	150	°C
Maximum Operating Junction Temperature Range	T_J (Max)	-55	150	°C
Moisture Sensitivity Level	MSL	Level 1		
Junction-to-ambient Thermal Resistance [1]	$R_{\theta JA}$	190		°C/W
ESD Capability, Human Body Model	ESD_{HBM}	2000		V
ESD Capability, Charge Device Model	ESD_{CDM}	500		V

[1] Thermal resistance data is highly dependent on application and board layout. In applications where high maximum power dissipation exists, special care must be paid to thermal dissipation issues in board design. Single component mounted on 2oz, 1.5*1.5 inch^2 FR4 PCB with 1.0*1.0 inch^2 Cu area.

Recommended Operation Conditions

Table 4

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Voltage[2]	V_{IN}	1.9		5.5	V
Output Voltage	V_{OUT}	1.2		3.3	V
Output Current	I_{OUT}	0		300	mA
Input capacitor[3]	C_{IN}		1		uF
Output capacitor[3]	C_{OUT}		1		uF
Operating Junction Temperature	T_J	-40		125	°C
Operating Ambient Temperature Range	T_A	-40		85	°C

[2] The minimum input voltage needs to be larger than (V_{OUT}+V_{DROP}) or 1.9 V, whichever is greater.

[3] The recommended capacitor is 1 uF or larger when considering stability.

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Electrical Characteristics

Over T_J from -40°C to +85°C, V_{IN}=V_{OUT}+1 V, V_{EN}=V_{IN}, I_{OUT}=1 mA, C_{IN}=1 μF, C_{OUT}=1 μF, unless otherwise noted. Typical values are at T_J=25°C.

Table 5

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}			1.9		5.5	V
V_{IN} Under Voltage Lockout	V_{IN} UVLO	Rising, I_{OUT}=1 mA (design guarantee)		1.66	1.75	1.84	V
		Falling, I_{OUT}=1 mA (design guarantee)		1.55	1.64	1.73	V
Output Voltage Accuracy	V_{OUT}	V_{IN}=V_{OUT}+1 V, T_A=25℃	V_{OUT}≤2.0 V	-30		30	mV
			V_{OUT}>2.0 V	-1.5		1.5	%
Dropout Voltage	V_{DROP}	V_{OUT}=0.98 ×$V_{OUT(NOM)}$	$V_{OUT(NOM)}$=3.3 V, I_{OUT}=300 mA		148	229	mV
			$V_{OUT(NOM)}$=3.0 V, I_{OUT}=300 mA		160	240	
			$V_{OUT(NOM)}$=2.8 V, I_{OUT}=300 mA		168	251	
			$V_{OUT(NOM)}$=1.8 V, I_{OUT}=300 mA		247	384	
Line Regulation	$\triangle V_{LINE}$	V_{OUT}+1 V≤V_{IN}≤5.5 V, I_{OUT}=1 mA			1	6	mV
Load Regulation	$\triangle V_{Load}$	V_{IN}=V_{OUT}+1 V, I_{OUT}=1 mA~300 mA			22	49	mV
Quiescent Current	I_Q	I_{OUT}=0 mA			58	105	μA
Shut-down Current	I_{SHDN}	V_{EN}=0 V, 1.9 V≤V_{IN}≤5.5 V				1.0	μA
Output Current Limit	I_{CL}	V_{OUT}=0.85×$V_{OUT(NOM)}$，V_{IN}≥$V_{OUT(NOM)}$+1 V			700		mA
Short Current	I_{SHORT}	V_{EN}=V_{IN}, V_{OUT} short to GND			140		mA
Power Supply Rejection Rate	PSRR	V_{IN}=(V_{OUT}+1 V)$_{DC}$+0.5V_{P-P} I_{OUT}=10 mA, V_{OUT}=2.8 V, C_{IN}=0 uF, C_{OUT}=1 uF	f=100 Hz		73		dB
			f=1 kHz		74		dB
			f=10 kHz		69		dB
			f=100 kHz		56		dB
			f=1 MHz		58		dB
EN Logic High Voltage	V_{ENH}	V_{IN} within its range		0.82			V
EN Logic Low Voltage	V_{ENL}	V_{IN} within its range				0.4	V
EN Input Current	I_{EN}	V_{EN}=V_{IN}=5.5 V			0.5		μA
Output Noise Voltage	e_{NO}	V_{IN}=V_{OUT}+1 V, C_{OUT}=1 μF, I_{OUT}=100 mA, 10 Hz to 100 kHz			15× V_{OUT}		μV_{RMS}
Thermal Shutdown Threshold	T_{SD}				160		°c
Thermal Shutdown hysteresis	$\triangle T_{SD}$				30		°c
Output Auto-discharge Resistance	R_{LOW}	V_{IN}=V_{OUT}=4 V, V_{EN}=0 V			240		Ω

