Features

- Low Supply Current ~ 55uA (per circuit)
- Low Shutdown Current ~0.1uA (Typ.)
- Output Current ~300mA
- High Power Supply Rejection Ratio ~75db@1KHz
- 1.7~5.5V Operation
- ±1.5% Initial Voltage Accuracy
- Low Temperature Drift Coefficient ~50ppm
- Line Regulation ~0.02%/V(Typ.)
- Low ESR Capacitor ~1uF ceramic capacitor
- SOT-23-6、TSOT-23-6、WDFN6-1.6x1.6、package
- Green Product (RoHS, Lead-Free, Halogen-Free Compliant)

Applications

- Portable communication equipment
- Notebook Computer
- Battery Powered Systems

General Description

The GS7129 is a CMOS linear regulator. It is featuring ultra-high power supply rejection ratio, low output voltage noise, low dropout voltage, low quiescent current and fast transient response. It guarantees delivery of 300mA output current, and supports preset 1.1V, 1.2V, 1.3V, 1.5V, 1.8V, 1.85V, 1.9V, 2.0V, 2.3V, 2.5V, 2.6V, 2.7V, 2.8V, 2.85V, 2.9V, 3.0V, 3.1V, 3.3V output voltage versions.

Based on its low quiescent current consumption and its less than 1uA shutdown mode, the GS7129 is ideal for battery- powered applications. The high power supply rejection ratio of the GS7129 holds well for low input voltages typically encountered in battery- operated systems. The regulator is stable with small ceramic capacitive loads (1μF typical).

Typical Application

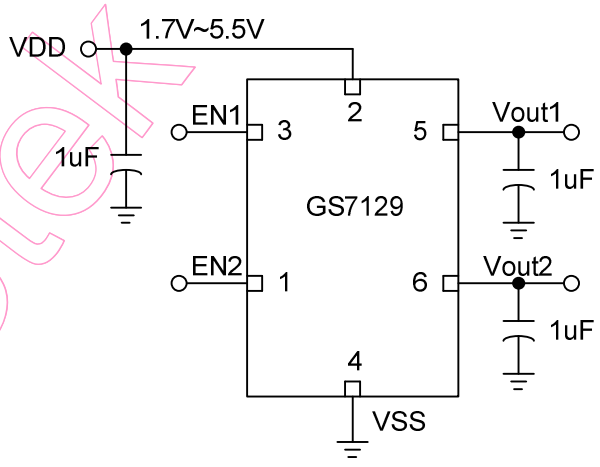


Figure.1 Typical Application of GS7129

Function Block Diagram

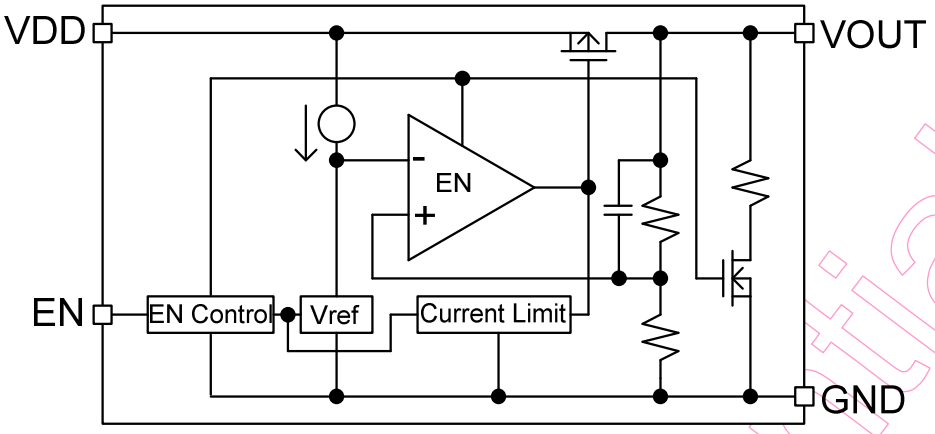


Figure 2(a) with auto discharge function (per circuit)

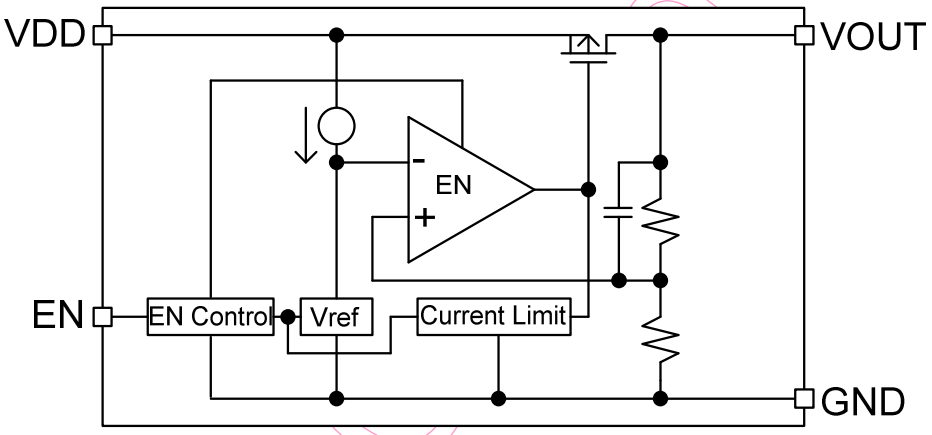


Figure 2(b) without auto discharge function (per circuit)

Figure 2 Function Block Diagram

Pin Configuration

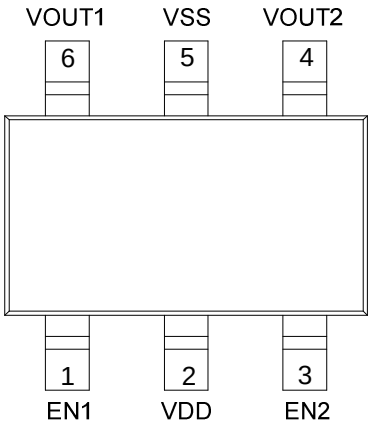


Figure 3a SOT-23-6/TSOT-23-6 Package

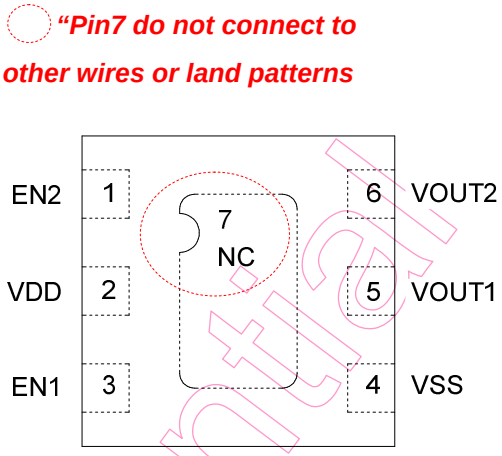


Figure 3b WDFN6-1.6x1.6 Package

Pin Descriptions

No		Name	I/O type	Description
SOT-23-6/ TSOT-23-6	WDFN6-1.6x1.6			
1	3	EN1	I	Enable Pin 1
2	2	VDD	I	Input Voltage Pin
3	1	EN2	I	Enable Pin 2
4	6	VOUT2	O	Output Voltage Pin2
5	4	VSS	I/O	Ground pin
6	5	VOUT1	O	Output Voltage Pin1
	7	NC		NC pin.

