WR0604

Low Dropout, POK Function, CMOS LDO

1. General Descriptions

The WR0604 is an adjustable output voltage, low dropout CMOS Linear regulator with POK function. The WR0604 can source 600 mA of output current with an input voltage range of 2.2 V to 5.5 V and an adjustable output range of 0.8 V to 5.0 V, making the device can be used for a wide variety of applications. Low-dropout voltage and low quiescent current make this series of devices ideal for a wide selection of battery-operated handheld equipment. The WR0604 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. All device versions have thermal shutdown and current limit for safety.

The devices offer a new level of cost-effective performance in cellular phones, laptop and notebook computers, and other portable devices.

The WR0604 regulators are available in standard DFN3030-10 package and ESOP-8 Package. Standard products are Pb-free and Halogen-free.

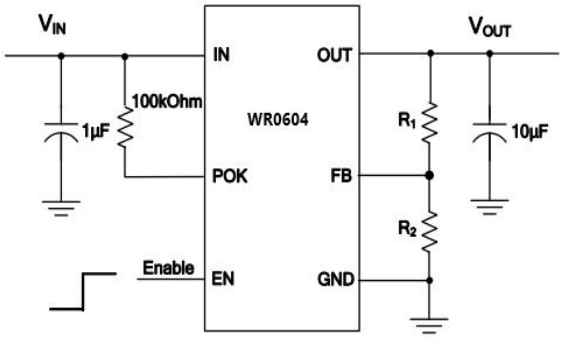
2. Features

- PSRR: 60dB@1KHz
- Output Current: 600mA
- Input Voltage: 2.2V~5.5V
- Adjustable Output Voltage: 0.8V~5.0V
- Dropout Voltage: 360mV @ I_{OUT} = 600mA
- Quiescent Current: 125μA (Typical)
- Shut-down Current: <1μA
- Recommend Output Capacitor: ≥4.7μF
- Operating Temperature: -40~+85ºC
- Built-In Fold Back Protection Circuit

3. Applications

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

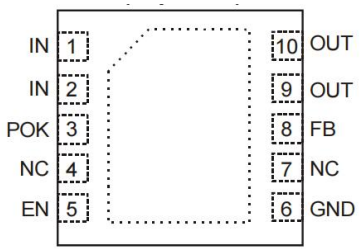
4. Typical Application



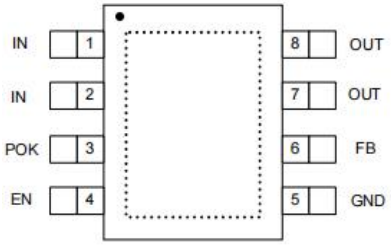
$$V_{OUT}=V_{REF}(1+\frac{R_1}{R_2})$$

5. Pin Configuration

(Top View)



DFN-3030-10



ESOP-8

6. Pin Description

PIN NUMBER		PIN NAME	I/O	PIN FUNCTIONS
DFN3030-10	ESOP-8			
1,2	1,2	IN	I	Input voltage supply. Bypass with a typical 1μF capacitor to GND. Place the input capacitor as close to the IN and GND pins of the device as possible.
3	3	POK	O	Power-OK output,active-high open-drain.
5	4	EN	I	Enable input. Active High. When the EN voltage（V_{EN}）is 0.9V higher than the input voltage（V_{IN}）, the chip turn off.
6	5	GND	-	Common ground.
8	6	FB	O	Output feedback.
9,10	7,8	OUT	O	Regulated output voltage. A low equivalent series resistance (ESR) capacitor, at least 4.7μF, is required from OUT to ground for stability. Place the output capacitor as close to the OUT and GND pins of the device as possible.
4,7	-	NC	-	NC

