WL2848D

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Low Noise, High PSRR, High Speed CMOS LDO

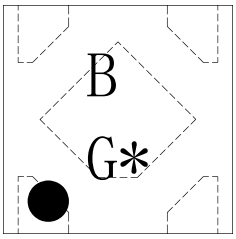
Descriptions

The WL2848D 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 WL2848D 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 WL2848D regulators are available in a standard DFN 1x1-4L package. Standard products are Pb-free and Halogen-free.

Figure 1 DFN1x1-4L (Package)



B = Device code
G = Voltage code
* = Date code

Figure 2 Marking of the WL2848D15-4/TR (Top View)

For markings of other WL2848D 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: 149 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} > 2.0 V
- Recommend output capacitor: 1 μF
- Thermal overload and short-circuit protection

Applications

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

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Order Information

Table 1

Device	Vout (V)	Package	Operation Temperature	Marking	Shipping
WL2848D12-4/TR	1.2	DFN1x1-4L	-40~+85°C	B E*	Tape and Reel, 10000
WL2848D15-4/TR	1.5	DFN1x1-4L	-40~+85°C	B G*	Tape and Reel, 10000
WL2848D18-4/TR	1.8	DFN1x1-4L	-40~+85°C	B H*	Tape and Reel, 10000
WL2848D22-4/TR	2.2	DFN1x1-4L	-40~+85°C	B J*	Tape and Reel, 10000
WL2848D25-4/TR	2.5	DFN1x1-4L	-40~+85°C	B K*	Tape and Reel, 10000
WL2848D27-4/TR	2.7	DFN1x1-4L	-40~+85°C	B Y*	Tape and Reel, 10000
WL2848D28-4/TR	2.8	DFN1x1-4L	-40~+85°C	B L*	Tape and Reel, 10000
WL2848D29-4/TR	2.9	DFN1x1-4L	-40~+85°C	B g*	Tape and Reel, 10000
WL2848D30-4/TR	3.0	DFN1x1-4L	-40~+85°C	B M*	Tape and Reel, 10000
WL2848D32-4/TR	3.2	DFN1x1-4L	-40~+85°C	B d*	Tape and Reel, 10000
WL2848D33-4/TR	3.3	DFN1x1-4L	-40~+85°C	B N*	Tape and Reel, 10000

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Pin Information

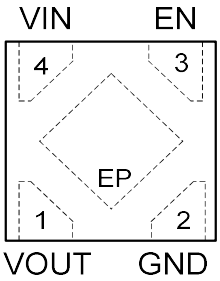

Figure 3 Pin Information (Top View)

Table 2

Pin	Symbol	Description
1	V_{OUT}	Regulator output. A 1-µF or larger capacitor is required for stability.
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 V_{IN} if not used.
4	V_{IN}	Unregulated input supply. A 1-µF or larger capacitor improves source impedance, noise, and PSRR.
EP		GND level. The pin must be connected to GND.

