WL2848D

http://www.omnivision-group.com

Low Noise, High PSRR, High speed CMOS LDO

Descriptions

The WL2848D series is a high accuracy, low noise, high speed, high PSRR, low dropout CMOS Linear regulator with high ripple rejection. The devices offer a new level of cost effective performance in cellular phones, laptop and notebook computers, and other portable devices.

The WL2848D occupies the soft-start function, which can prevent input inrush current, and has the fold-back maximum output current which depends on the output voltage. So the current limit functions both as a short circuit protection and as an output current limiter.

The WL2848D regulators are available in standard DFN1x1-4L Package. Standard products are Pb-free and Halogen-free.

Features

- Input Voltage Range : 1.9V~5.5V
- Output Voltage Range : 1.2V~3.3V
- Output current : 300mA
- Quiescent current : 58μA Typ
- Shut-down current : <1μA
- Dropout voltage : 149mV @ I_{OUT}=0.3A
- PSRR : 74dB @ 1kHz, V_{OUT}=2.8V
- Low Output Voltage Noise : 15×V_{OUT} μV_{RMS}
- V_{OUT} accuracy : ±1.5% @ V_{OUT}>2.0V
- Recommend output capacitor : 1μF
- Thermal-Overload and Short-Circuit Protection

Applications

- MP3/MP4 Players
- Cellphones, radiophone, digital cameras
- Bluetooth, wireless handsets
- Others portable electronics device

Figure 1: DFN1x1-4L (Package)

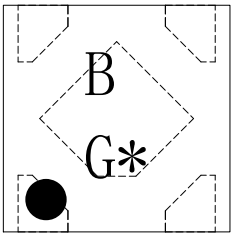


Figure 2: Marking (Top View)

B : Device Code
G : Voltage Code
* : Date Code

For detail marking information, please see page 11.

Order Information

For detail order information, please see page 11.

Pin Information

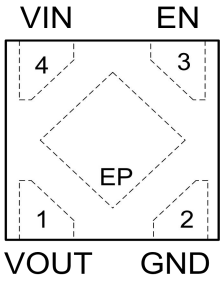


Figure 3: Pin Information (Top View)

Table 1

PIN	Symbol	Description
1	V_{OUT}	Regulator output. A 1μF or larger capacitor is required for stability.
2	GND	Ground.
3	EN	Driving this pin high can turn on the regulator. Driving this pin low and then the regulator operates into shutdown mode. EN pin must not be left floating and can be connected to V_{IN} if not used.
4	V_{IN}	Unregulated input supply. A 1μF or larger capacitor can improve source impedance, noise, or PSRR.
EP		GND level, this pin must be connected to GND.