7. Absolute Maximum Ratings

PARAMETER		RATING	UNIT
Input voltage range		-0.3 to 7.0	V
EN Input voltage range		-0.3 to V_{IN}	V
Output voltage range		-0.3 to V_{IN}	V
Power-OK voltage range		-0.3 to V_{IN}	V
Feedback voltage range		-0.3 to V_{IN}	V
Maximum output current		800	mA
Power Dissipation P_D @T_A = 25ºC	SOP-8	4000	mW
	DFN3030-10	3100	
Thermal Resistance, θ_{JA}	SOP-8	27	℃/W
	DFN3030-10	40	
Junction Temperature		150	℃
Lead Temperature Range		260	℃
Storage Temperature Range		-55 to 150	℃
ESD Susceptibility	HBM	±6000	V

8. Recommended Operating Conditions

PARAMETER	RATING	UNIT
Input voltage range	2.2 to 5.5	V
EN Input voltage range	0 to 5.5	V
Nominal output voltage range	0.8 to 5.0	V
Output current	0 to 600	mA
Input capacitor	1	μF
Output capacitor	10	μF
Operating Temperature Range	-40 to 85	℃

9. Electrical Characteristics ($V_{IN}=V_{OUT(NOMINAL)}+1V$, $C_{IN}=1\mu F$,$C_{OUT}=10\mu F$, Full= -40℃ to 85℃, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OUT}	Output Voltage Range	I_{OUT}=1mA	0.975 V_{OUT}	V_{OUT}	1.025 V_{OUT}	V
V_{DO}	Dropout Voltage	V_{OUT}=5.0V, I_{OUT}=600mA, Full		350	400	mV
		V_{OUT}=3.3V, I_{OUT}=600mA, Full		350	400	
		V_{OUT}=2.5V, I_{OUT}=600mA, Full		350	400	
		V_{OUT}=1.8V, I_{OUT}=600mA, Full		370	420	
		V_{OUT}=1.2V, I_{OUT}=600mA, Full		390	440	
		V_{OUT}=0.8V, I_{OUT}=600mA, Full		850	950	
I_{LIM}	Output current limit	V_{EN}=V_{IN}, Full		1000		mA
I_{OUT}	Maximum output current in the accuracy range	V_{EN}=V_{IN}, Full	600			mA
I_{SHORT}	Short Current	V_{EN}=V_{IN}=2.8V, V_{OUT}=1.8V, V_{OUT} Short to GND, Full		450		mA
I_{FB}	FB leakage			0.01	1	μA
LNR	Line Regulation	V_{IN}=(V_{OUT}+1)~5.5V, I_{OUT}=1mA, Full		1		mV
Δ V_{OUT}/V_{OUT}	Load Regulation3	I_{OUT}=1~600mA, Full	-1		1	%
I_Q	Quiescent Current	I_{OUT}=0mA T_A=25℃		125	170	μA
I_{SHDN}	Shut-down Current	V_{EN} = 0V, Full		0.01		μA
PSRR	Power Supply Ripple Rejection	V_{IN}=(V_{OUT}+1V) $_{DC}$+0.3V_{P-P} f=1kHz, I_{OUT}=10mA, T_A=25℃		60		dB
V_{ENH}	EN high voltage (enabled)	I_{OUT}=1mA, Full	1.4			V
V_{ENL}	EN low voltage (disabled)	I_{OUT}=1mA, Full			0.4	V
I_{EN}	EN Input leakage	V_{EN} = 0V		0.01	1	μA
		V_{EN} = 5.5V				
V_{OL}	POK output low voltage	Force 2mA		100	200	mV
$V_{POK\_TH\_UP}$	Output voltage (rising) POK threshold	FB rising	0.696	0.736	0.776	mV

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{POK_Hys}	Output voltage POK hysteresis			0.032		mV
POK deglitch				150		μs
t_{ST}	Start-up Time, from EN high to POK high	V_{EN} = 0V to 2.0V, I_{OUT} = 100mA		170		μs
I_{POK_LK}	POK leakage current	V_{POK} = 5.5V		0.01	1	μA
T_{SD}	Thermal shutdown threshold			160		ºC
ΔT_{SD}	Thermal shutdown hysteresis			40		ºC

Note1: The dropout voltage is defined as (V_{IN}-V_{OUT}) when V_{OUT} is $V_{OUT(NOM)}$*97.5%.