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Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Turn-On Time	Ton	From assertion of EN signal to 90% $V_{OUT(NOM)}$, C_{IN}=1 uF, C_{OUT}=1 uF, I_{OUT}=1 mA, V_{IN}=V_{OUT}+1 V	V_{OUT}=2.8 V		1.0	2.00	ms
			V_{OUT}=1.8 V		0.8	1.82	
			V_{OUT}=1.2 V		0.7	1.52	
V_{OUT} Rise Time	trise	V_{OUT} from 10% to 90% $V_{OUT(NOM)}$, C_{IN}=C_{OUT}=1 uF, I_{OUT}=1 mA, V_{IN}=V_{OUT}+1 V	V_{OUT}=2.8 V		320		us
			V_{OUT}=1.8 V		180		
			V_{OUT}=1.2 V		100		

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Typical characteristics

At V_{OUT}=2.8 V, V_{IN}=V_{OUT}+1 V or 1.9 V (whichever is greater), I_{OUT}=1 mA, C_{IN}=1 µF, C_{OUT}=1 µF, V_{EN}=2.2 V and T_J=25°C, unless otherwise noted.

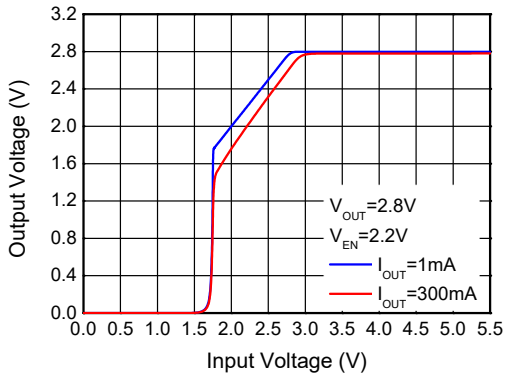

Figure 6 Output Voltage vs. Input Voltage

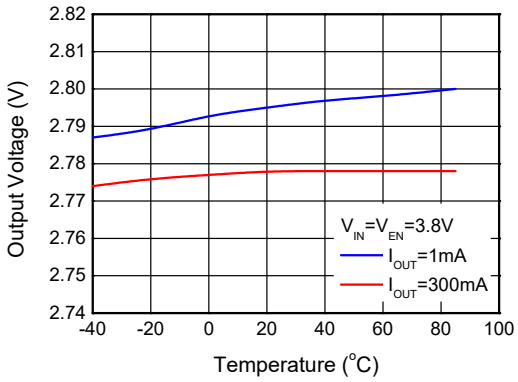

Figure 7 Output Voltage vs. Temperature

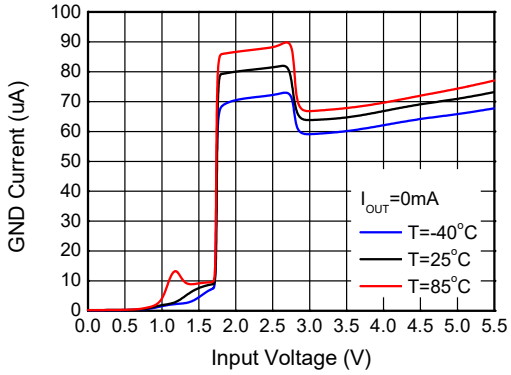

Figure 8 GND Current vs. Input Voltage

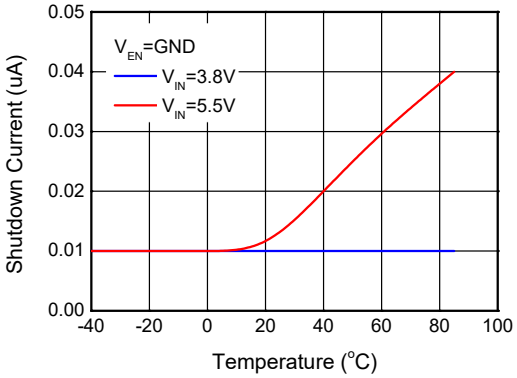

Figure 9 Shutdown Current vs. Temperature

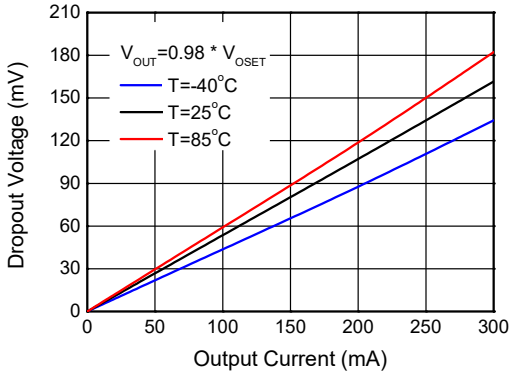

Figure 10 Dropout Voltage vs. Output Current

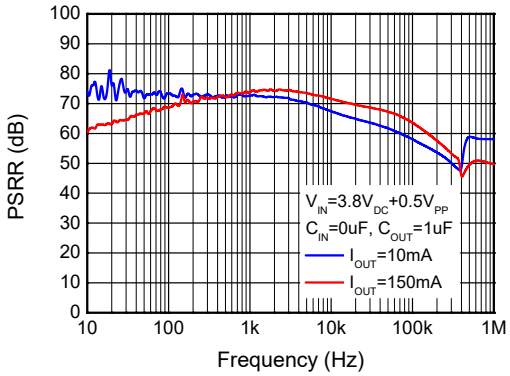

Figure 11 PSRR vs. Frequency

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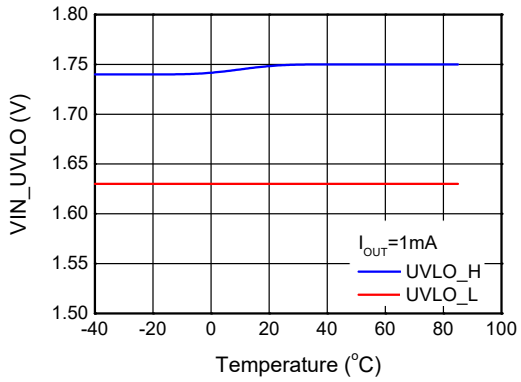