Block Diagram

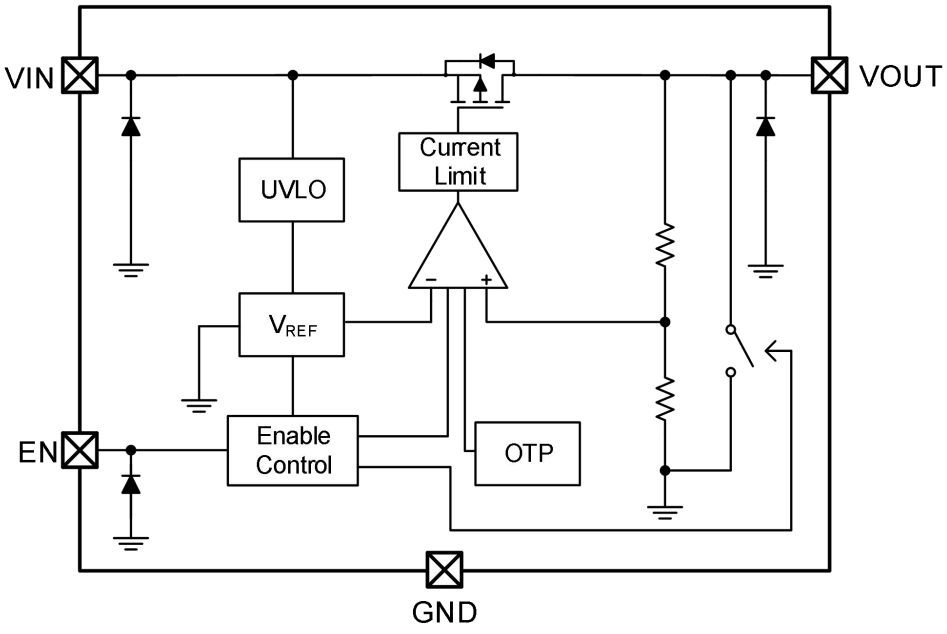


Figure 4: Block Diagram

Typical Application

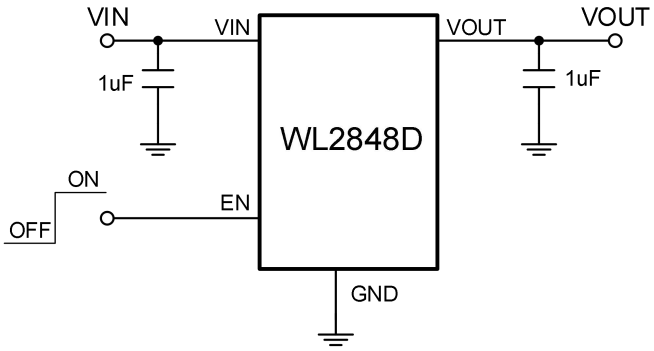


Figure 5: Typical Applications

Note: A 1uF 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.

Absolute Maximum Ratings

Table 2

Parameter	Symbol	Values		Unit
		Min	Max	
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		
ESD Capability, Human Body Model	ESD_{HBM}	7500		V
ESD Capability, Charge Device Model	ESD_{CDM}	1500		V

Stresses exceeding those listed in the Maximum Ratings table may damage the device.

Recommended Operating Conditions

Table 3

Parameter	Symbol	Values			Unit
		Min	Typ	Max	
Input Voltage (1)	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 (2)	C_{IN}		1		uF
Output capacitor (2)	C_{OUT}		1		uF
Operating Junction Temperature	T_J	-40		125	°C
Operating Ambient Temperature Range	T_A	-40		85	°C

(1) The minimum input voltage should be larger than (V_{OUT}+V_{DROP}) or 1.9V, whichever is greater.
(2) The recommended capacitor is 1uF or larger when considering stability.

Thermal Characteristics

Table 4

Parameter	Symbol	Values	Unit
Junction-to-ambient Thermal Resistance (1)	$R_{\theta JA}$	250	°C/W

Thermal resistance data is is highly application and board-layout dependent. In applications where high maximum power dissipation exists, special care must be paid to thermal dissipation issues in board design.

(1) Single component mounted on 2oz, 1.5*1.5 inch^2 FR4 PCB with 1.0*1.0 inch^2 Cu area.