Note2: Maximum output current is affected by the PCB layout, size of metal trace, the thermal conduction path between metal layers, ambient temperature and the other environment factors of system. Attention should be paid to the dropout voltage when V_{IN}< V_{OUT} + V_{DROP}.

Note3: The Load regulation is measured using pulse techniques with duty cycle < 5%.

10. Typical Performance Characteristics (T_A=-40 to 85ºC,V_{IN}=V_{OUT} +1V,C_{IN}=1μF,C_{OUT}=10μF,unless otherwise noted)

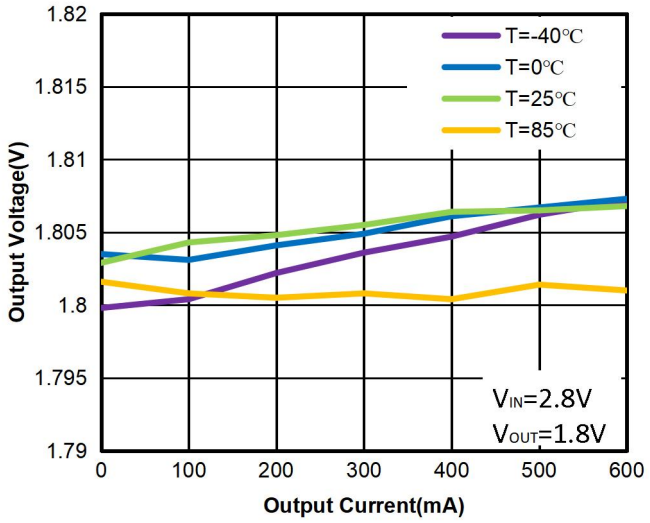