Figure 12 VIN_UVLO vs. Temperature

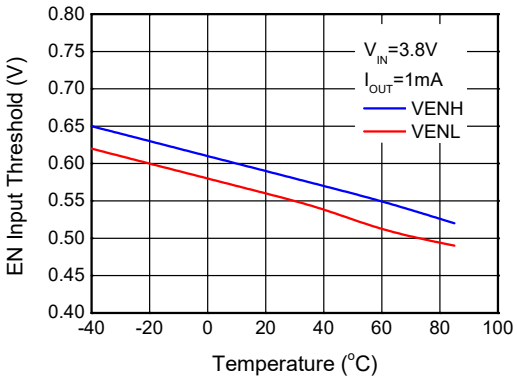

Figure 13 EN Input Threshold vs. Temperature

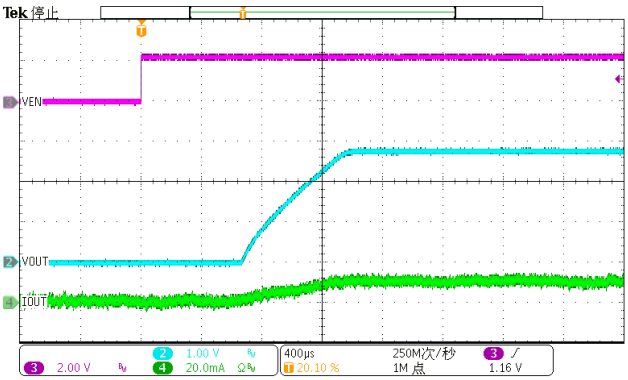

Figure 14 Start by EN (<10 us) , (VIN=3.8 V, VEN=2.2 V, IOUT=10 mA)

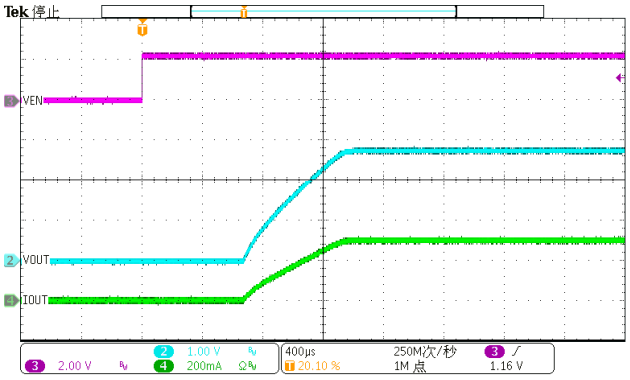

Figure 15 Start by EN (<10 us) , (VIN=3.8 V, VEN=2.2 V, IOUT=300 mA)

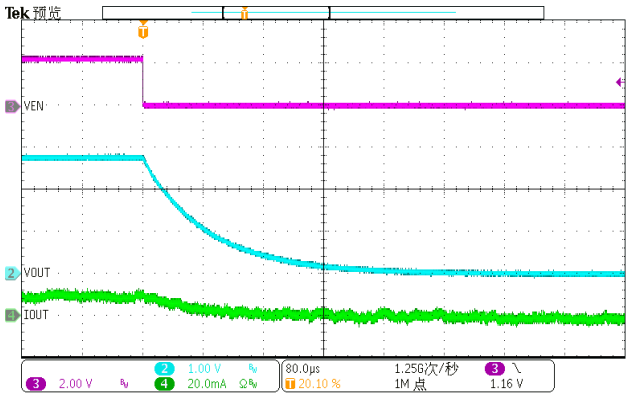

Figure 16 Shutdown by EN (<10 us) , (VIN=3.8 V, VEN=2.2 V, IOUT=10 mA)

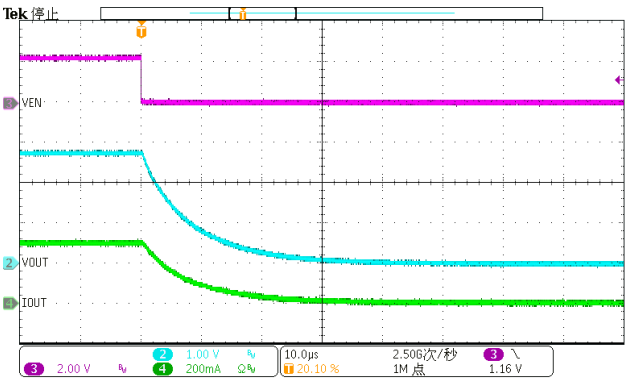

Figure 17 Shutdown by EN (<10 us) , (VIN=3.8 V, VEN=2.2 V, IOUT=300 mA)