Block Diagram

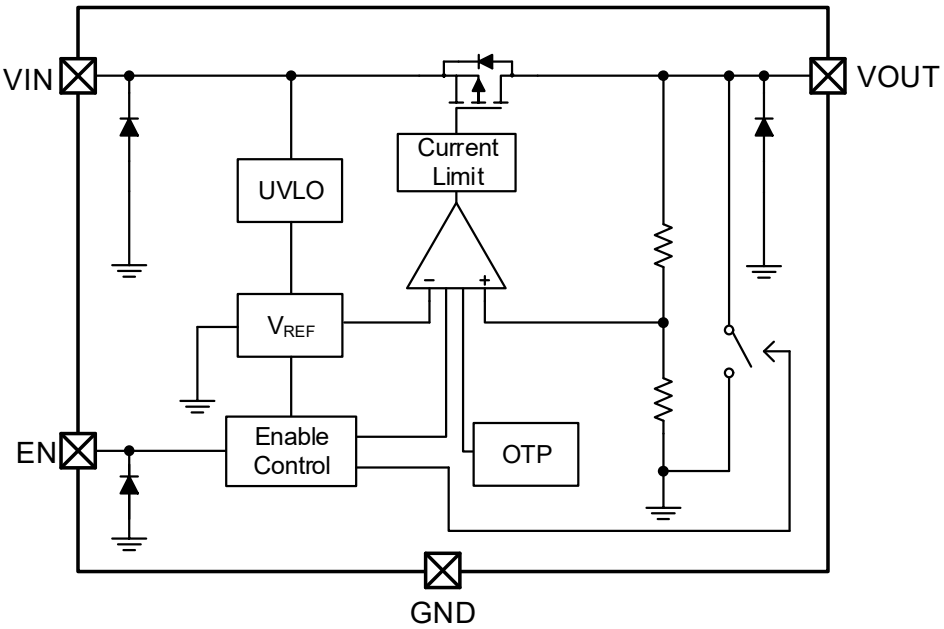

Figure 4 Block Diagram

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Typical Applications

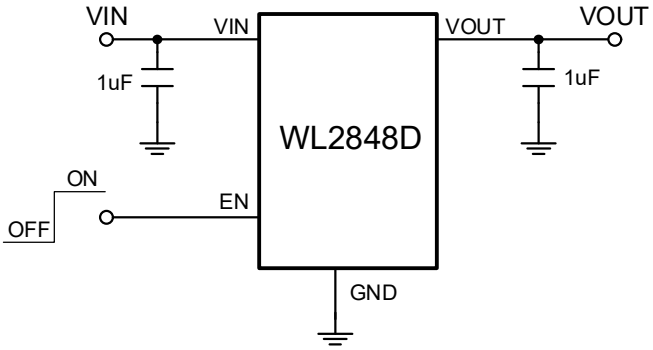

Figure 5 Typical Applications

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]	$R_{\theta JA}$	250		°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_A 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_A=25°C.

Table 5

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}			1.9		5.5	V
Input 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°C	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		130	200	mV
			$V_{OUT(NOM)}$=3.0 V, I_{OUT}=300 mA		141	212	
			$V_{OUT(NOM)}$=2.8 V, I_{OUT}=300 mA		149	223	
			$V_{OUT(NOM)}$=1.8 V, I_{OUT}=300 mA		228	355	
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	39	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}+1V)$_{DC}$+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.