Electrical Characteristics

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

Table 5

Parameter	Symbol	Test Conditions		Values			Unit
				Min	Typ	Max	
Input Voltage	V_{IN}			1.9		5.5	V
Input Under Voltage Lockout	V_{IN} UVLO	Rising, I_{OUT}=1mA		1.66	1.75	1.84	V
		Falling, I_{OUT}=1mA		1.55	1.64	1.73	V
Output Voltage Accuracy	V_{OUT}	V_{IN}=V_{OUT}+1V, T_A=25℃	V_{OUT}≤2.0V	-30		30	mV
			V_{OUT}>2.0V	-1.5		1.5	%
Dropout Voltage	V_{DROP}	V_{OUT}>0.98×$V_{OUT(NOM)}$	$V_{OUT(NOM)}$=3.3V, I_{OUT}=300mA		130	200	mV
			$V_{OUT(NOM)}$=3.0V, I_{OUT}=300mA		141	212	
			$V_{OUT(NOM)}$=2.8V, I_{OUT}=300mA		149	223	
			$V_{OUT(NOM)}$=1.8V, I_{OUT}=300mA		228	355	
Line Regulation	△V_{LINE}	V_{OUT}+1V≤V_{IN}≤5.5V, I_{OUT}=1mA			1	6	mV
Load Regulation	△V_{Load}	V_{IN}=V_{OUT}+1V, I_{OUT}=1mA~300mA			22	39	mV
Quiescent Current	I_Q	I_{OUT}=0mA			58	105	μA
Shut-down Current	I_{SHDN}	V_{EN}=0V, 1.9V≤V_{IN}≤5.5V				1.0	μA
Output Current Limit	I_{CL}	V_{OUT}=0.85×$V_{OUT(NOM)}$, V_{IN}≥$V_{OUT(NOM)}$+1V			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}=10mA, V_{OUT}=2.8V, C_{IN}=0uF, C_{OUT}=1uF	f=100Hz		73		dB
			f=1kHz		74		dB
			f=10kHz		69		dB
			f=100kHz		56		dB
			f=1MHz		58		dB
EN Logic High Voltage	V_{ENH}	V_{IN}=V_{OUT}+1V, I_{OUT}=1mA		0.82			V
EN Logic Low Voltage	V_{ENL}	V_{IN}=$V_{OUT(NOM)}$+1V, V_{OUT}=0V				0.4	V
EN Input Current	I_{EN}	V_{EN}=V_{IN}=5.5V			0.5		μA
Output Noise Voltage	e_{NO}	V_{IN}=V_{OUT}+1V, C_{OUT}=1μF, I_{OUT}=100mA, 10Hz to 100KHz			15×V_{OUT}		μV_{RMS}
Thermal Shutdown Threshold	T_{SD}				160		℃
Thermal Shutdown hysteresis	△T_{SD}				30		℃
Output Auto-discharge Resistance	R_{LOW}	V_{IN}=4.0V, V_{EN}=0V, V_{OUT}=2.8V			237		Ω
Turn-On Time	Ton	From assertion of EN signal to 90% $V_{OUT(NOM)}$, C_{IN}=1uF, C_{OUT}=1uF, I_{OUT}=1mA, V_{IN}=V_{OUT}+1V	V_{OUT}=2.8V		1.0	2.00	ms
			V_{OUT}=1.8V		0.8	1.82	
			V_{OUT}=1.2V		0.7	1.52	
V_{OUT} Rise Time	Trise	V_{OUT} from 10% to 90% $V_{OUT(NOM)}$, C_{IN}=C_{OUT}=1uF, I_{OUT}=1mA, V_{IN}=V_{OUT}+1V	V_{OUT}=2.8V		320		us
			V_{OUT}=1.8V		180		
			V_{OUT}=1.2V		100		