Ordering Information

GS7129PP-XXX XXX- R

1. Package
2. Output voltage of of voltage regulator 1
3. Output voltage of of voltage regulator 2
4. Shipping

No	Item	Contents
1	Package	ST: SOT-23-6 TS:TSOT-23-6 UD:WDFN6-1.6x1.6
2	Output voltage of voltage regulator 1	1P1:1.1V, 1P2: 1.2V, 1P3: 1.3V, 1P5: 1.5V, 1P8: 1.8V, 1P85: 1.85V, 1P9: 1.9V, 2P0: 2.0V, 2P3: 2.3V, 2P5: 2.5V, 2P6: 2.6V, 2P7: 2.7V, 2P8: 2.8V, 285: 2.85V, 2P9: 2.9V, 3P0: 3.0V, 3P1: 3.1V, 3P3: 3.3V
3	Output voltage of voltage regulator 2	1P1:1.1V, 1P2: 1.2V, 1P3: 1.3V, 1P5: 1.5V, 1P8: 1.8V, 1P85: 1.85V, 1P9: 1.9V, 2P0: 2.0V, 2P3: 2.3V, 2P5: 2.5V, 2P6: 2.6V, 2P7: 2.7V, 2P8: 2.8V, 285: 2.85V, 2P9: 2.9V, 3P0: 3.0V, 3P1: 3.1V, 3P3: 3.3V
4	Shipping	R: Tape & Reel

Example: GS7129 SOT-23-6 1.8V and 2.8V Tape & Reel ordering information is “GS7129ST-1P82P8-R”

Absolute Maximum Rating (Note 1)

Parameter	Symbol	Limits	Units
VIN to GND	V_{IN}	-0.3 < V_{IN}< 6	V
VEN to GND	V_{EN}	-0.3 < V_{EN}< 6	V
Output Voltage	V_{OUT}	-0.3 < V_{OUT}<V_{IN}+0.3	V
Output Current	I_{OUT}	300	mA
Package Power Dissipation at T_A ≦25℃	$P_{D\_SOT-23-6}$	400	mW
Package Power Dissipation at T_A ≦25℃	$P_{D\_TSOT-23-6}$	455	mW
Package Power Dissipation at T_A ≦25℃	$P_{D\_WDFN6-1.6x1.6}$	560	mW
Junction Temperature	T_J	- 45 ~ 150	℃
Storage Temperature	T_{STG}	- 65 ~ 150	℃
Lead Temperature (Soldering) 10S	T_{LEAD}	260	℃
ESD (Human Body Mode) (Note 2)	V_{ESD_HBM}	2K	V
ESD (Machine Mode) (Note 2)	V_{ESD_MM}	200	V

Thermal Information (Note 3)

Parameter	Symbol	Limits	Units
Thermal Resistance Junction to Ambient	$\theta_{JA\_SOT-23-6}$	250	℃/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_TSOT-23-6}$	220	℃/W
Thermal Resistance Junction to Ambient	$\theta_{JA\_WDFN6-1.6x1.6}$	179	℃/W

Recommend Operating Condition (Note 4)

Parameter	Symbol	Limits	Units
VIN to GND	V_{IN}	1.7 to 5.5	V
Junction Temperature	T_J	-40 ~ 125	℃
Ambient Temperature	T_A	-40 ~ 85	℃

Electrical Characteristics

(V_{IN} = V_{OUT} + 1V, T_A =T_J=25℃, C_{IN}=C_L=1uF, I_{OUT}=1mA, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
SUPPLY VOLTAGE SECTION						
Supply Voltage	V_{IN}		1.7		5.5	V
Supply Current (per circuit)	I_{VIN}	Unload		55	70	uA
Standby Current	I_{STBY}	V_{EN}=0 or V_{EN}= V_{IN}		0.1	1.0	uA
EN Input Current	I_{EN}	V_{EN}= 6.5V		0.3		uA
Output Current	I_{OUT}	V_{DD}≧V_{OUT}+1V	300			mA
OUTPUT SECTION						
Output Voltage	V_{OUT}	I_{OUT}=1mA, V_{OUT} =1.1V,1.2V, 1.3V, 1.5V, 1.8V, 1.85V, 1.9V, 2.0V, 2.3V, 2.5V, 2.6V, 2.7V, 2.8V, 2.85V, 2.9V, 3.0V, 3.1V, 3.3V	-1.5		+1.5	%
Dropout Voltage (Note 5)	V_{DROP}	I_{OUT}=300mA, V_{OUT}=1.1V		680	950	mV
		I_{OUT}=300mA, 1.2V≤V_{OUT}<1.5V		530	870	mV
		I_{OUT}=300mA, 1.5V≤V_{OUT}<1.7V		460	660	mV
		I_{OUT}=300mA, 1.7V≤V_{OUT}<2.0V		400	580	mV
		I_{OUT}=300mA, 2.0V≤V_{OUT}<2.5V		350	470	mV
		I_{OUT}=300mA, 2.5V≤V_{OUT}<2.8V		310	400	mV
		I_{OUT}=300mA, 2.8V≤V_{OUT}≤3.3V		280	360	mV
Line Regulation	△V_{LNR}	V_{IN} = V_{OUT} +0.5V to 6.5V, I_{OUT}=1mA		0.05	0.10	%/V
Load Regulation	△V_{LDR}	V_{IN} = V_{OUT}+1V, I_{OUT}=1mA to 100mA		15	40	mV
Ripple Rejection Rate	PSRR	V_{IN}=MAX{V_{OUT}+1.0V, 3V}, Ripple 0.2Vp-p, I_{OUT}=30mA, f=1KHz		75		dB
Limit Current	Ilim	V_{IN}=3.5V	400	490	700	mA
Short Current	Ishort	V_{OUT}=0V, V_{IN}=3.5V		50		mA
EN Input Voltage High	V_{ENH}		1.2			V
EN Input Voltage Low	V_{ENL}				0.3	V
CL Auto-Discharge Resistance (Note 6)	Rdischg	V_{IN}=4.0V, (V_{EN}=0V or V_{EN}= V_{IN})		110		Ω

Temperature Drift	$\triangle V_{OUT}$ / $\triangle T_A$	I_{OUT}=1mA, T_A = -40℃ to +85℃		50		ppm/°C
Thermal Shutdown Temperature	T_{SD}	T_J Rising		150		℃
Thermal Shutdown Returned Temperature				130		℃

Note 1. Stresses listed as the above “Absolute Maximum Ratings” may cause permanent damage to the device. These are for stress ratings. 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 remain possibility to affect device reliability.