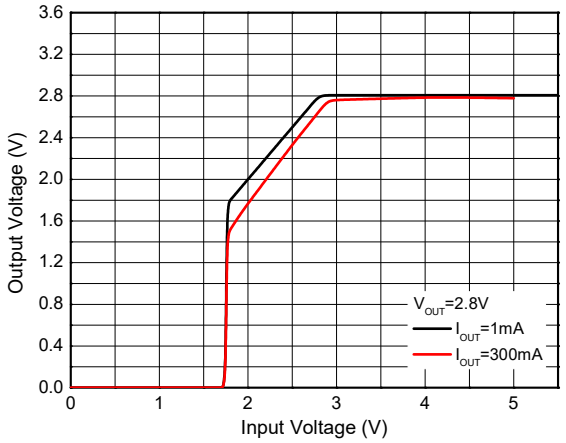

Figure 6 Output Voltage vs. Input Voltage

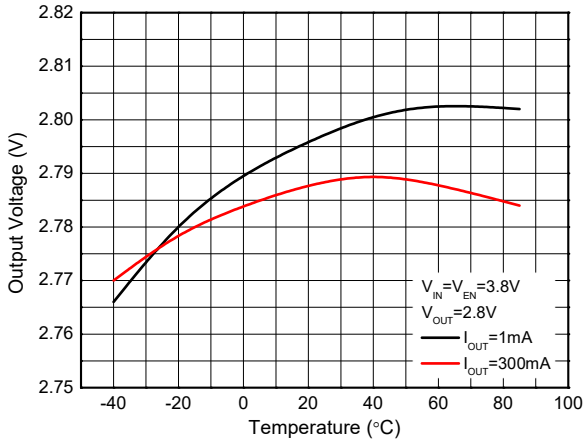

Figure 7 Output Voltage vs. Temperature

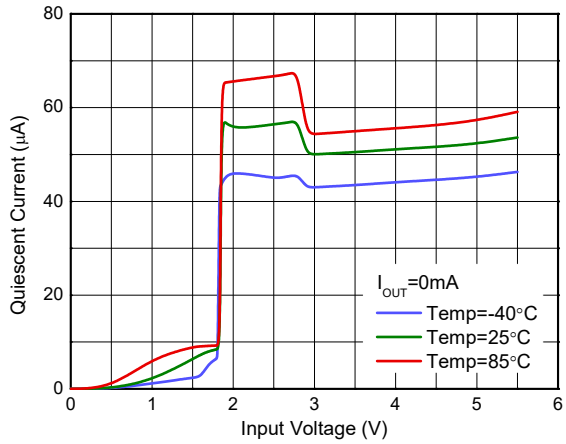

Figure 8 Quiescent Current vs. Input Voltage

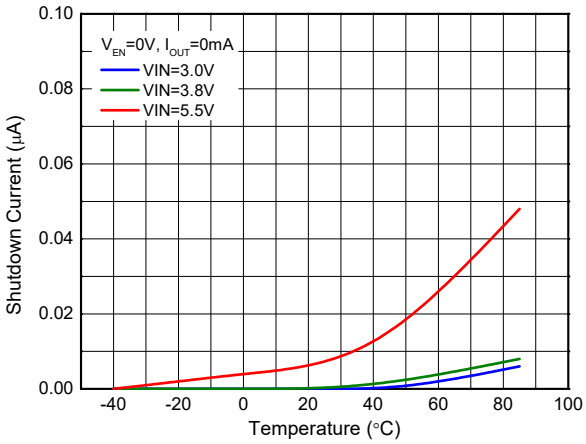

Figure 9 Shutdown Current vs. Temperature

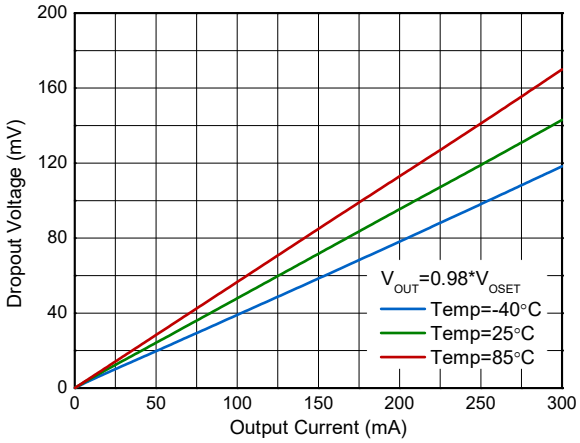

Figure 10 Dropout Voltage vs. Output Current

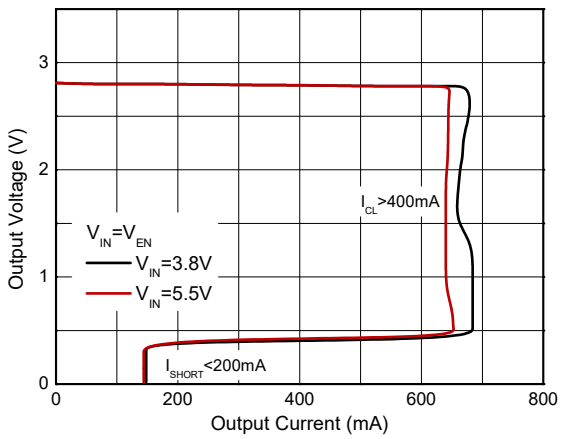

Figure 11 Output Current Limit and Short[1]

[1] For the overload condition, the output current is limited since the LDO operates in the OCL mode. With the load increase in the process, the output voltage reduces while the output current is always around ICL. If V_{OUT} is lower than 0.2 V, the LDO enters the short mode and the output current equals to the short current I_{SHORT}.

