General Description

The LTP753 is a 300 mA low dropout regulator that provides voltage with very high accuracy, high stability and low noise. A unique feature that dynamic quiescent current adjustment is employed to have very low current consuption at no-load is integrated in order to enhance the performance for battery operated portable applications. It is available in SOT23-5, DNF1*1-4 and DFN2*2-6. Small packages, low noise and low quiescent makes the device to be suitable for space-constrained, noise-sensitive and power-sensitive applications.

Features

- Operating Input Voltage Range: 1.7 V to 5.5 V
- Fix Output Voltage: 0.8V to 3.6V (Contact Factory for Other Voltage Options)
- Low Quiescent Current: 50 µA Typically
- Soft Start Feature with High Slew Rate Speed
- Low Dropout: 210 mV at 2.8 VTypically, 350 mV at 1.8 VTypically,
- High Output Voltage Accuracy: ±1% at 25℃
- High Power Supply Ripple Rejection: 70 dB at 1 kHz
- Stable with Ceramic Capacitors 1 µF
- Built-in Soft Start Circuit
- Over-Current Protection
- Thermal Shutdown Protection

Applications

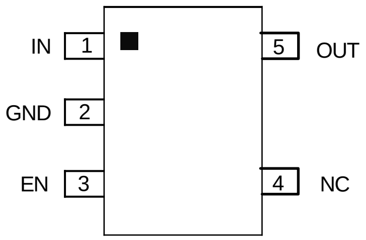
- PDAs, Mobile phone, GPS, Smartphones
- Wireless module;
- Portable Equipment
- Other Battery Powered Applications

Ordering Information

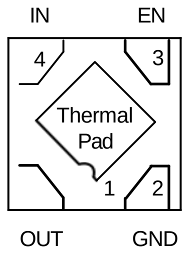
Model	Package	Ordering Number Note1	Packing Option
LTP753	SOT23-5	LTP753-xxNXT5	Tape and Reel, 3000
	DFN 1*1-4	LTP753-xxNXF4	Tape and Reel, 10000
	DFN 2*2-6	LTP753-xxNXF6	Tape and Reel, 3000

Note1: xx stands for output voltages, e.g. if xx = 18, the output voltage is 1.8 V; if xx = 30, the output voltage is 3.0 V.

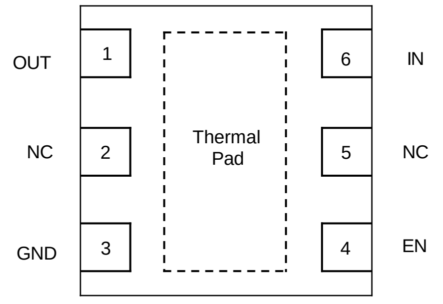
Pin Configurations (Top View)