Figure 1. WR0604-1.8V
Output Voltage vs. I_{OUT} & Ambient Temperature

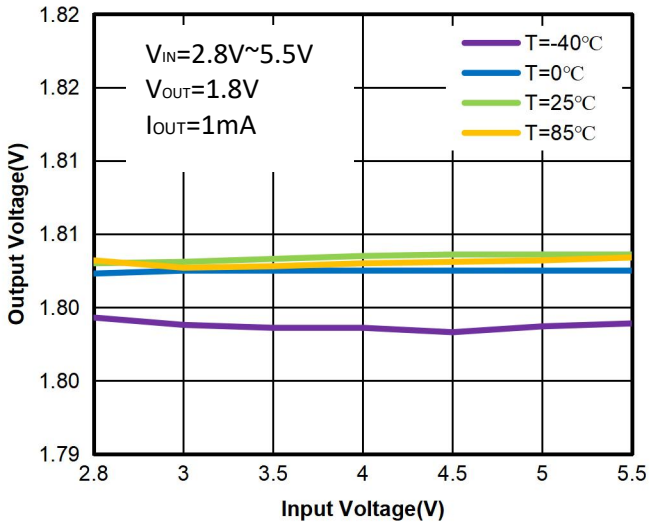


Figure 2. WR0604-1.8V
Output Voltage vs. V_{IN} & Ambient Temperature

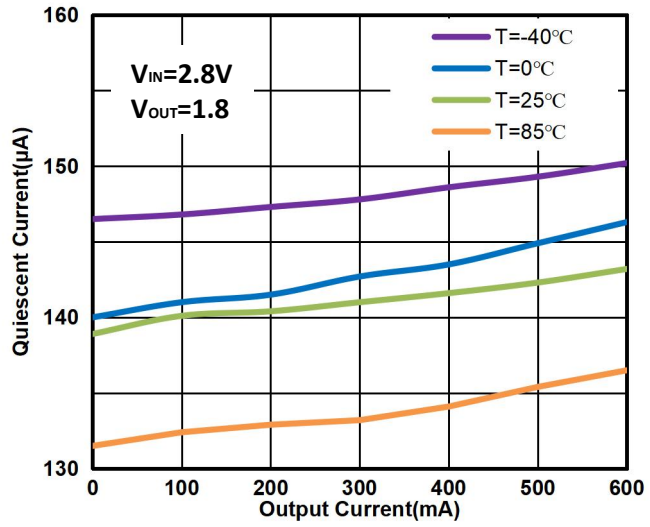


Figure 3. WR0604-1.8V
Quiescent Current vs. I_{OUT} & Ambient Temperature

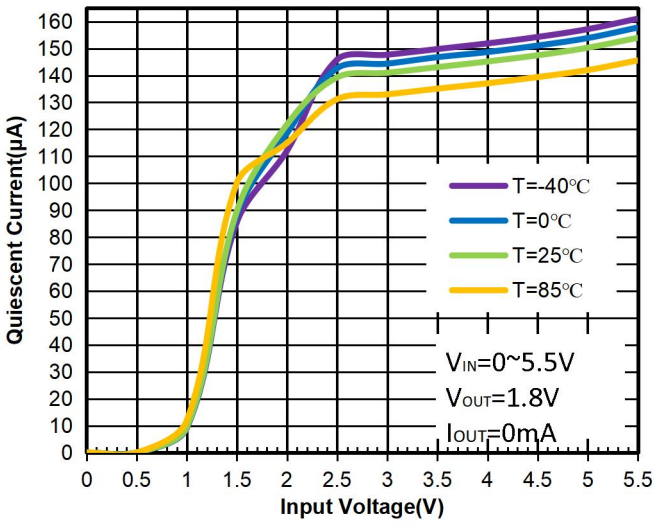


Figure4. WR0604-1.8V
Quiescent Current vs. V_{IN} & Ambient Temperature

Typical Performance Characteristics (T_A= -40 to 85ºC, V_{IN}=V_{OUT}+1V, C_{IN}=1μF, C_{OUT}=10μF, unless otherwise noted)