Typical characteristics

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

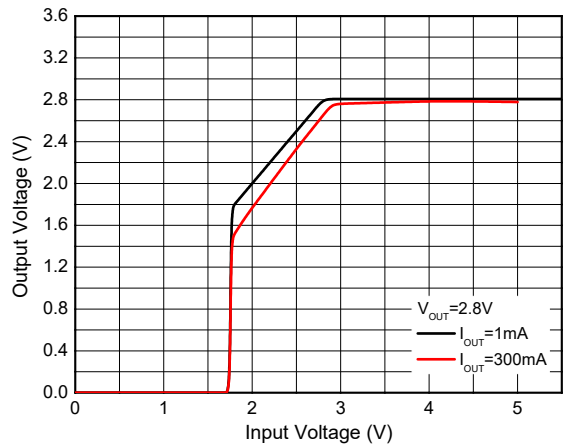


Figure 6: Output Voltage vs. Input Voltage

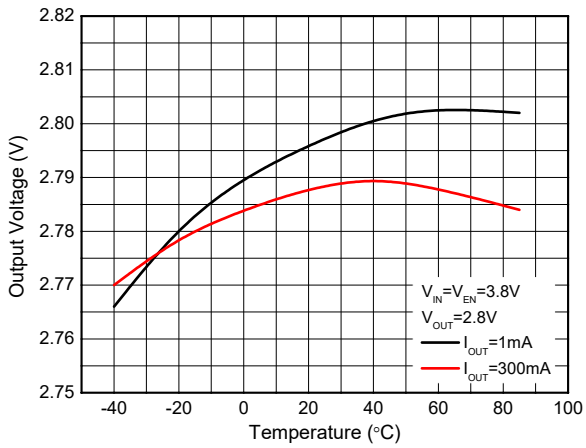


Figure 7: Output Voltage vs. Temperature

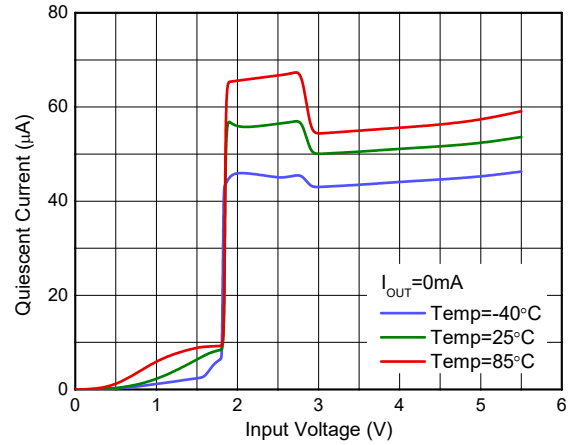


Figure 8: Quiescent Current vs. Input Voltage

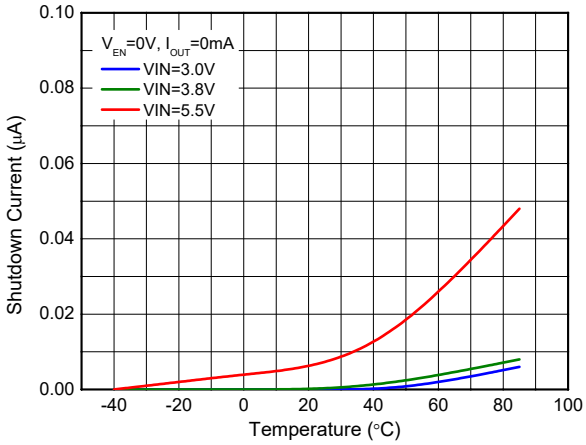


Figure 9: Shutdown Current vs. Temperature

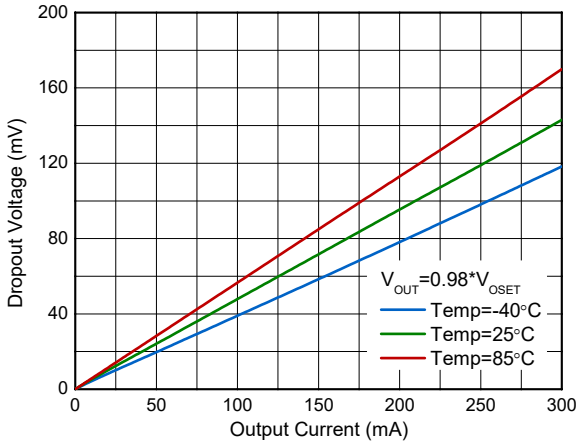


Figure 10: Dropout Voltage vs. Output Current

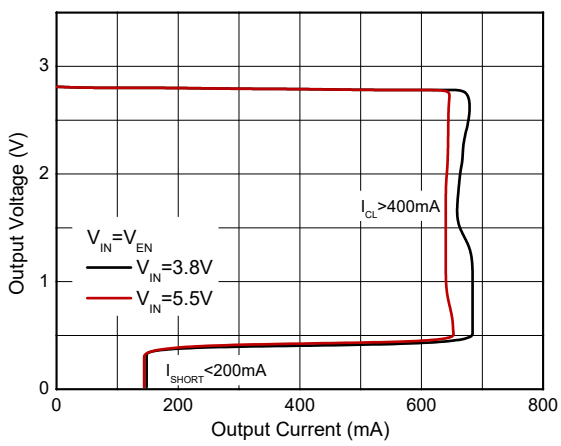


Figure 11: Output Current Limit & short (1)

(1) For the overload condition, the output current is limited since LDO operates in the OCL mode. During this process, with the load increase, the output voltage reduces while the output current is always around I_{CL}. When V_{OUT} reduces low enough (V_{OUT}<0.2V), the LDO will operate into the short mode and the output current equals to the short current I_{SHORT}.