Note 2. Devices are ESD sensitive. Handling precaution recommended.

Note 3. θ_{JA} is measured in the natural convection at T_A=25℃ on a high effective thermal conductivity test board (4 Layers, 2S2P) of JEDEC 51-7 thermal measurement standard.

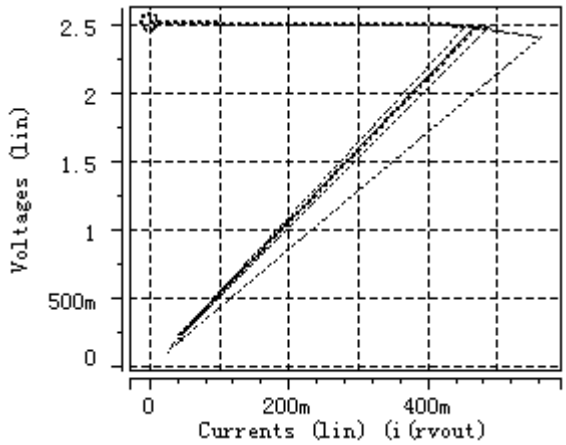
Note 4. The device is not guaranteed to function outside its operating conditions.

Note 5. The dropout voltage is defined as V_{IN} - $V_{OUT,}$ which is measured when V_{OUT} is 98%*$V_{OUT.}$

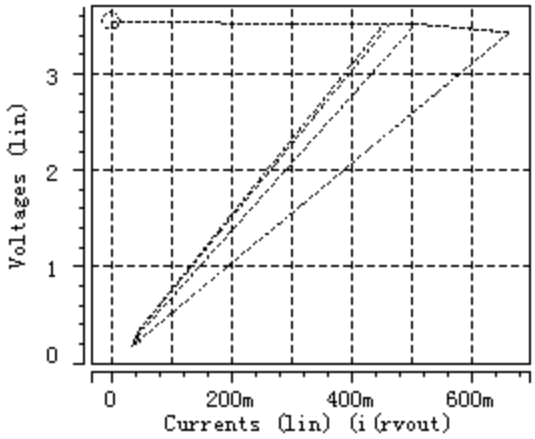
Note 6. The output voltage Auto discharge function is optional.