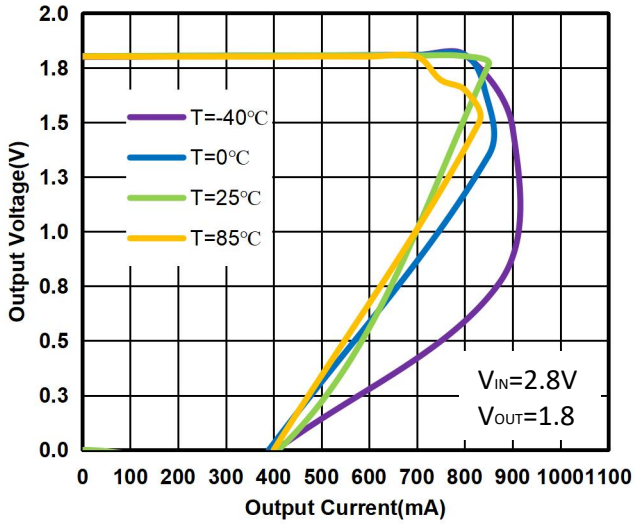


Figure 5. WR0604-1.8V
Foldback Current Limit vs. I_{OUT} & Ambient Temperature

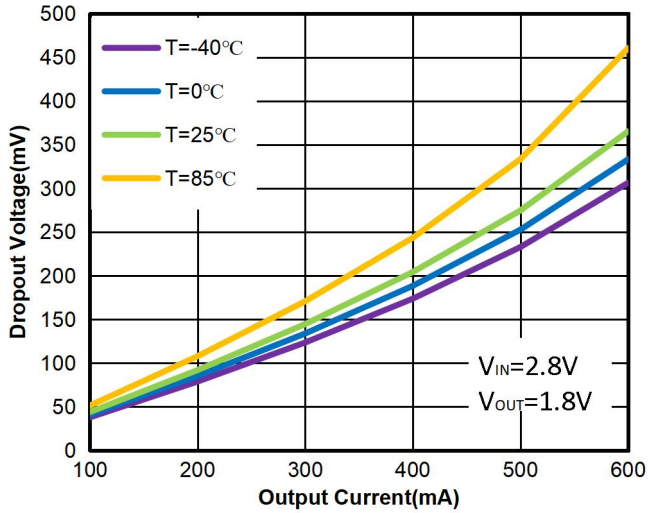


Figure 6. WR0604-1.8V
Dropout Voltage vs. I_{OUT} & Ambient Temperature

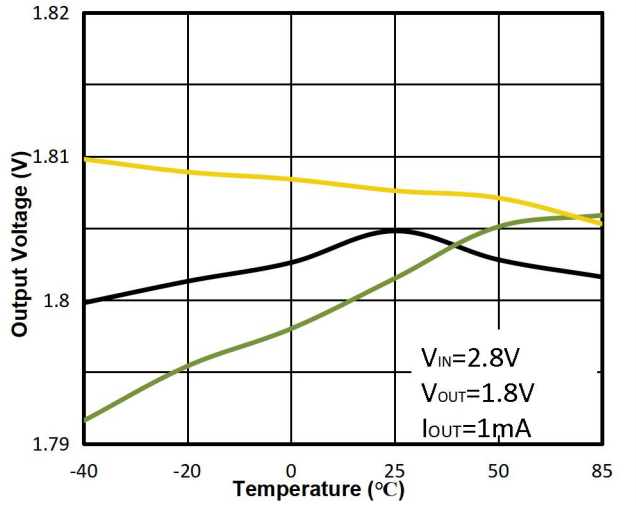


Figure 7. WR0604-1.8V
Output Voltage vs. Ambient Temperature

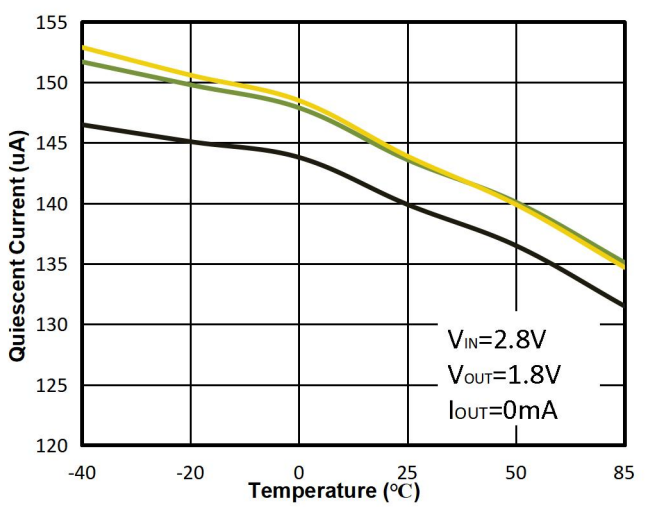


Figure 8. WR0604-1.8V
Output Voltage vs. Ambient Temperature

Typical Performance Characteristics (T_A = -40 to 125ºC, V_{IN}=V_{OUT}+1V, C_{IN}=C_{OUT}=1μF, unless otherwise noted)