Typical characteristics (Continued)

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

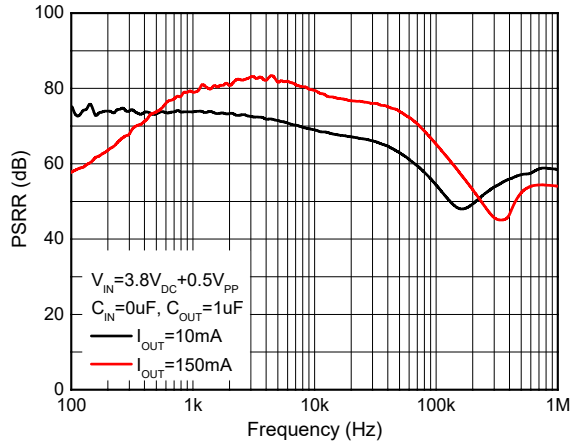


Figure 12: PSRR vs. Frequency (V_{DROP}=1V, C_{OUT}=1μF)

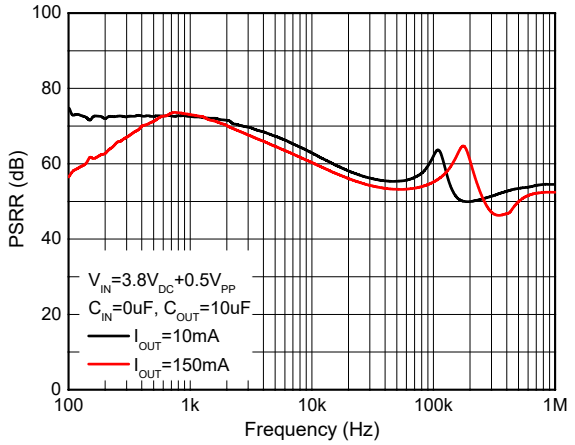


Figure 13: PSRR vs. Frequency (V_{DROP}=1V, C_{OUT}=10μF)