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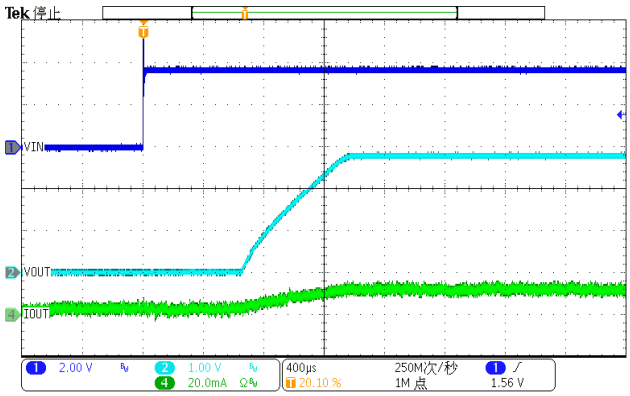

Figure 18 Start by VIN (<10 us) , (VIN=3.8 V, VEN=2.2 V, IOUT=10 mA)

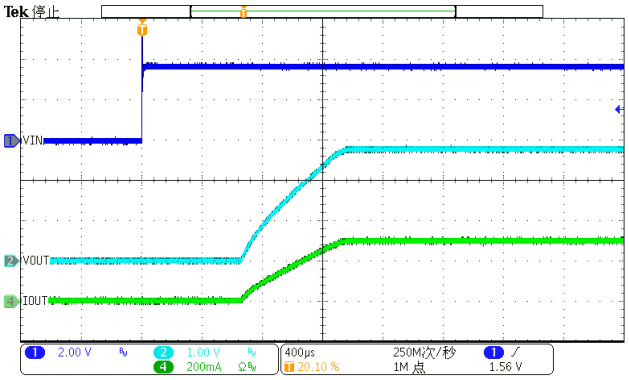

Figure 19 Start by VIN (<10 us) , (VIN=3.8 V, VEN=2.2 V, IOUT=300 mA)

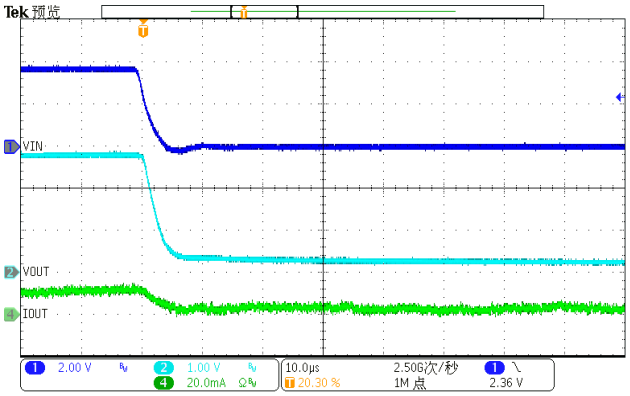

Figure 20 Shutdown by VIN (<10 us) , (VIN=3.8 V, VEN=2.2 V, IOUT=10 mA)

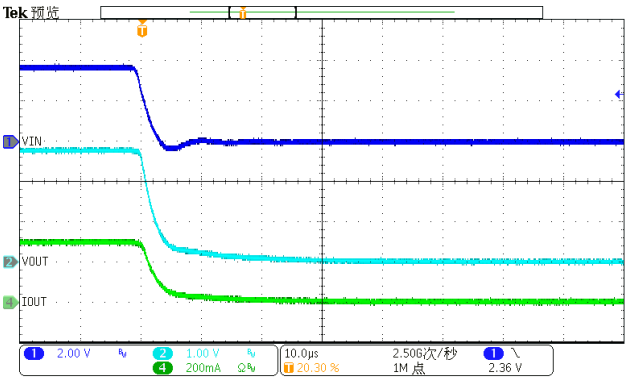

Figure 21 Shutdown by VIN (<10 us) , (VIN=3.8 V, VEN=2.2 V, IOUT=300 mA)