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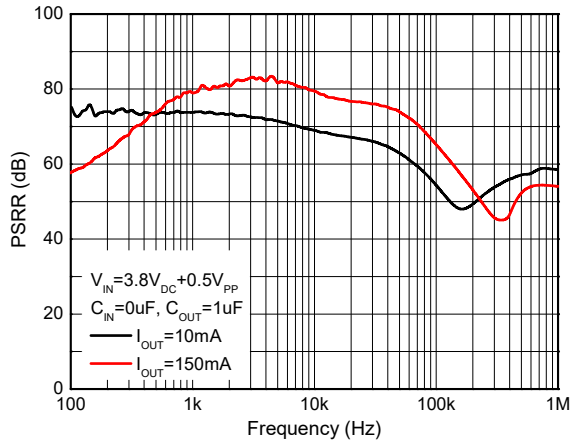

Figure 12 PSRR vs. Frequency (V_{DROP}=1 V, C_{OUT}=1 µF)

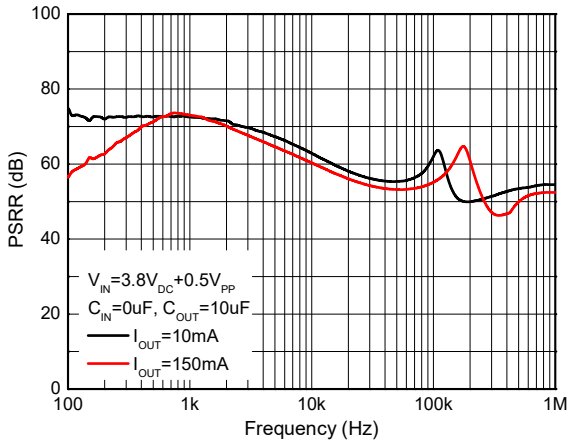

Figure 13 PSRR vs. Frequency (V_{DROP}=1 V, C_{OUT}=10 µF)