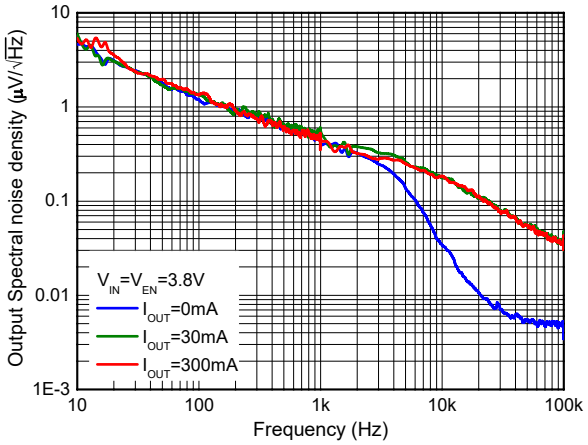


Figure 14: Output Spectral Noise Density vs. Frequency

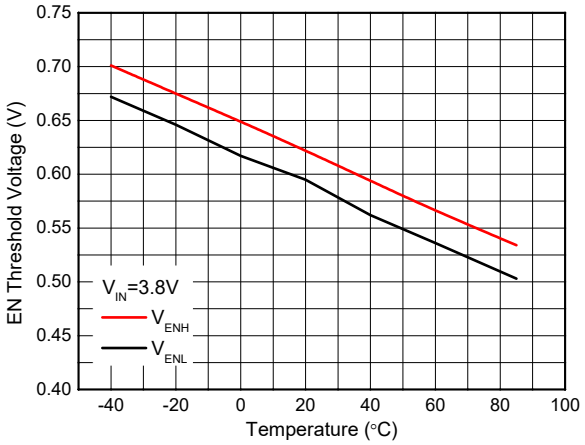


Figure 15: EN Threshold Voltage vs. Temperature

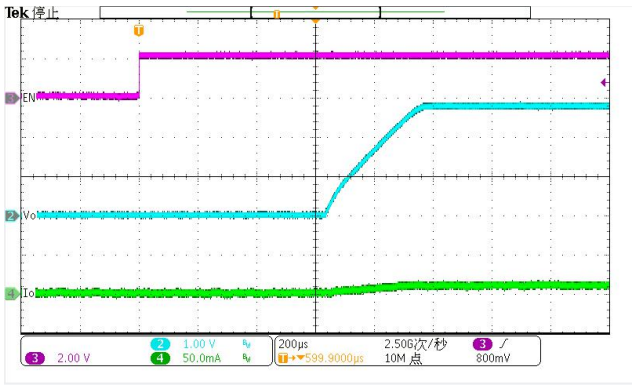


Figure 16: Soft Start-Up from EN (I_{OUT}=10mA)

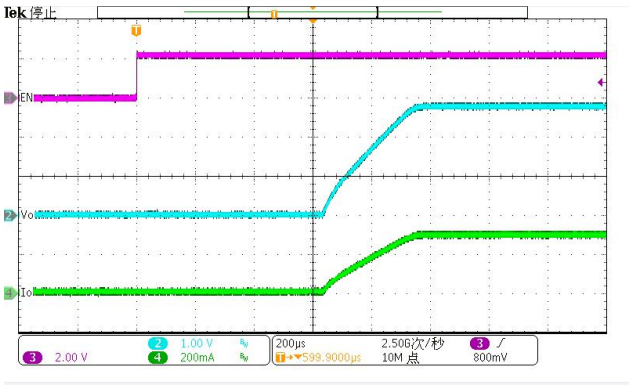


Figure 17: Soft Start-Up from EN (I_{OUT}=300mA)

Typical characteristics (Continued)

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

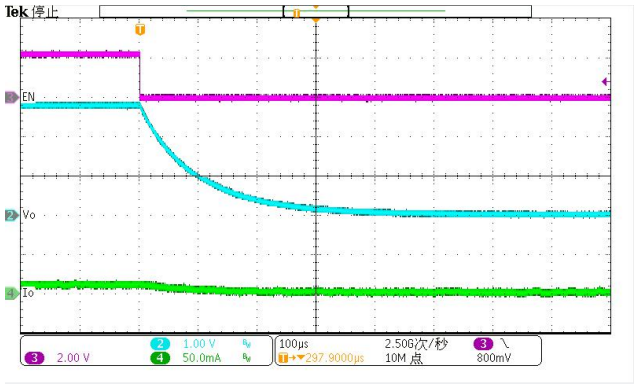


Figure 18: Shutdown from EN (I_{OUT}=10mA)

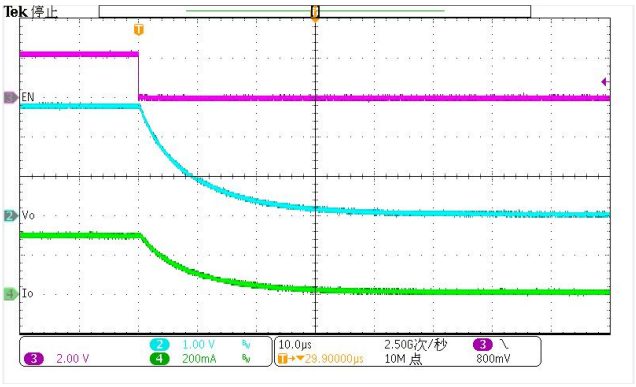


Figure 19: Shutdown from EN (I_{OUT}=300mA)

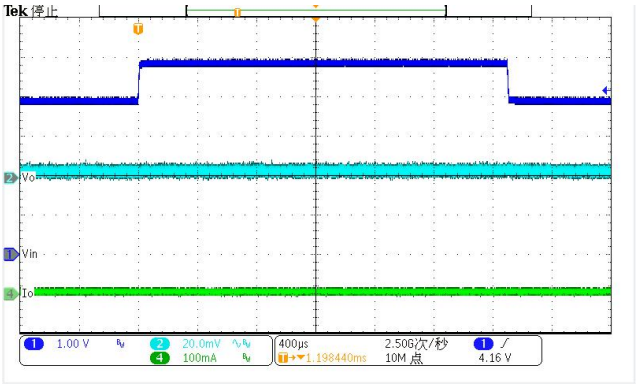


Figure 20: Line Transient (V_{IN}=3.8V~4.8V in 10us, I_{OUT}=1mA)