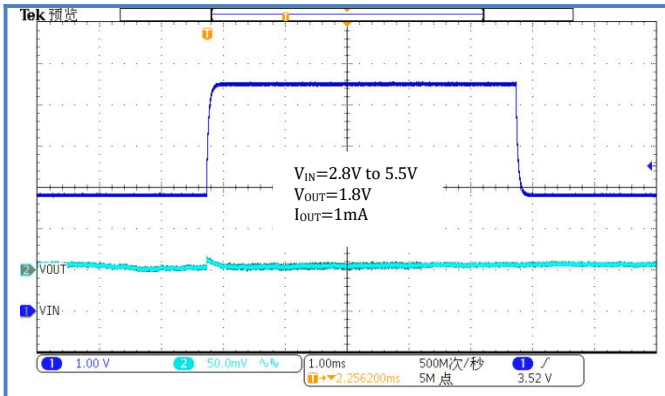


Figure 9. Line Transient

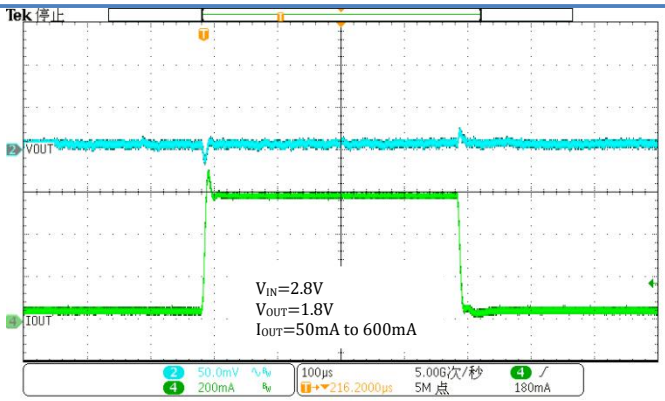


Figure 10. Load Transient

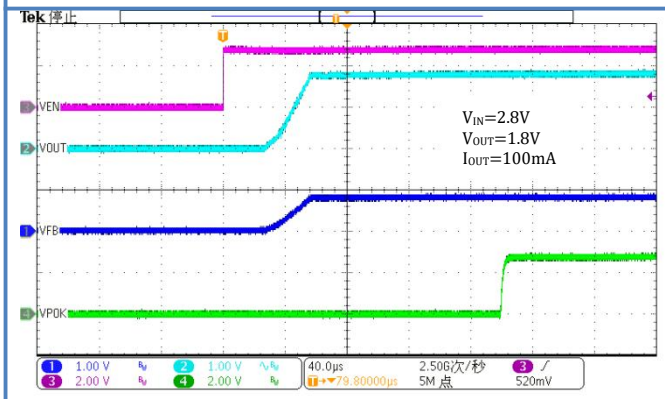


Figure 11. Start-up Time

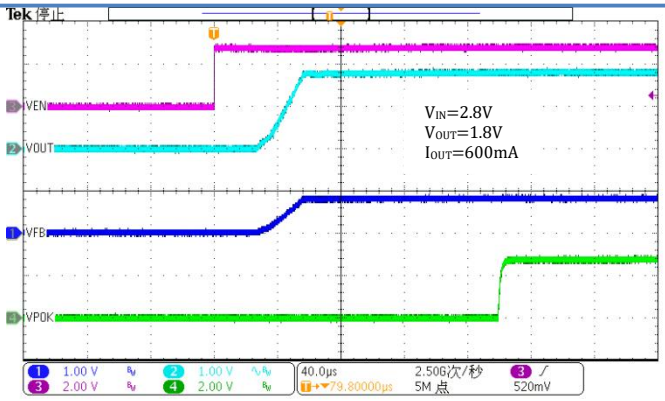