Typical Characteristics

1. Output Voltage vs. Output Current (C1=1.0uF, C2=1.0uF, Temp=25℃)

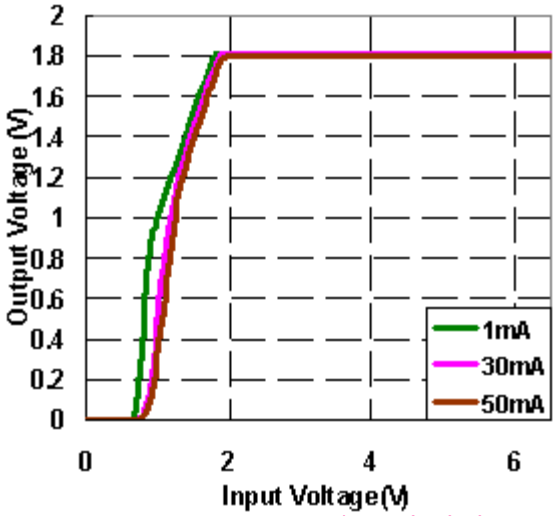


V_{OUT}=2.5V, V_{DD}=1.3V,1.5V,2.0V,3.0V,5.0V

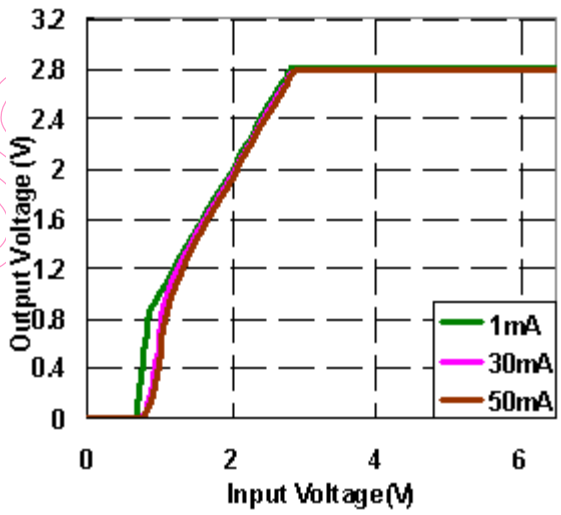


V_{OUT}=3.5V, V_{DD}=3.8V,4.0V,4.5V,5.0V

2. Output Voltage vs. Input Voltage (C1=1.0uF, C2=1.0uF, Temp=25℃)

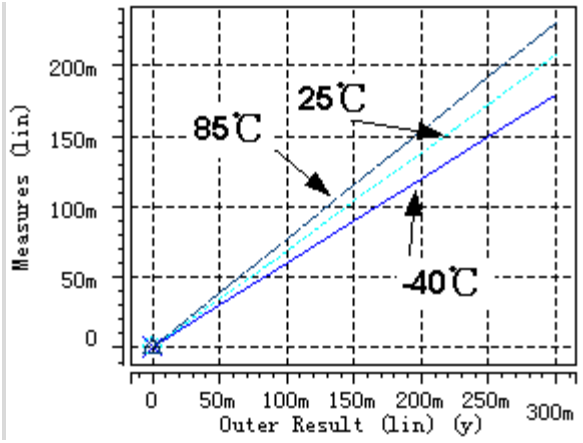


V_{OUT}=1.8V

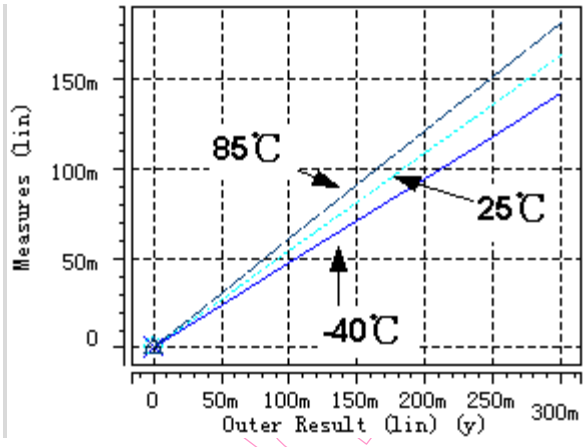


V_{OUT}=2.8V

3. Dropout Voltage vs. Output Current (C1=1.0uF, C2=1.0uF)

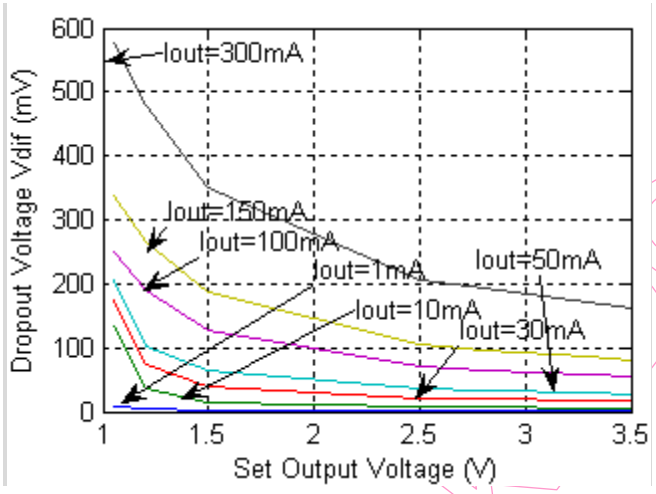


V_{OUT}=2.5V

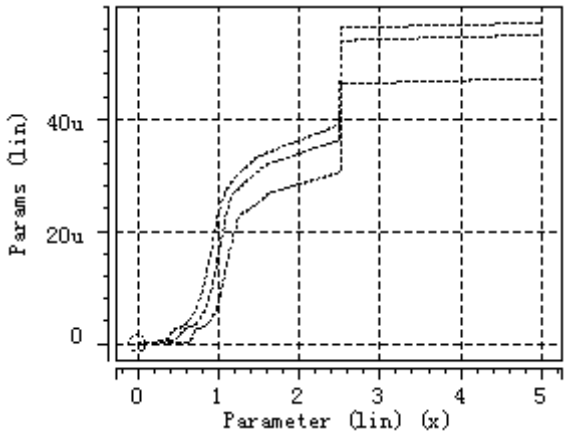


V_{OUT}=3.5V

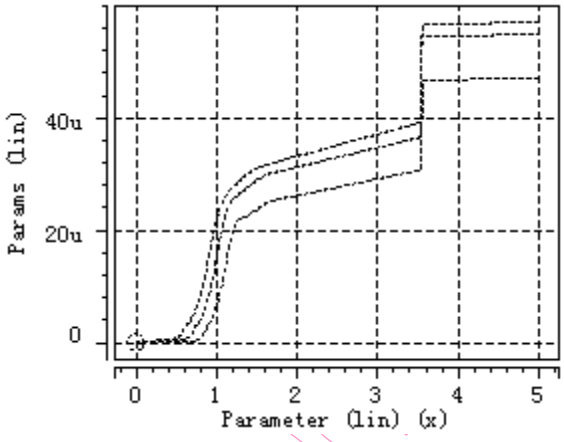
4. Dropout Voltage vs. Set Output Voltage (C1=1.0uF, C2=1.0uF, Temp=25℃)