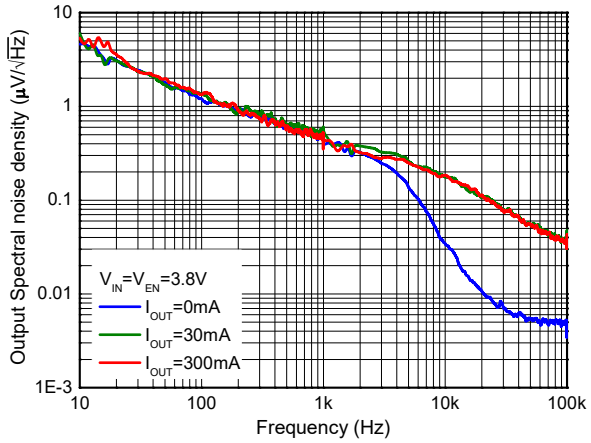

Figure 14 Output Spectral Noise Density vs. Frequency

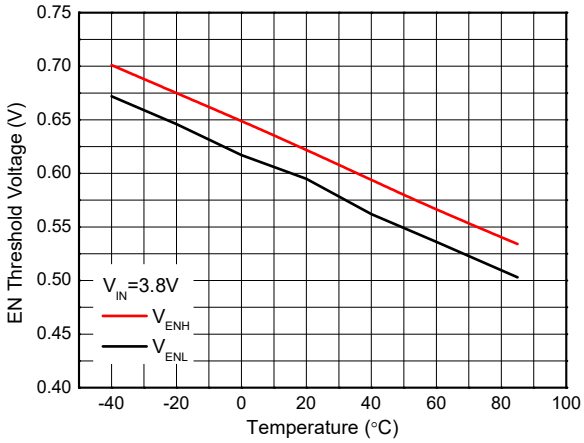

Figure 15 EN Threshold Voltage vs. Temperature

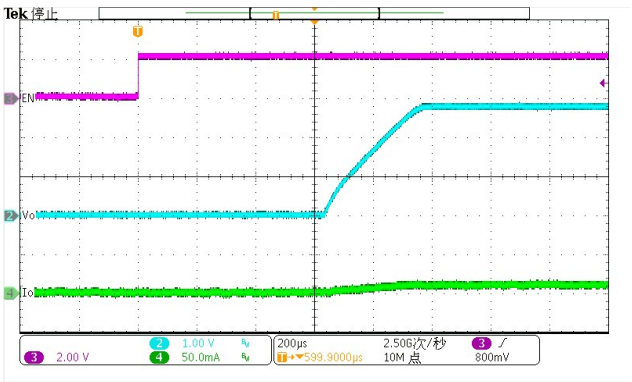

Figure 16 Soft Start-Up from EN (I_{OUT}=10 mA)

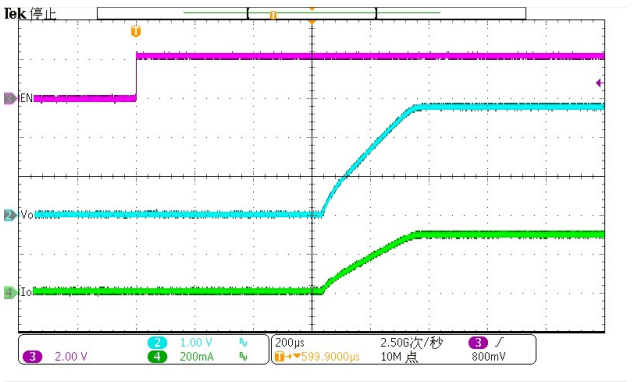

Figure 17 Soft Start-Up from EN (I_{OUT}=300 mA)

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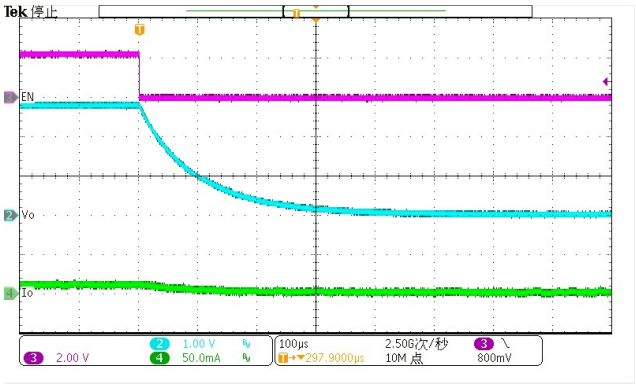

Figure 18 Shutdown from EN (I_{OUT}=10 mA)

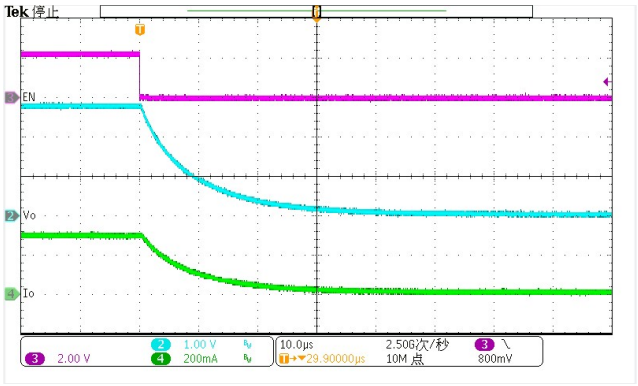

Figure 19 Shutdown from EN (I_{OUT}=300 mA)

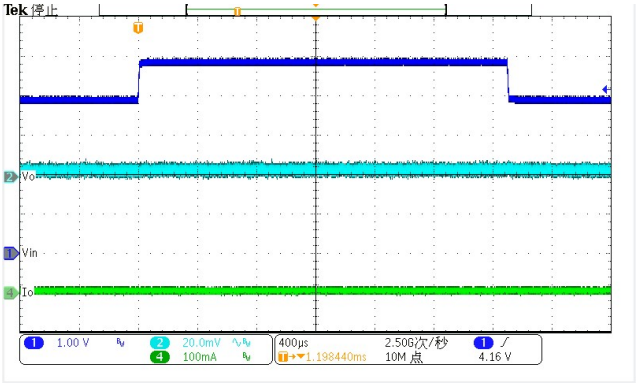

Figure 20 Line Transient (V_{IN}=3.8 V~4.8 V in 10 us, I_{OUT}=1 mA)