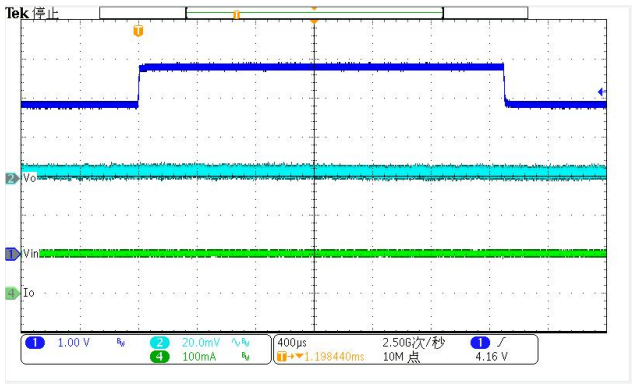


Figure 21: Line Transient (V_{IN}=3.8V~4.8V in 10us, I_{OUT}=100mA)

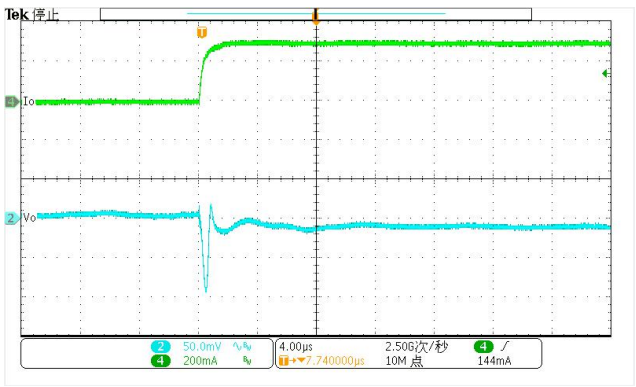


Figure 22: Load Transient (V_{IN}=3.8V, I_{OUT} =1mA to 0.3A in 1us)

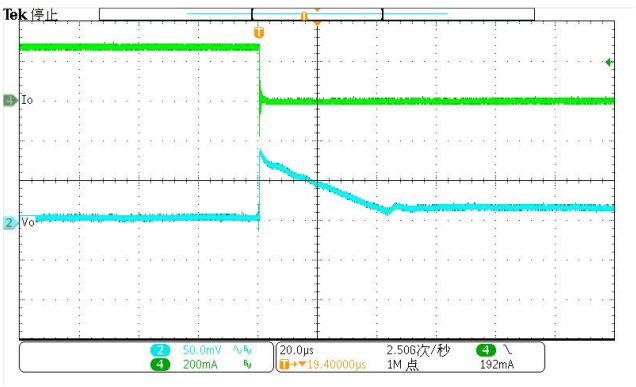
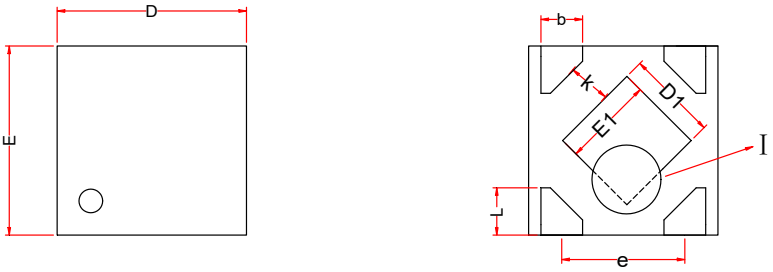


Figure 23: Load Transient (V_{IN}=3.8V, I_{OUT} =0.3A to 1mA in 1us)