5. Current Consumption vs. Input Voltage (C1=1.0uF, C2=1.0uF, Iout=1mA)

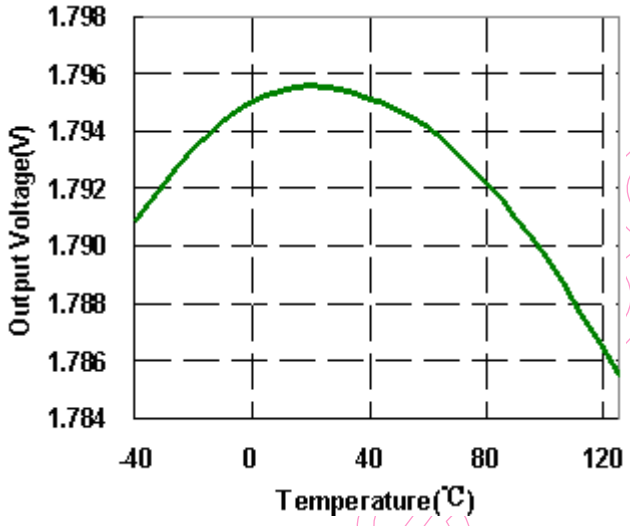


V_{OUT}=2.5V, no load

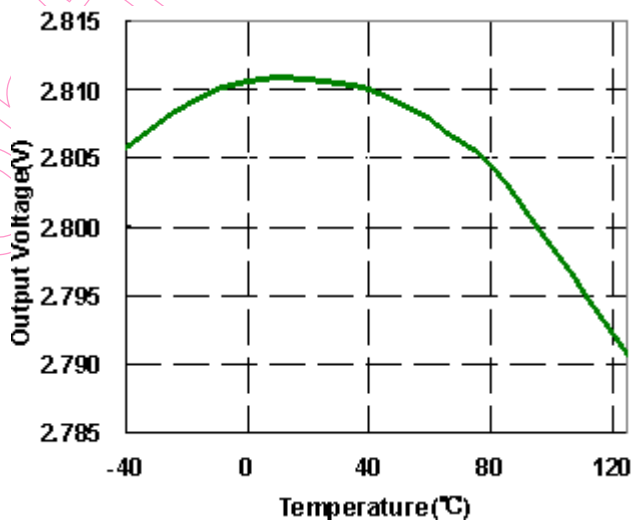


V_{OUT}=3.5V, no load

6. Output Voltage vs. Temperature (C1=1.0uF, C2=1.0uF,Iout=1mA)

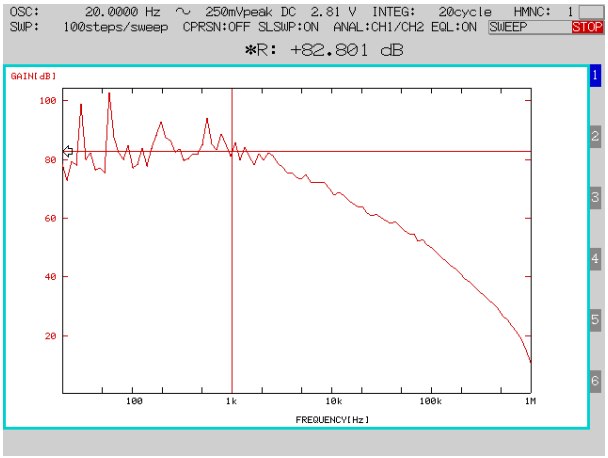


V_{OUT}=1.8V, V_{DD}=2.8V, no load

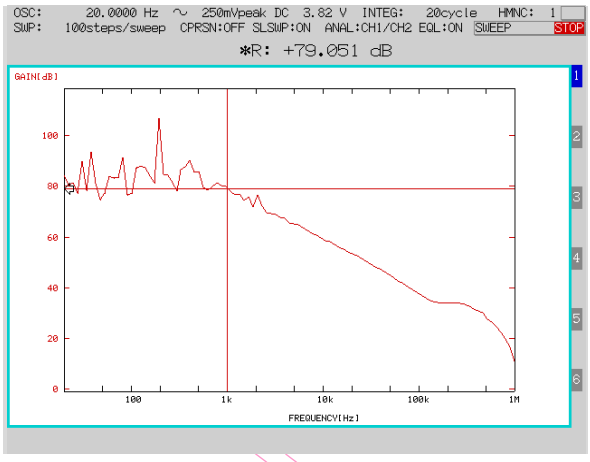


V_{OUT}=2.8V, V_{DD}=3.8V, no load

7. Ripple Rejection (C1=1.0uF, C2=1.0uF, Iout=1mA, Temp=25℃)

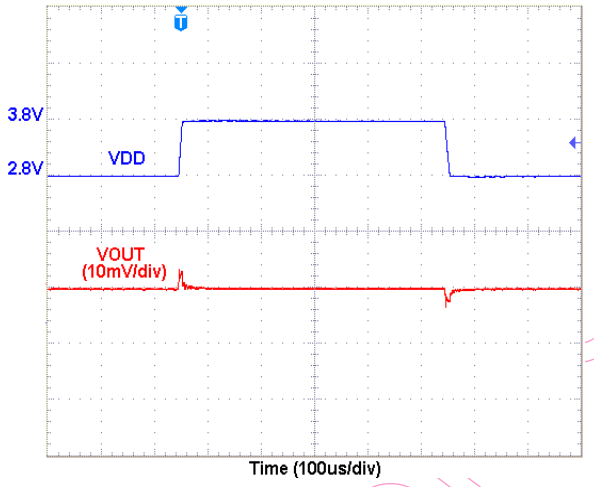


V_{OUT}=1.8V,V_{DD}=2.8V

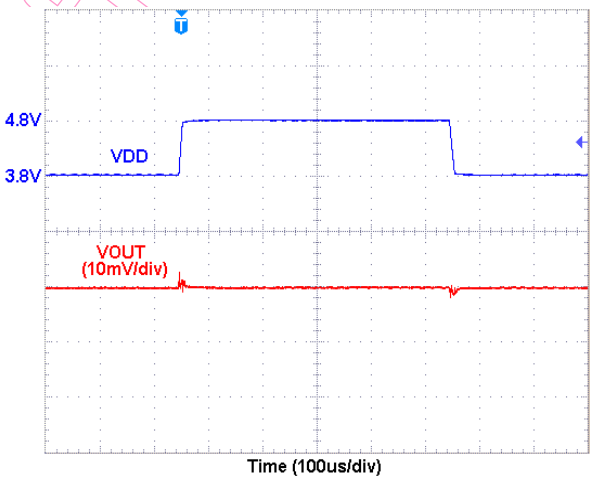


V_{OUT}=2.8V,V_{DD}=3.8V

8. Transient Response Characteristics when Input Common to Vr1 and Vr2 (C1=1.0uF, C2=1.0uF, Iout=30mA, Temp=25℃ , tr=tf=5.0us)