Figure 12. Start-up Time

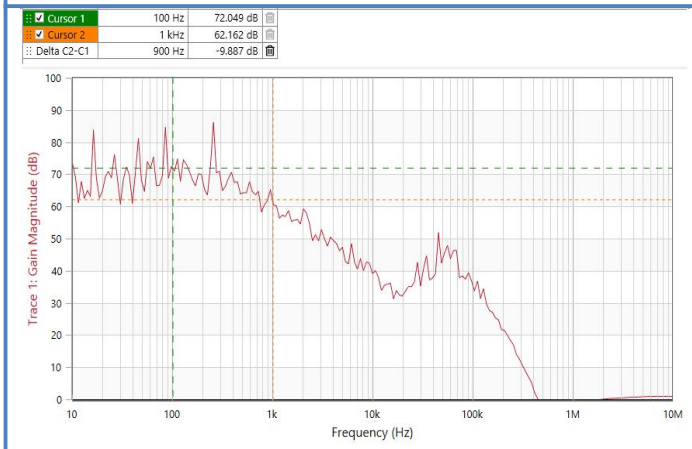


Figure 13. Power Supply Rejection Ratio vs. Frequency

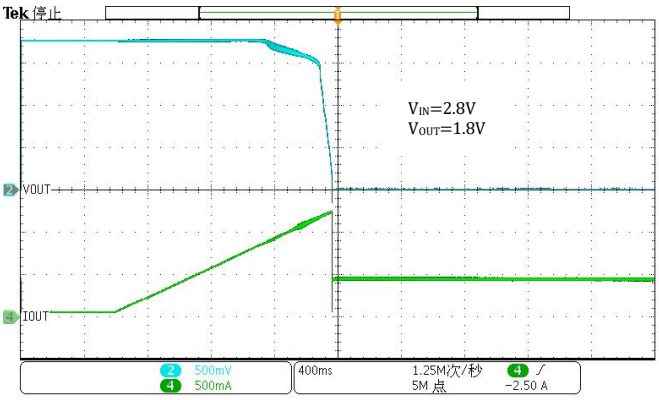
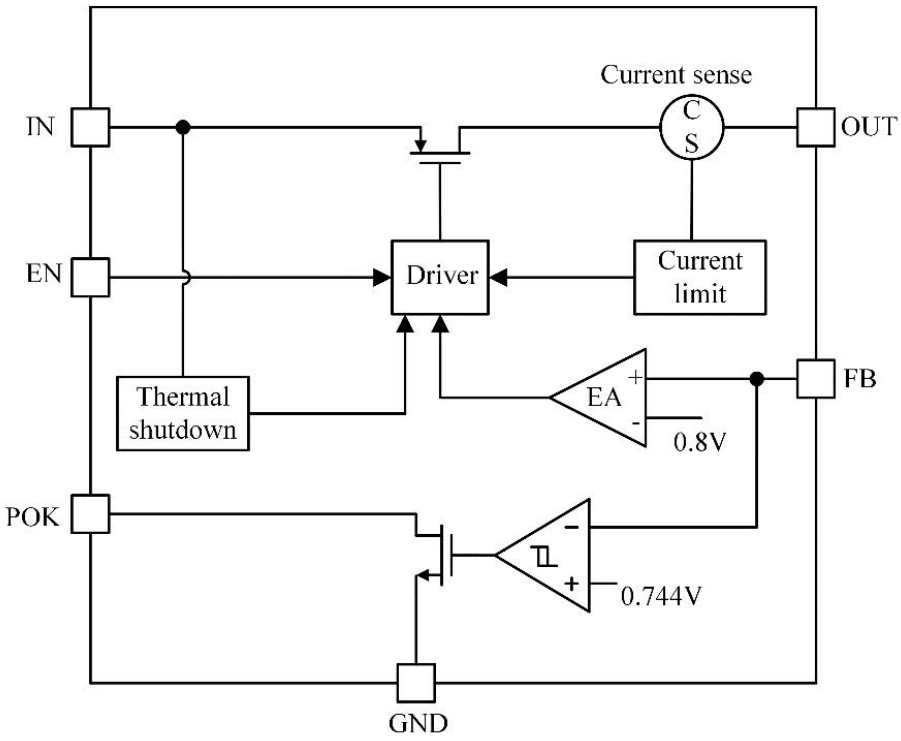


Figure 14. Current Limit Protection (VOUT=1.8V)