SOT23-5



DFN1×1-4

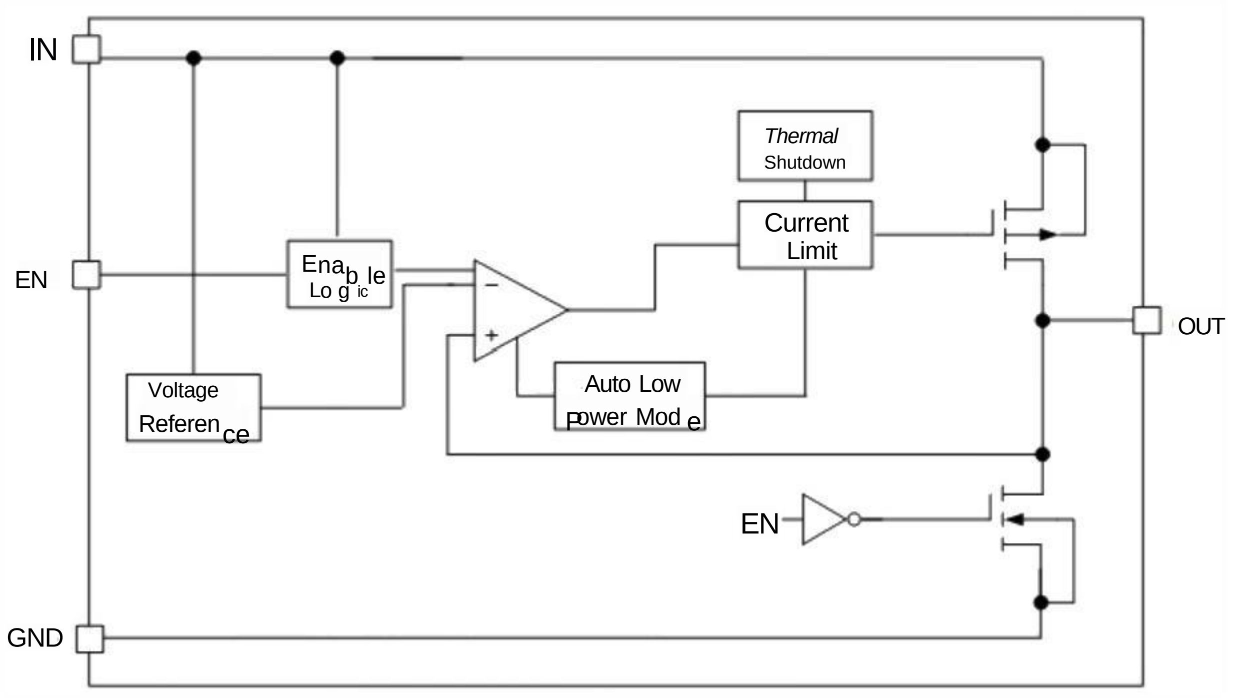


DFN2×2-6

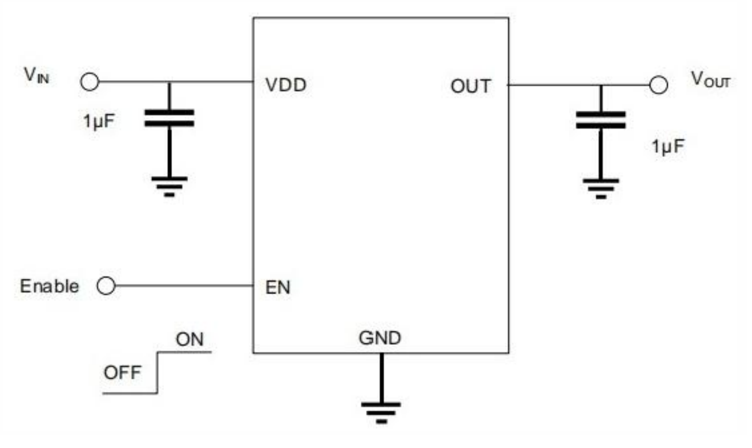
Pin Function

Package			Symbol	Function
SOT23-5	DFN1×1-4	DFN2×2-6		
1	4	6	IN	Power Supply Input Pin.
2	2	3	GND	Ground Pin.
3	3	4	EN	Enable input pin (high - enabled, low - disabled). If this pin is connected to IN pin or if it is left unconnected (pull-up resistor is not required) the device is enabled.
4	/	/	NC	No Connection.
5	1	1	OUT	Output Pin
/			EPAD	Exposed pad should be connected directly to the GND pin. Soldered to a large ground copper plane allows for effective heat removal.

Block Diagram



Application Circuits



Note:The EN pin is not be suspended

Applications Information

General

The LTP753 is a high-performance 300 mA Low Dropout Linear Regulator. Very high PSRR (70 dB at 1 kHz) and excellent dynamic performance as load/line transients provide the device clean and fast-responsd output despite the unpredictable environment. The unique design to have very low quiescent current makes the device very suitable for various battery powered applications such as tablets， cellular phones， wireless and many other low power-concumption needed situations. Protections in case of output over load, output short circuit condition and over heating are integrated, assuring a very robust design.

Input Capacitor

It is recommended to connect at least a 1 µF Ceramic X5R or X7R capacitor between IN and GND pins of the device, placed as close as possible to the input pin. This capacitor filters any unwanted AC signals or noises superimposed onto constant Input Voltage. The good input capacitor will limit the influence of input trace inductances and source resistance during sudden load current changes.

Overall line transient response can be improved by hiring a higher capacitance and lower Equivalent Series Resistance (ESR) capacitor.

Output Capacitor

The LTP753 does not require a minimum ESR for the output capacitor but should no larger than 1.8 ohm. The 1uF and X5R or X7R types have low capacitance variations over temperature thus they are recommended. Place the output capacitor as close as possible to the output pin of the regulator.

Enable

The LTP753 has an EN pin to turn on or turn off the regulator, When the EN pin is in logic high, the regulator will be turned on. The EN pin may be directly tied to V_{IN} to turn on the device. The shutdown current is very close to 0 µA typically. The Enable input is CMOS logic and cannot be left floating.

Current Limit Protection

When output current at the OUT pin is higher than current limit threshold, the current limit protection will be triggered and clamp the output current to approximately 460 mA to prevent over-current and to protect the regulator from damage due to overheating.

Thermal Shutdown

When the die temperature exceeds the Thermal Shutdown point (T_{SD} =160 ° C typically) the device goes to disabled state and the output voltage is not delivered until the die temperature decreases to 160 ° C. The Thermal Shutdown feature provides a protection from a catastrophic device failure at accidental overheating. This protection is not intended to be used as a substitute for proper heat sinking.

Power Dissipation and Heat sinking

The maximum power dissipation supported by the device is dependent upon board design and layout. Mounting pad configuration on the PCB, the board material and the ambient temperature affect the rate of junction temperature rise for the part. The maximum power dissipation the LTP753 device can handle is given by:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

where $T_{J(MAX)}$ is the maximum junction temperature, TA is the ambient temperature, and θ_{JA} is the junction to ambient thermal resistance. For recommended operating condition specifications the maximum junction temperature is 125ºC and T_A is the ambient temperature. The junction to ambient thermal resistance, $\theta_{JA,}$ is layout dependent. The maximum power dissipation depends on the operating ambient temperature for fixed $T_{J(MAX)}$ and thermal resistance, θ_{JA}.

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	-0.3 V to 6 V	V
Output Voltage	V_{OUT}	-0.3 V to V_{IN} + 0.3 V or 6 V	V
Enable Voltage	V_{EN}	-0.3 V to 6 V	V
Output Short Circuit Duration	t_{SC}	∞	S
Maximum Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55 to 150	℃
Thermal Characteristics, DFN1X1-4 Thermal Resistance, Junction-to-Air	$R_{\theta JA}$	210	℃/W
Thermal Characteristics, DFN2X2-6 Thermal Resistance, Junction-to-Air		75	
Thermal Characteristics, SOT23-5 Thermal Resistance, Junction-to-Air		165	
Human Body Model	ESD	2000	V
Machine Model		200	V
Current Maximum Rating	Latch up	150	mA

NOTE：

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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Caution

This integrated circuit can be damaged by ESD if you don’t pay attention to ESD protection. LINEARIN recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

LINEARIN reserves the right to make any change in circuit design, specification or other related things if necessary without notice at anytime. Please contact LINEARIN sales office to get the latest datasheet.

Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	1.7 to 5.5	V
Output Current	I_{OUT}	0 to 300	mA
Operating Ambient Temperature	T_A	-40 to 125	℃
Effective Input Ceramic Capacitor Value	C_{IN}	1	μF
Effective Output Ceramic Capacitor Value	C_{OUT}	1	μF

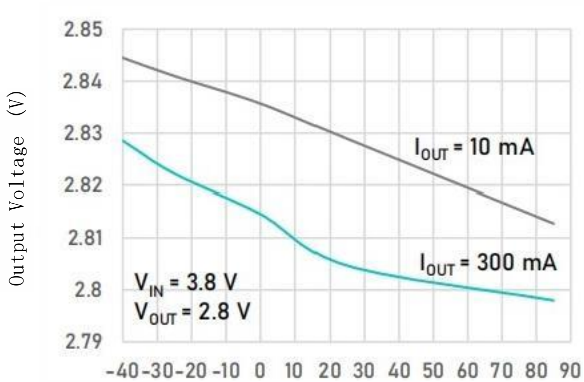
Electrical Characteristics

(V_{IN}= $V_{OUT-NOM}$ +1V, I_{OUT} = 1 mA, T_a = 25 °C, C_{IN} = C_{OUT} = 1 uF, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage Operation Range	V_{IN}		1.7		5.5	V
Output Voltage Accuracy	V_{OUT}	T_J = -40°C to +85°C, V_{OUT} > 2.0 V	-2		2	%
		T_J = -40°C to +85°C, V_{OUT} ≤2.0 V	-40		40	mV
Line Regulation	$\Delta V_O(\Delta V_I)$	V_{IN} = $V_{OUT-NOM}$ +0.5 V to 5.5 V V_{IN} ≥ 1.7 V		0.01	0.1	$\%V_{OUT}$
Load Regulation	$\Delta V_O(\Delta I_O)$	I_{OUT} = 1 mA to 300 mA (DFN2×2-6)		20		mV
		I_{OUT} = 1 mA to 300 mA (DFN1×1-4)		25		
Dropout Voltage	V_{DO}	I_{OUT} = 300 mA, V_{OUT} = 2.8 V		210		mV
		I_{OUT} = 300 mA, V_{OUT} = 1.8 V		350		
Output Current Limit	I_{LIM}	V_{OUT} = 90%$V_{OUT-NOM}$		460		mA
Quiescent Current	I_Q	I_{OUT} = 0 mA		50	95	µA
Shutdown Current	I_{SHDN}	V_{EN} ≤0.4 V, V_{IN} = 5.5 V		0.01	1	µA
EN Threshold	V_{EN-TH}	V_{EN} rising	0.9			V
EN Hysteresis	V_{EN-HY}	V_{EN} falling			0.2	V
Output Voltage Slew Rate	V_{OUT_SR}	I_{OUT} = 10 mA		170		mV/µs
EN Pin Input Current	I_{EN}	V_{EN} = 5.5 V		0.3		µA
Power Supply Rejection Ratio	PSRR	V_{OUT} = 2.8 V, I_{OUT} = 10 mA ,f=1kHz		70		dB
Output Voltage Noise	V_N	f = 10 Hz to 100 Hz		75		μV_{RMS}
EN Input Current	I_{EN}	V_{EN} = 5.5 V		0.3	1.0	µA
Thermal Shutdown Temperature	T_{SD}	Temperature rising from T_J = +25°C		160		°C
Thermal Shutdown Hysteresis	T_{SDH}	Temperature falling from T_{SD}		20		°C
Active Output Discharge Resistance	R_{DIS}	V_{EN} < 0.4 V		100		Ω

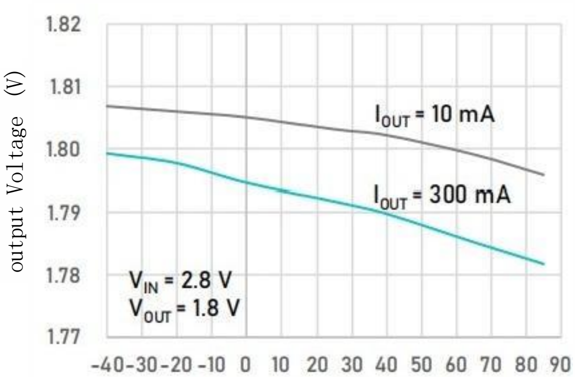
Typical Performance Characteristics

Note:Typical Characteristics are intended to be used as reference data;they are not guaranteed.



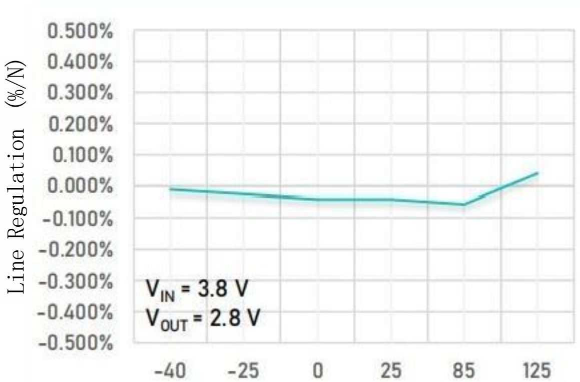
Temperature(℃)

Output Voltage vs.Temperature
Vou=2.8 VDFNI×1-4



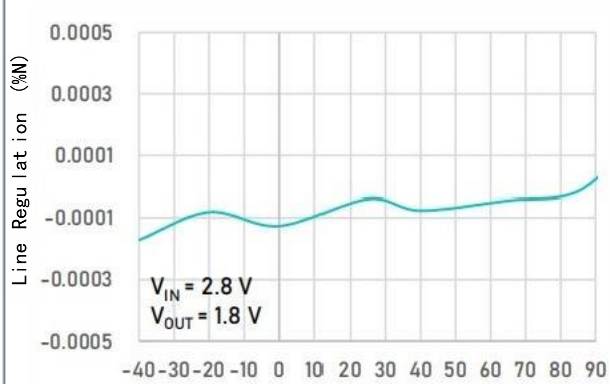
Temperature(℃)