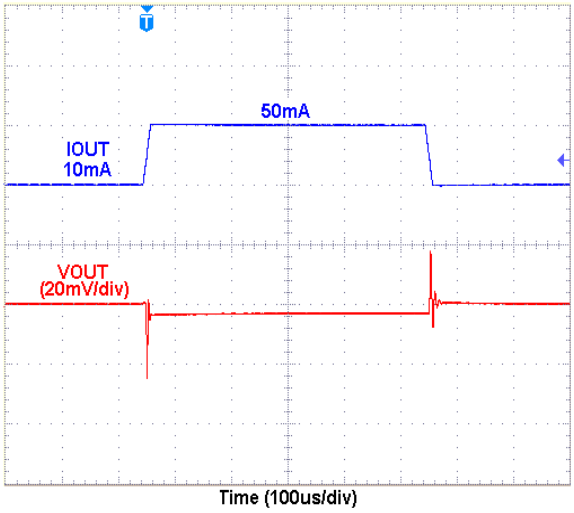


V_{OUT} =1.8V,V_{DD}=2.8V~3.8V~2.8V

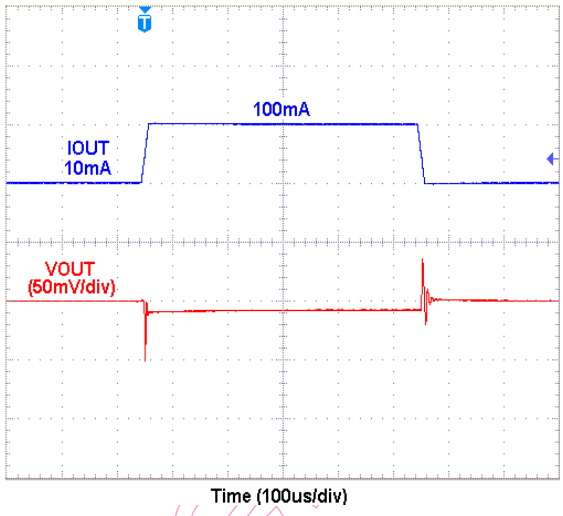


V_{OUT} =2.8V,V_{DD}=3.8V~4.8V~3.8V

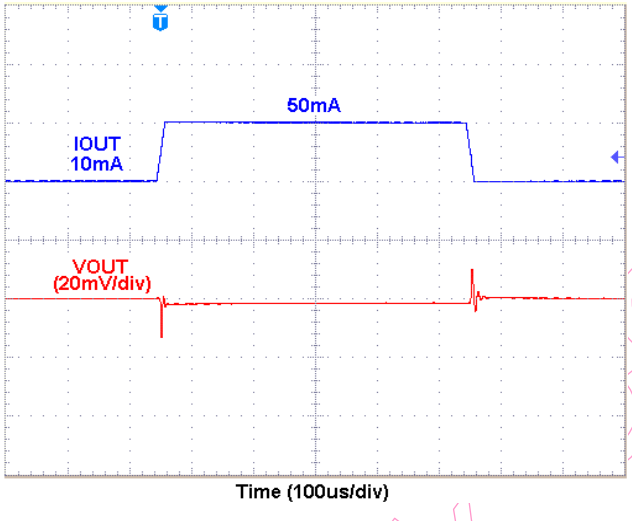
9. Transient Response Characteristics of load (C1=1.0uF, C2=1.0uF, Temp=25℃ , tr=tf=5.0us)