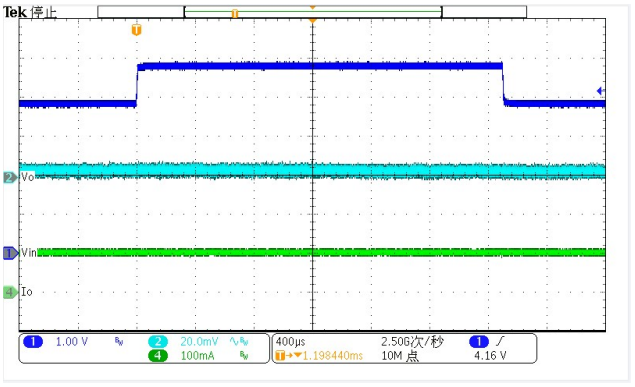

Figure 21 Line Transient (V_{IN}=3.8 V~4.8 V in 10 us, I_{OUT}=100 mA)

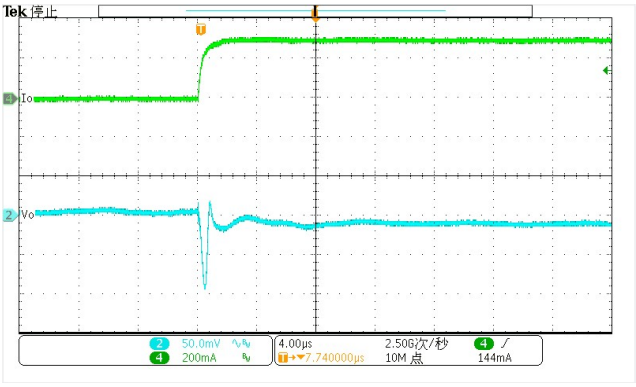

Figure 22 Load Transient (V_{IN}=3.8 V, I_{OUT} =1 mA to 0.3 A in 1 us)

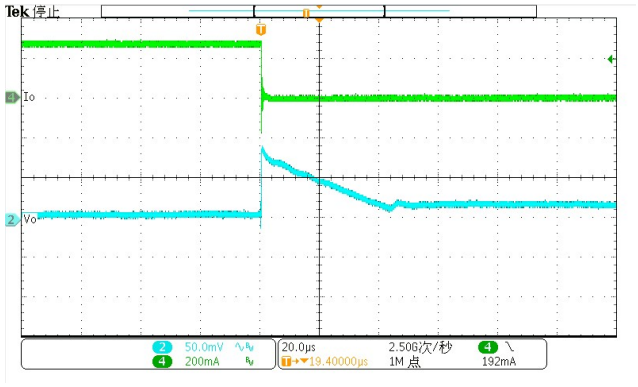

Figure 23 Load Transient (V_{IN}=3.8 V, I_{OUT} =0.3 A to 1 mA in 1 us)

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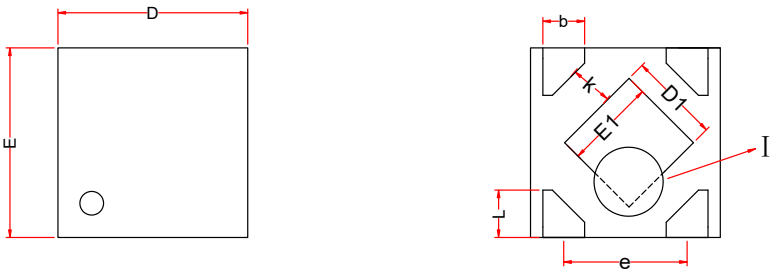
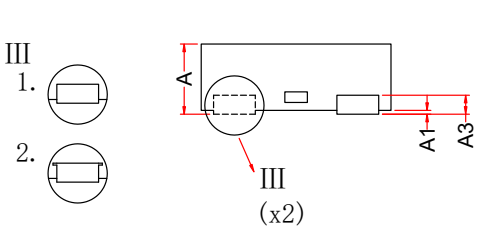
Package Outline Dimensions