Output Voltage vs.Temperature
Vour=1.8 VDFN2×2-6

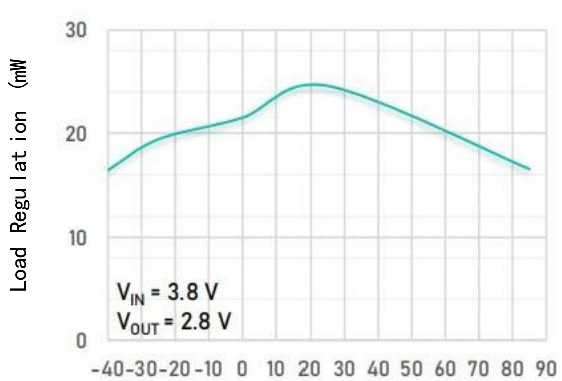


Temperature (℃)

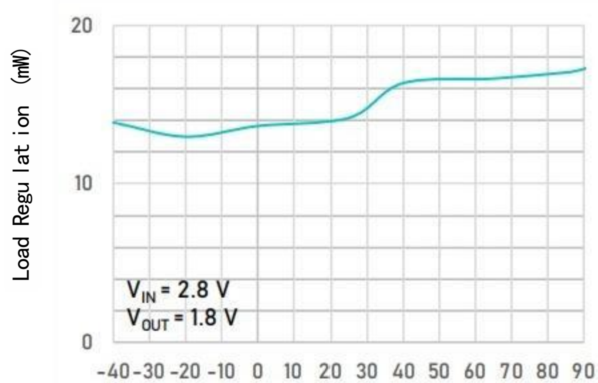
Line Regulation vs.Temperature
Vour=2.8 VDFN1×1-4



Temperature(℃)
Line Regulation vs.Temperature
Vour=1.8 VDFN2×2-6



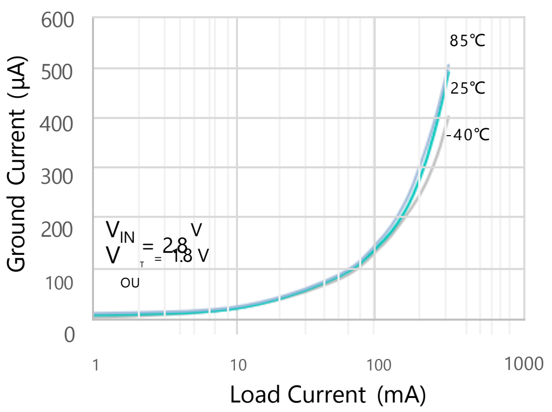
Temperature(℃)
Load Regulation vs.Temperature
Vou=2.8V DFN1×1-4



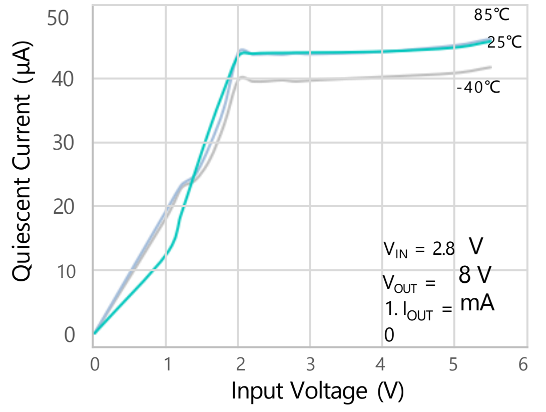
Temperature(℃)
Load Regulation vs.Temperature
Vour=1.8 VDFN2×2-6

Typical Performance Characteristics

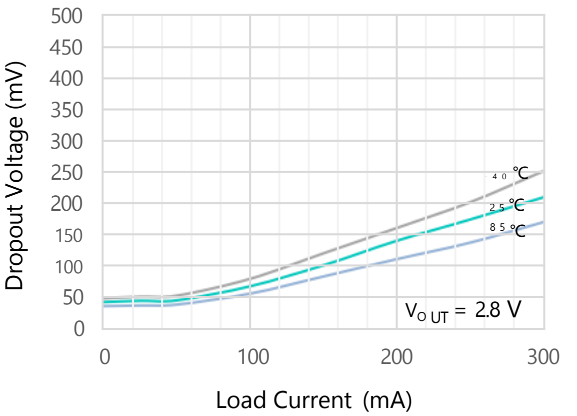
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.



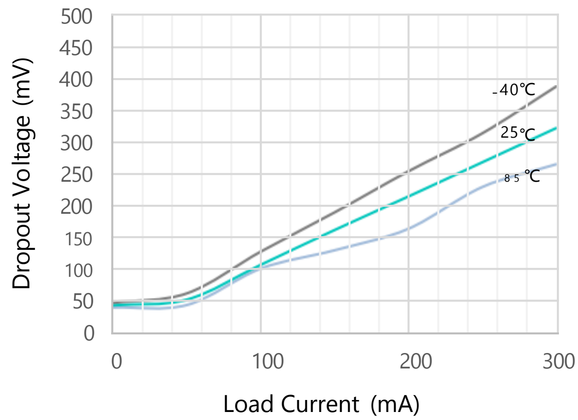
Ground Current vs. Load Current
V_{OUT} = 1.8 V DFN2×2-6



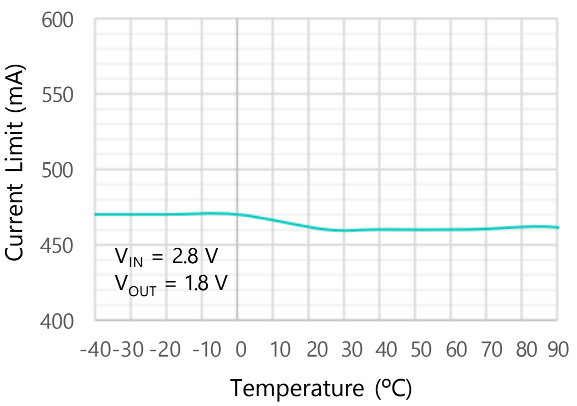
Quiescent Current vs. Input Voltage
V_{OUT} = 1.8 V DFN2×2-6