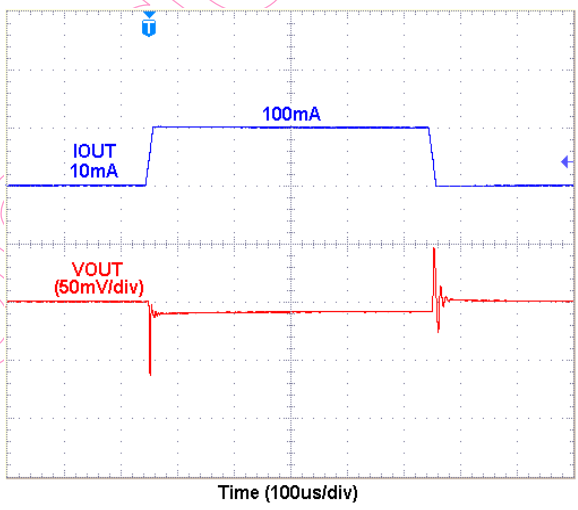
V_{OUT} =1.8V, V_{DD} =2.8V



V_{OUT} =1.8V, V_{DD} =2.8V

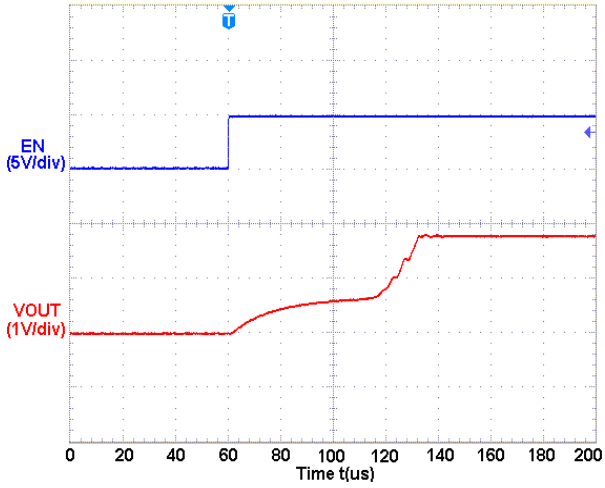


V_{OUT} =2.8V, V_{DD} =3.8V

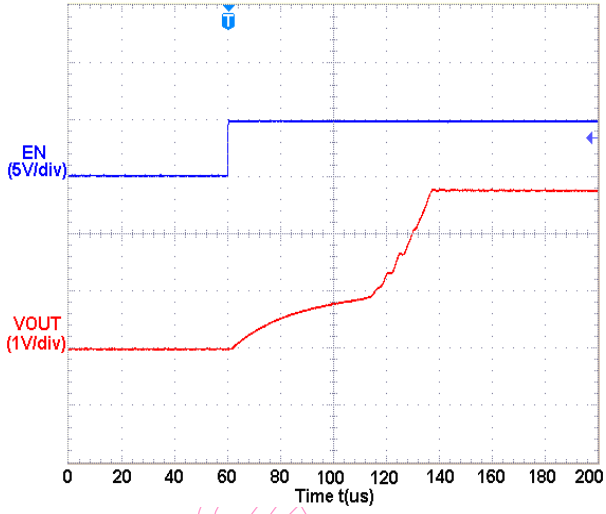


V_{OUT} =2.8V, V_{DD} =3.8V

10. Transient Response Characteristics of ON/OFF Pin (C1=1.0uF, C2=1.0uF, Temp=25℃)

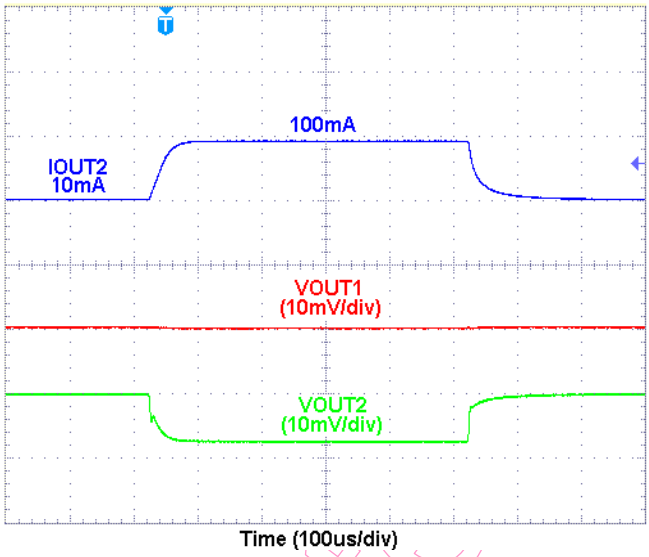


V_{OUT}=1.8V, V_{DD}=2.8V, R_{LOAD}=180Ω

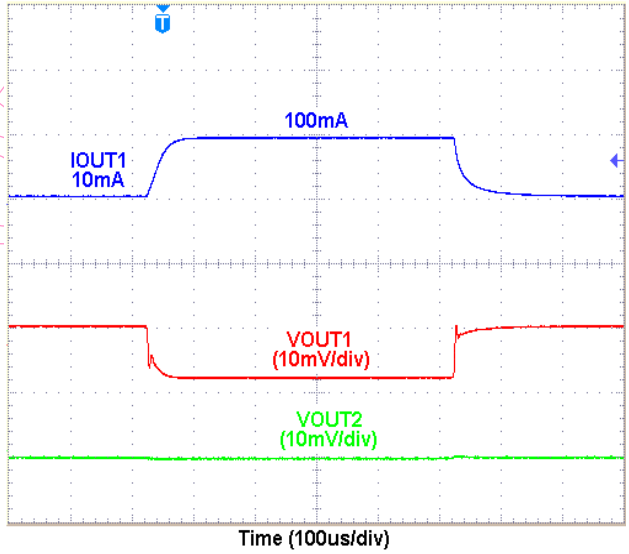


V_{OUT}=2.8V, V_{DD}=3.8V, R_{LOAD}=280Ω

11. Transient Response Characteristics of Load's Mutual Interference (C1=1.0uF,C2= 1.0uF , Temp=25℃)

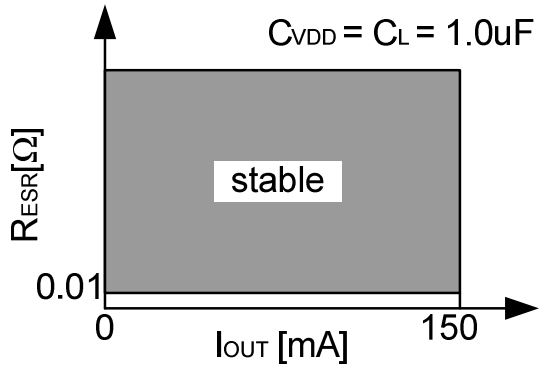


I_{OUT2}=10mA~100mA~10mA,I_{OUT2}=0mA,V_{OUT1} =2.8V,
V_{OUT2} =1.8V, V_{DD}=3.8V, tr=tf =5.0us



I_{OUT1}=10mA~100mA~10mA,I_{OUT2}=0mA,V_{OUT1} =2.8V,
V_{OUT2} =1.8V, V_{DD}=3.8V, tr=tf =5.0us

12. Example of Equivalent Series Resistance vs. Output Current Characteristics (Temp=25℃)



Application Information

Enable

The GS7129 has two enable pins. When the EN pin is set to the power-off level, the entire internal circuit stops operating, and the built-in P-channel MOS output transistor between the VDD and VOUT pin is turned off, in order to reduce the current consumption significantly. The VOUT pin is set to the VSS level. Note that the current consumption increases when a voltage of 0.3V to 1.2V is applied to the en pin.

Current Limit

The GS7129 contains an independent current limit and short circuit current protection to prevent unexpected applications. The current limit monitors and controls the pass transistor's gate voltage, limiting the output current to higher than 460mA typical. When the output voltage is less than 0.4V, the short circuit current protection starts the current fold back function and maintains the loading current 40mA. The output can be shorted to ground indefinitely without damaging the part.

Output Capacitor

The GS7129 is specifically designed to employ ceramic output capacitors as low as 1uF (X7R). The ceramic capacitors offer significant cost and space savings, along with high frequency noise filtering. Place the capacitors physically as close as possible to the device with wide and direct PCB traces.

Ceramic capacitors have different temperature characteristics and bias characteristics which depend on their dimensions and manufacturers. If the setting voltage is 2.5V or more and the capacitor's dimensions for V_{OUT} equal to 1.0mm by 0.5mm or smaller than that, the capacitance value might be extremely low. As a result, the capacitance might be much less than expected value. In such cases, the operation might be unstable at low temperature (-25℃ or less). In that case, use a larger capacity, or a large dimensions' capacitor. (For example 1.6mm by 0.8mm)

Input Capacitor

Good bypassing is recommended from input to ground to help improve AC performance. A 1uF (X7R) input capacitor or greater located as close as possible to the IC is recommended. Place the capacitors physically as close as possible to the device with wide and direct PCB traces.

Power Dissipation and Layout Considerations

Excessive power dissipation may cause thermal overload, and hence the increase of the IC junction temperature beyond a safe operating level. For continuous operation, it is highly recommended to keep the junction temperature below the maximum operation junction temperature 125℃ for maximum reliability.

The relationship between θ_{JA} and $T_{J(MAX)}$ can be calculated as:

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

Where $T_{J(MAX)}$ is the maximum operation junction temperature 125℃, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance.

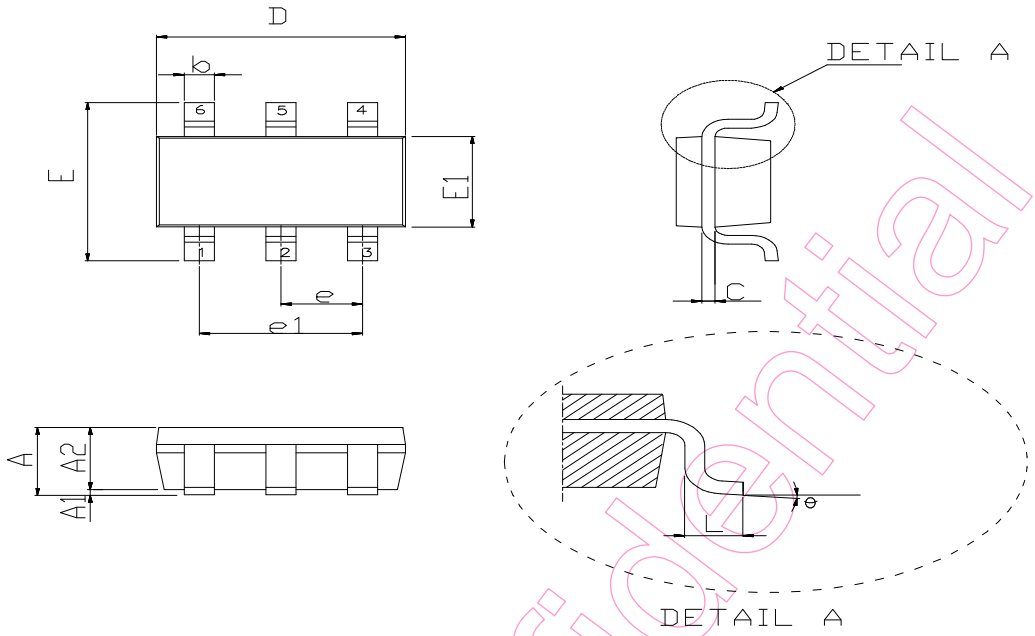
The power dissipation definition in device is:

$P_D = (V_{IN} - V_{OUT}) \times I_{OUT} + V_{DD} \times I_Q$

As the above equations indicate, it is desirable to work ICs whose θ_{JA} values are small such that $T_{J(MAX)}$ does not increase strongly with P_D. To

avoid thermally overloading the GS7129, refrain from exceeding the absolute maximum junction temperature rating of 150℃ under continuous operating condition. Overstressing the regulator with high loading currents and elevated input-to-output differential voltages can increase the IC die temperature significantly.