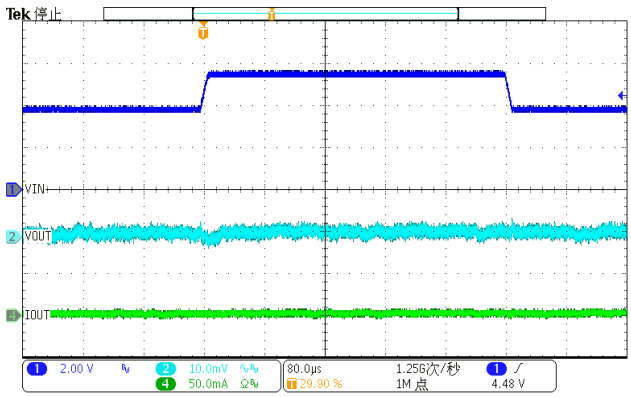

Figure 22 Line Transient, (VIN=3.8 V-->5.5 V-->3.8 V, VEN=2.2 V; Iout=1 mA)

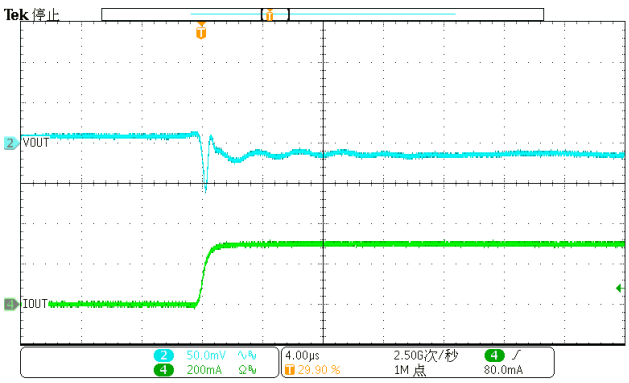

Figure 23 Load Transient, (VIN=3.8 V, Iout=1 mA~300 mA)

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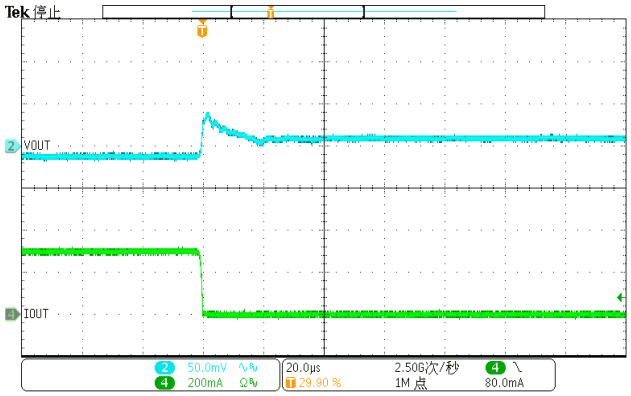

Figure 24 Load Transient , (VIN=3.8V, Iout=300mA~1mA)

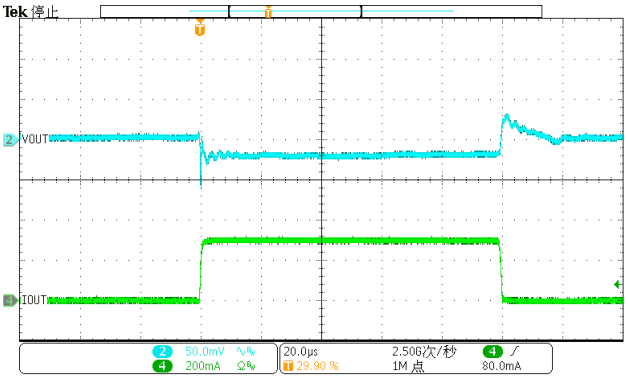

Figure 25 Load Transient , (VIN=3.8V, Iout=1mA-300mA~1mA)