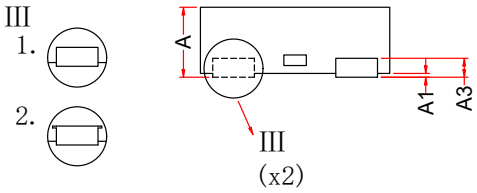
PACKAGE OUTLINE DIMENSIONS

DFN1x1-4L

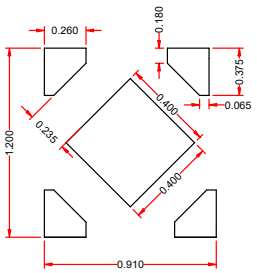


TOP VIEW

BOTTOM VIEW



SIDE VIEW

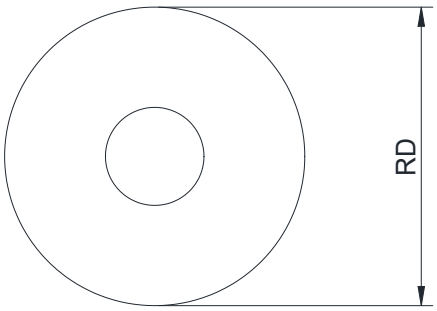


RECOMMENDED LAND PATTERN(Unit:mm)

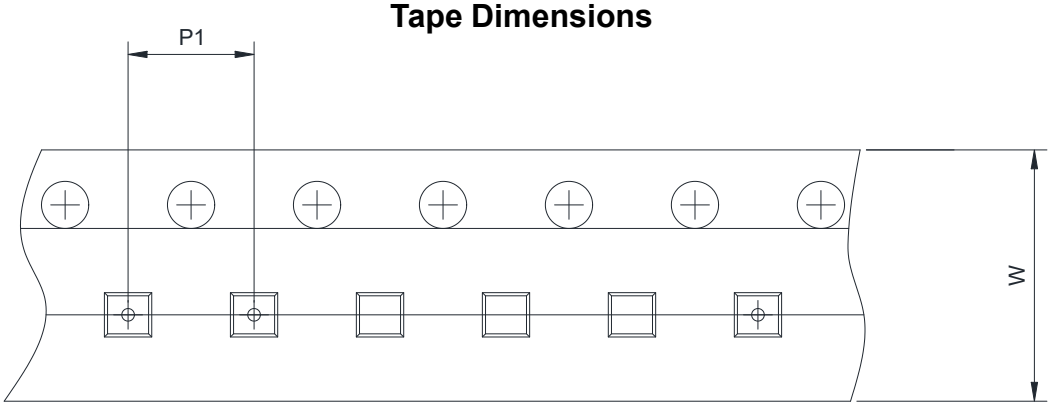
Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.32	0.37	0.40
A1	-	-	0.05
A3	0.13 Ref.		
b	0.17	0.22	0.28
L	0.20	0.25	0.30
D	0.95	1.00	1.05
E	0.95	1.00	1.05
D1	0.43	0.48	0.53
E1	0.43	0.48	0.53
K	0.15	-	-
e	0.65BSC		

TAPE AND REEL INFORMATION

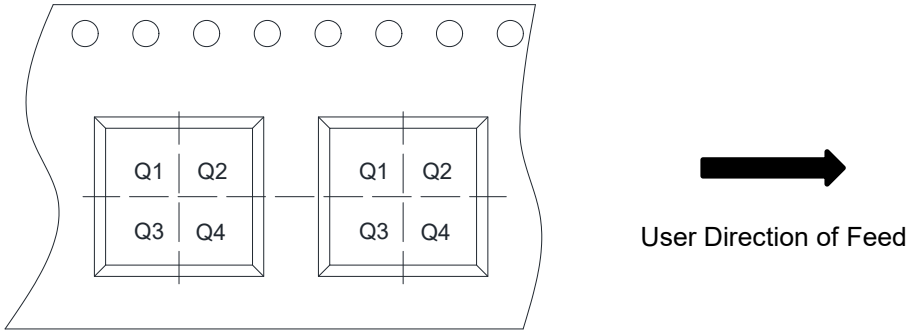
Reel Dimensions



Tape Dimensions



Quadrant Assignments For PIN1 Orientation In Tape



ORDER INFORMATION

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

ORDER INFORMATION

Ordering No.	Vout (V)	Package	Operating 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