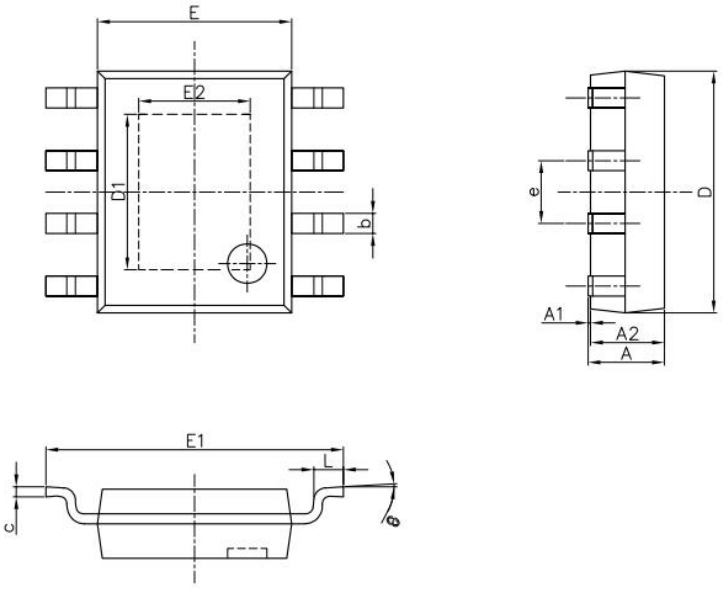
11. Function Description

11.1 Block Diagram



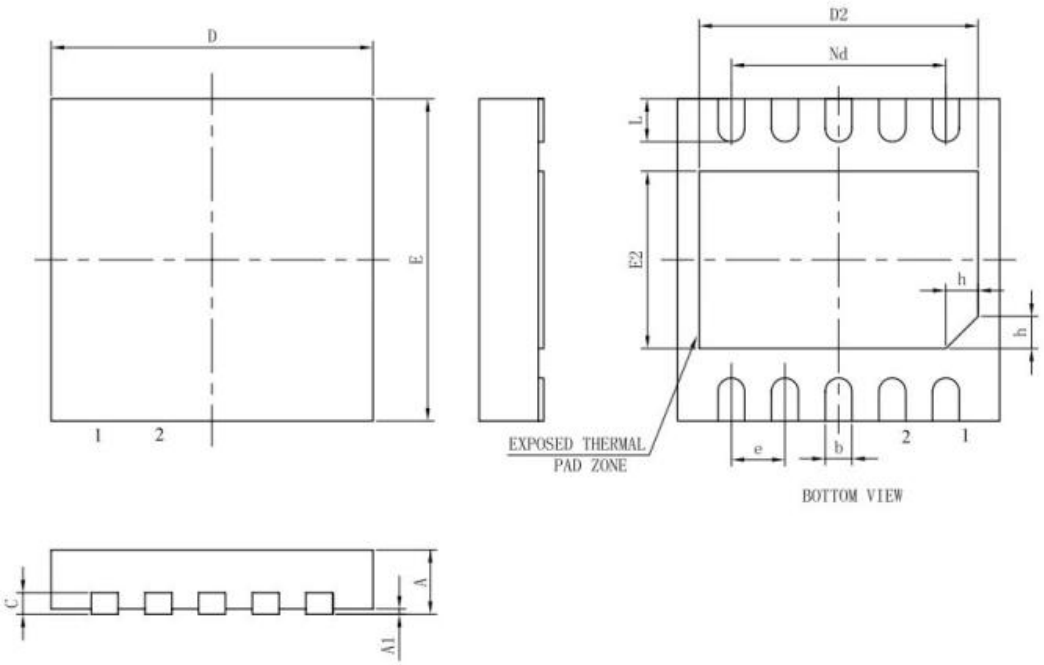
12. Package Information

ESOP-8



SYMBOL	MILLIMETERS	
	MIN	MAX
A	1.30	1.70
A1	0.00	0.18
A2	1.30	1.55
b	0.33	0.51
c	0.17	0.25
D	4.70	5.10
D1	3.05	3.50
E	3.70	4.10
E1	5.80	6.20
E2	2.16	2.50
e	1.270BSC	
L	0.40	1.27
θ	0°	8°

DFN3030-10



SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	-	0.02	0.05
b	0.18	0.25	0.30
c	0.18	0.20	0.25
D	2.90	3.00	3.10
D2	2.40	2.50	2.60
e	0.50BSC		
Nd	2.00BSC		
E	2.90	3.00	3.10
E2	1.45	1.55	1.65
L	0.30	0.40	0.50
h	0.20	0.25	0.30
L/F载体尺寸	106*75		

Ordering Information

Part Number	Output Voltage	Package	Packing Quantity	Marking*
WR0604-ADP80R	adjustable	ESOP-8	4K/peel	WR0604 AD XXXX
WR0604-ADFEAR	adjustable	DFN3030-10	3K/peel	WR0604 AD XXXX

STATEMENTS

WAY-ON provides data sheets based on the actual performance of the device, and users should verify actual device performance in their specific applications. The device characteristics and parameters in this data sheet can and do vary from application to application, and actual device performance may change over time.This information is intended for developers designing with WAY-ON products. Users are responsible for selecting the appropriate WAY-ON product for their application and for designing and verifying the application to ensure that your application meets the appropriate standards or other requirements, and users are responsible for all consequences. Specifications are subject to change without notice.

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