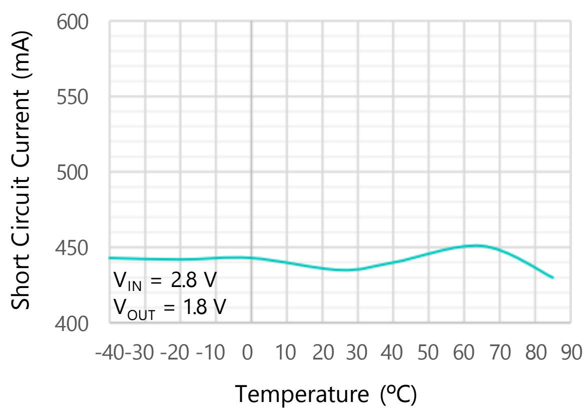
Dropout Voltage vs. Load Current
V_{OUT} = 2.8 V DFN1×1-4



Dropout Voltage vs. Load Current
V_{OUT} = 1.8 V DFN2×2-6



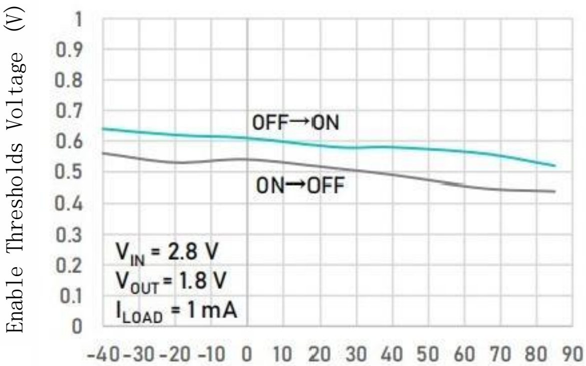
Current Limit vs. Temperature
V_{OUT} = 1.8 V DFN2×2-6



Short Circuit Current vs. Temperature
V_{OUT} = 1.8 V DFN2×2-6

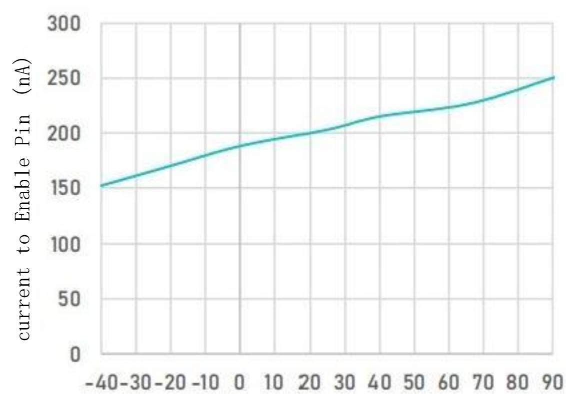
Typical Performance Characteristics

Note:Typical Characteristics are intended to be used as reference data;they are not guaranteed.



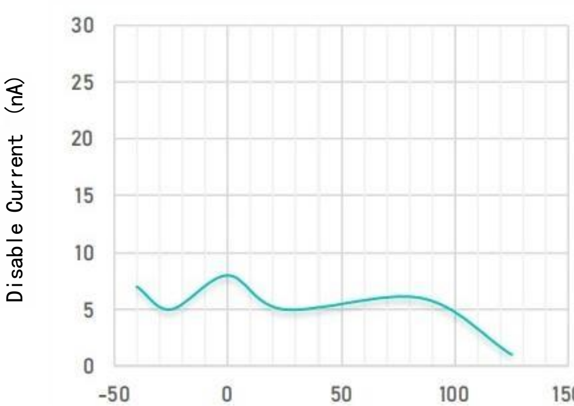
Temperature(℃)

Enable Thresholds Voltage vs.Temperature
Vour=1.8 VDFN2×2-6



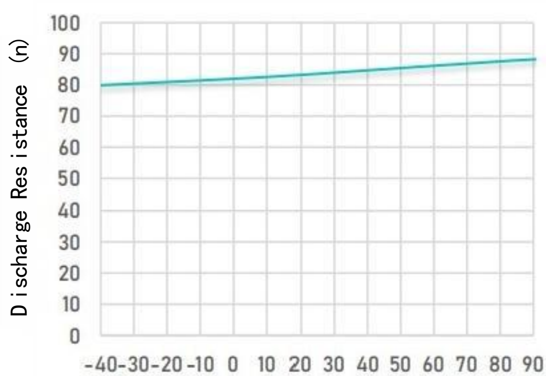
Temperature(℃)

Current to Enable Pin vs.Temperature



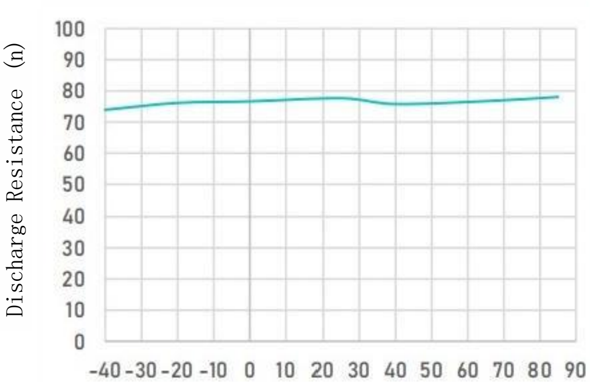
Temperature(℃)