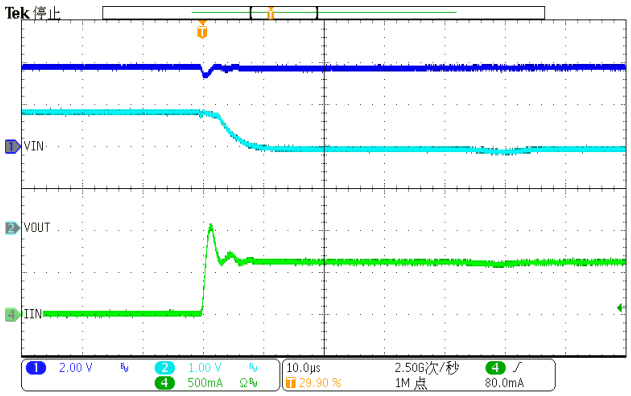

Figure 26 Output OCL, (VIN=3.8 V, VEN=2.2 V)

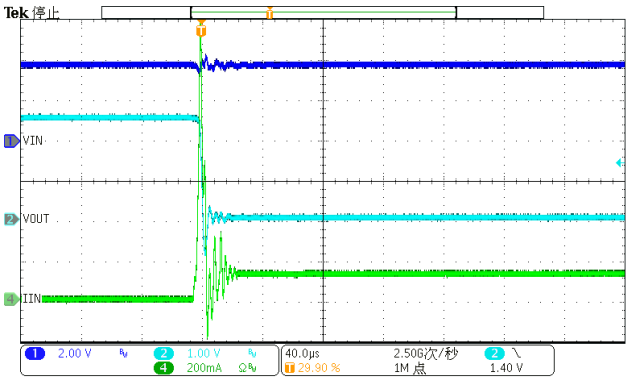

Figure 27 Output Short, (VIN=3.8 V, VEN=2.2 V)

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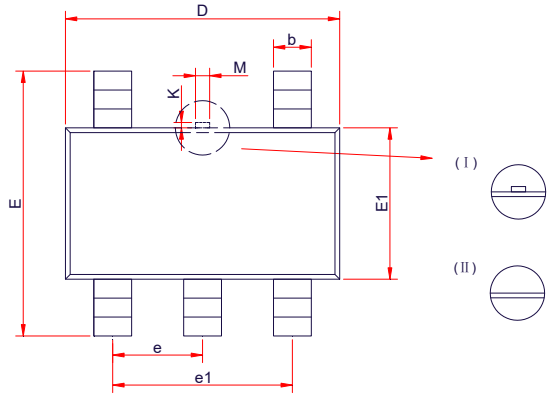
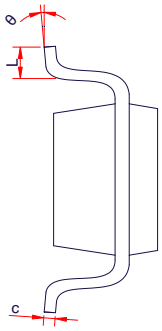
Package Outline Dimensions

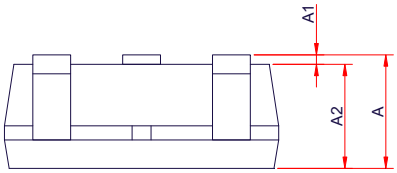
SOT-23-5L



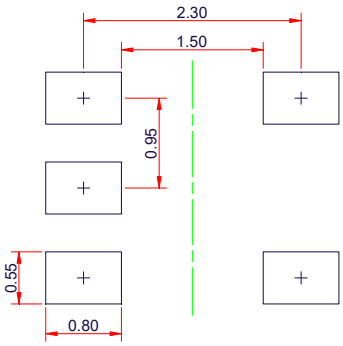
TOP VIEW



SIDE VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (unit: mm)