Package Dimensions, SOT-23-6



Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.90	1.45
A1	0.00	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.25
D	2.70	3.10
E	2.50	3.10
E1	1.40	1.80
e	0.95 REF.	
e1	1.90 REF.	
L	0.37 REF.	
θ	0^{o}	10^{o}

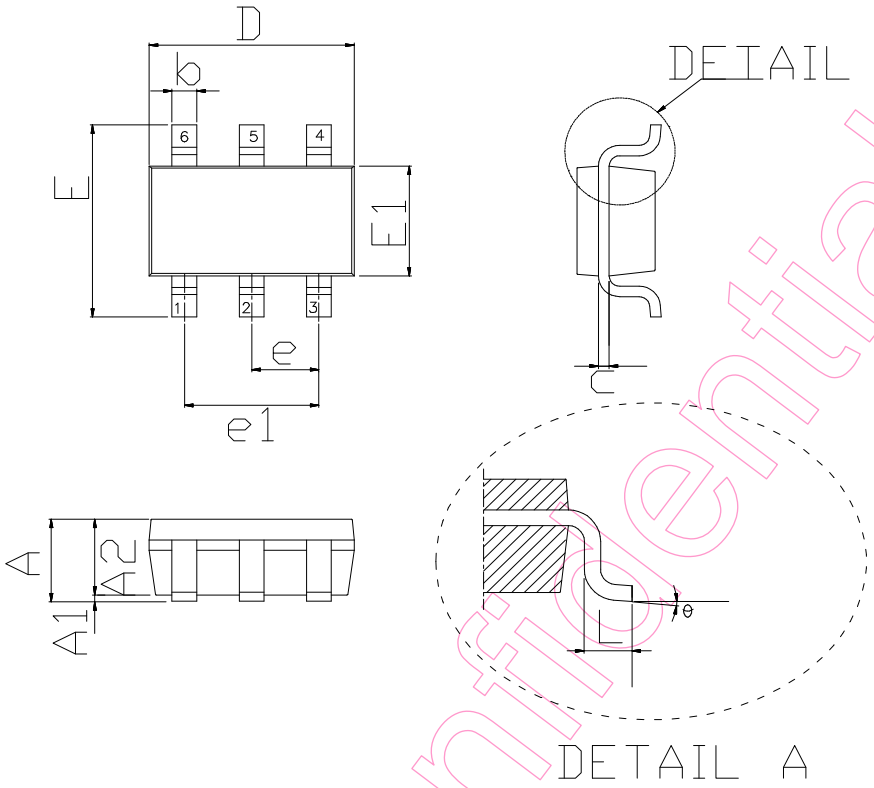
Note

1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

3.REF.: Reference. Normal/Regular dimension specified for reference.

Package Dimensions, TSOT-23-6



Symbol	Dimensions in Millimeters	
	Min.	Max.
A	0.70	1.25
A1	0.00	0.15
A2	0.70	0.95
b	0.30	0.50
c	0.08	0.25
D	2.70	3.10
E	2.50	3.10
E1	1.40	1.80
e	0.95 REF.	
e1	1.90 REF.	
L	0.37 REF.	
θ	0^{o}	10^{o}

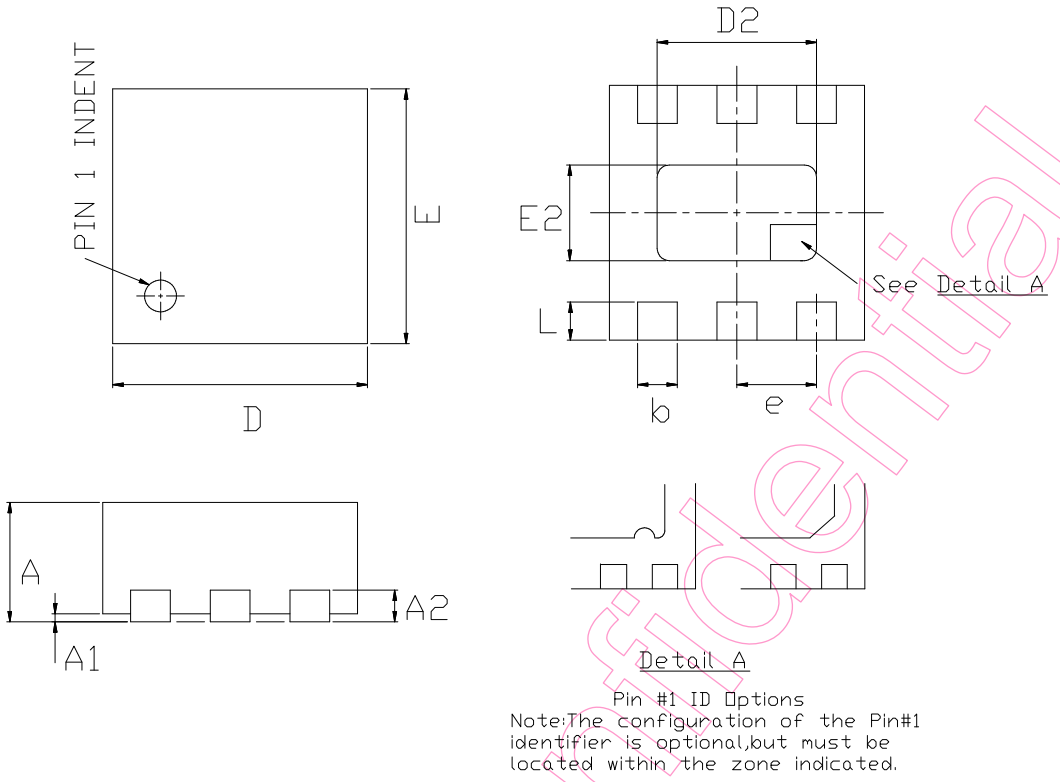
Note

1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

3.REF.: Reference. Normal/Regular dimension specified for reference.

Package Dimensions, WDFN6-1.6x1.6



Symbol	Dimensions in Millimeters	
	Min	Max
A	0.50	0.80
A1	0.00	0.05
A2	0.152 REF	
b	0.20	0.30
D	1.50	1.70
D2	1.00 REF	
E	1.50	1.70
E2	0.60 REF	
e	0.50 REF.	
L	0.16	0.35

Note

1.Min.: Minimum dimension specified.

2.Max.: Maximum dimension specified.

3.REF.: Reference. Normal/Regular dimension specified for reference.

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