Disable Current vs.Temperature



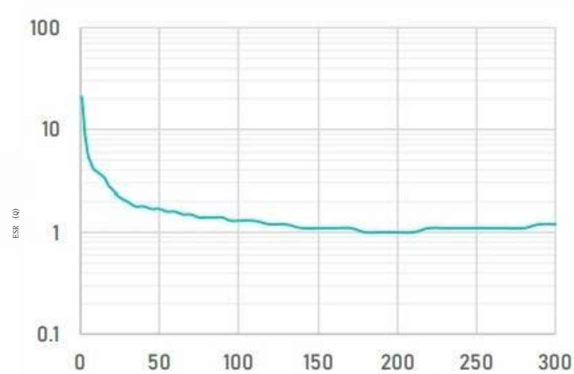
Temperature (℃)

Discharge Resistance vs.Temperature



Temperature(℃)

Discharge Resistance vs.Temperature

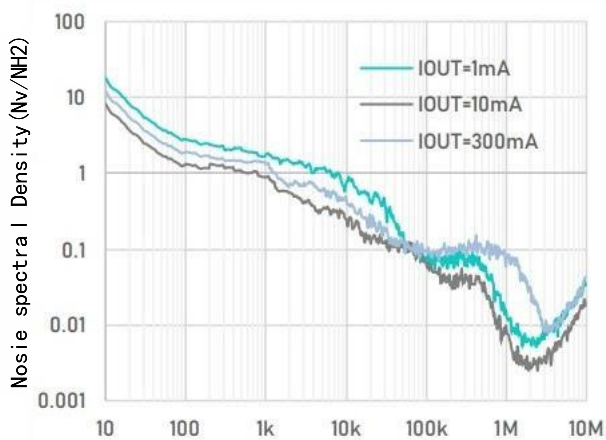


Output Current (mA)

Maximum Cour ESR Valuevs.Load Current

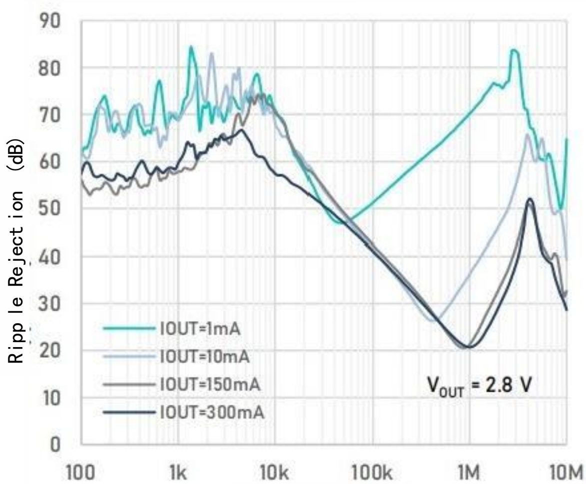
Typical Performance Characteristics

Note:Typical Characteristics are intended to be used as reference data;they are not guaranteed.



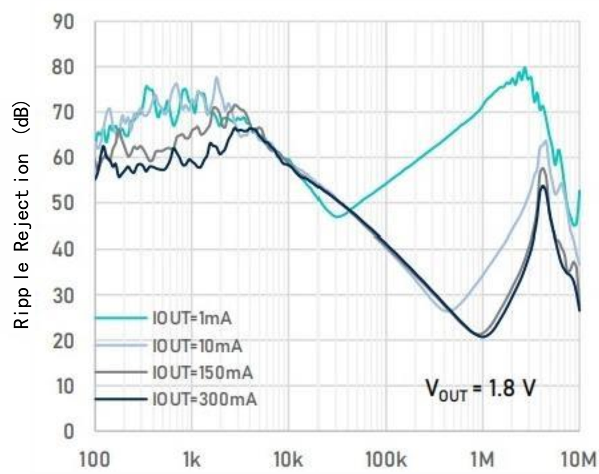
Frequency (Hz)

Output Voltage Noise Spectral Density vs.Frequency



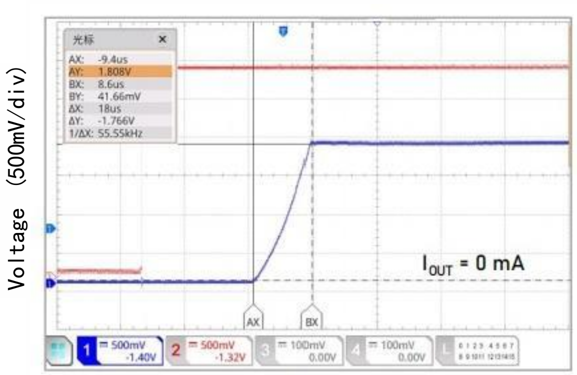
Frequency (Hz)

Power Supply Rejection Ratio vs.Frequency



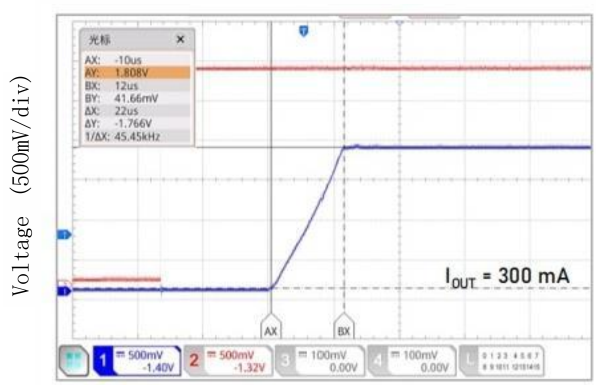
Frequency (Hz)

Power Supply Rejection Ratio vs.Frequency



Time (50μS/div)