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	-	-	1.25
A1	0.00	-	0.15
A2	1.00	1.10	1.20
b	0.30	0.40	0.50
c	0.10	-	0.21
D	2.72	2.92	3.12
E	2.60	2.80	3.00
E1	1.40	1.60	1.80
e	0.95 BSC		
e1	1.90 BSC		
L	0.30	0.45	0.60
M	0.10	0.15	0.25
K	0.00	-	0.25
θ	0°	-	8°

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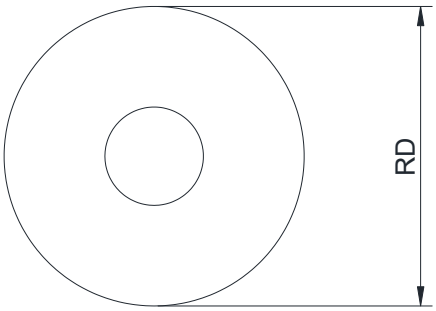
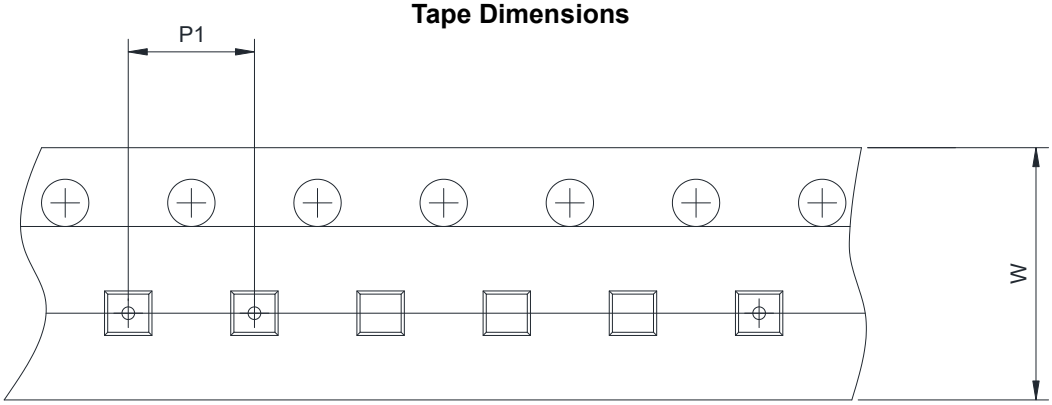
Tape and Reel Information

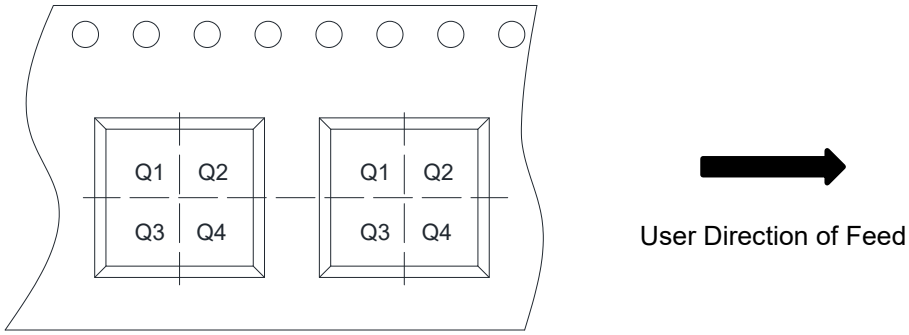
Reel Dimensions



Tape Dimensions



Quadrant Assignments for PIN1 Orientation in the Tape



RD	Reel dimension	☑ 7inch	☐ 13inch		
W	Overall width of the carrier tape	☑ 8mm	☐ 12mm	☐ 16mm	
P1	Pitch between successive cavity centers	☐ 2mm	☑ 4mm	☐ 8mm	
Pin1	Pin1 quadrant	☐ Q1	☐ Q2	☑ Q3	☐ Q4

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