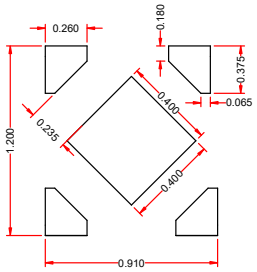
DFN1x1-4L



TOP VIEW BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN(Unit:mm)

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.32	0.37	0.40
A1	-	-	0.05
A3	0.13 Ref.		
b	0.17	0.22	0.28
L	0.20	0.25	0.30
D	0.95	1.00	1.05
E	0.95	1.00	1.05
D1	0.43	0.48	0.53
E1	0.43	0.48	0.53
K	0.15	-	-
e	0.65BSC		

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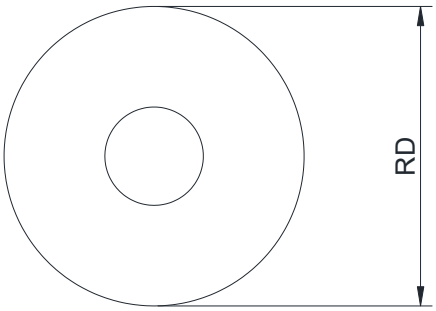
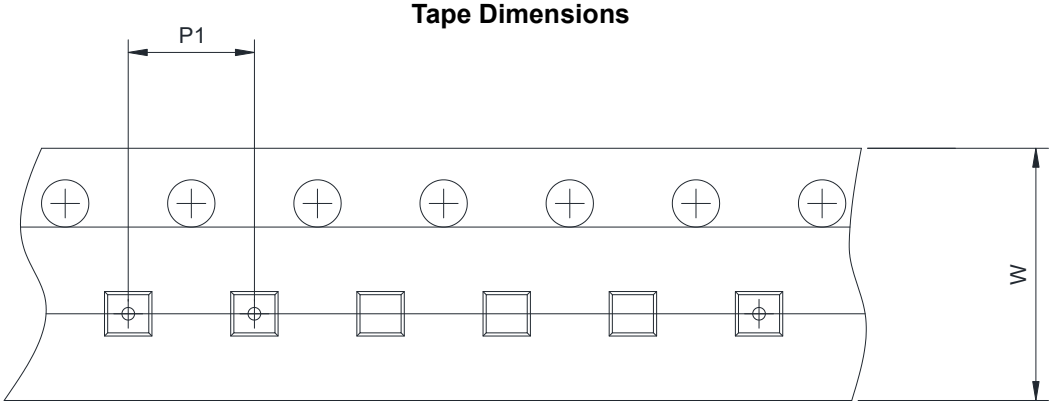
Tape and Reel Information

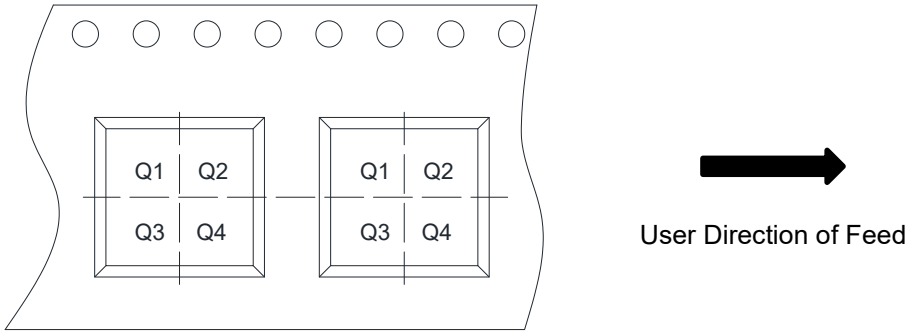
Reel Dimensions



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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