Vour Slew-Rate -Iour=0 mA



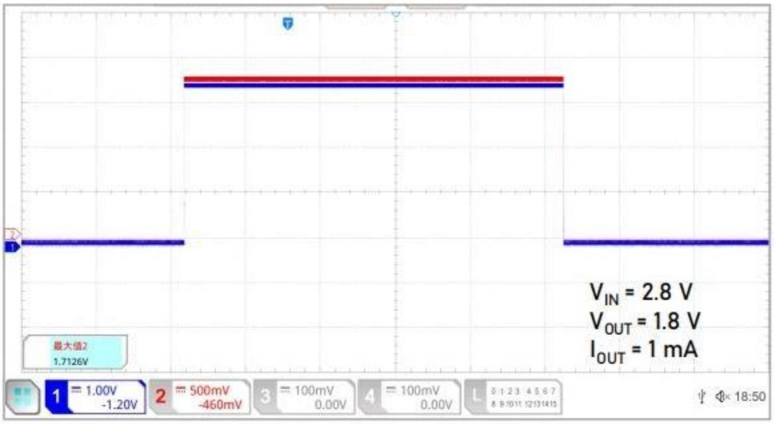
Time (50μS/div)

Vour **Slew-Rate** -Iour**=300 mA**

Typical Performance Characteristics

Note:Typical Characteristics are intended to be used asreference data;they are not guaranteed.

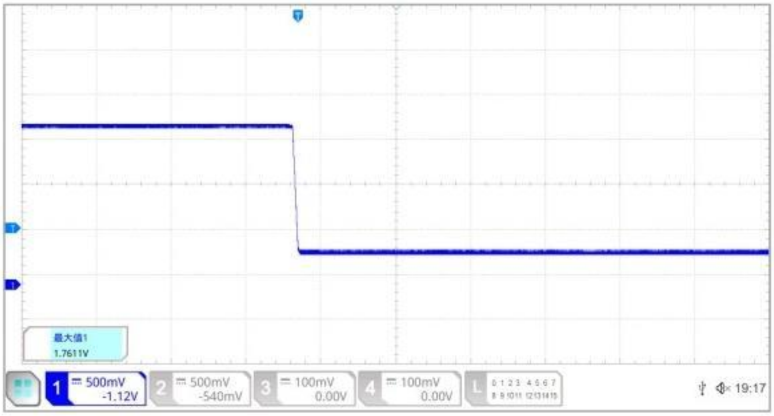
Voltage (500mV/div)



Time (50μS/div)

Turn-on/off-Slow Rising

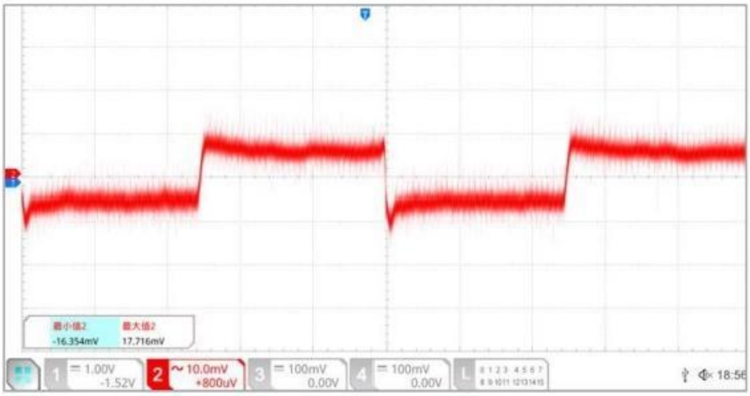
Voltage (500mV/div)



Time (50μS/div)

Overheating Protection

Voltage (10mV/div

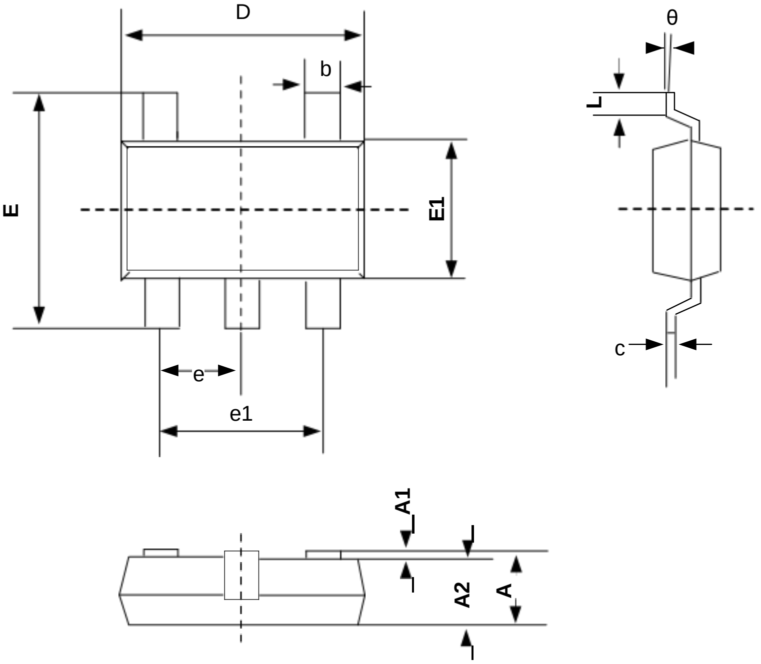


Time (50μS/div)

Load Transient Response -Iour=1 to 300 mA

Package Dimension

SOT23-5

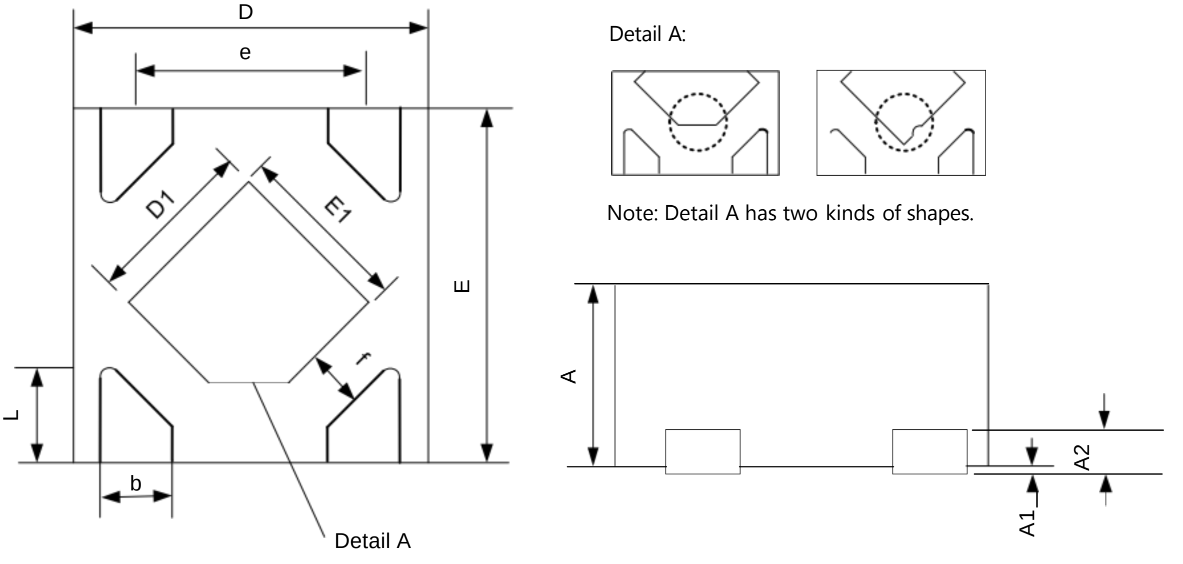


Unit: mm

Symbol	Dimensions In Millimeters	
	MIN	MAX
A	0.700	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.350	0.500
c	0.080	0.200
D	2.820	3.020
E	2.650	2.950
E1	1.600	1.700
e	0.950BSC	
E1	1.800	2.000
L	0.300	0.600
Θ	0°	8°

Package Dimension

DFN1×1-4

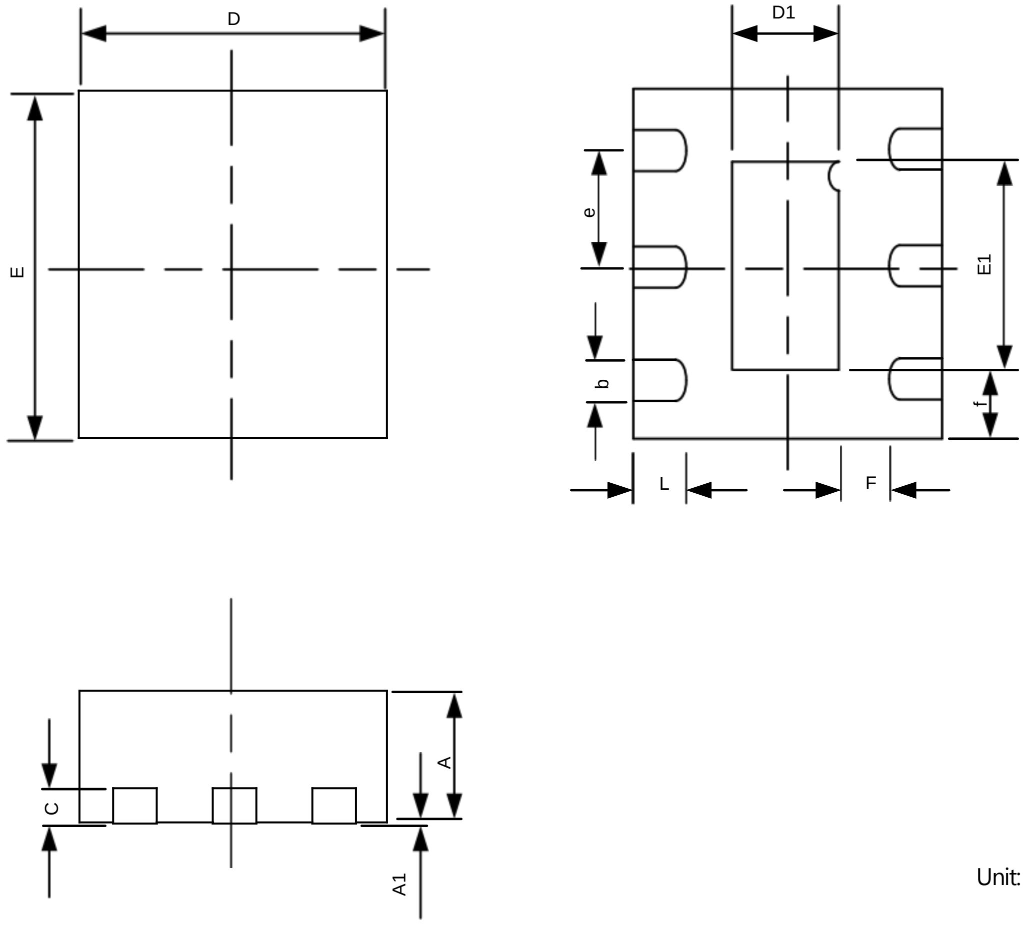


Unit: mm

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.340	0.370	0.400
A1	0.000	0.020	0.050
A2	0.100REF		
D	0.950	1.000	1.050
D1	0.430	0.480	0.530
E	0.950	1.000	1.050
E1	0.430	0.480	0.530
b	0.170	0.220	0.270
e	0.650BSC		
f	0.190	0.195	0.200
L	0.200	0.250	0.300

Package Dimension

DFN2×2-6



Unit: mm

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.700	0.750	0.800
A1	0.000	0.020	0.050
b	0.225	0.250	0.275
c	0.190	0.210	0.230
D	1.900	2.000	2.100
E	1.900	2.000	2.100
E1	1.150	1.200	1.250
D1	0.650	0.700	0.750
e	0.625	0.650	0.675
L	0.300	0.350	0.400
R		0.100	
F	0.280	0.300	0.320
f	0.380	0.400	0.420