TP142C Serirs

450mA 2uA Higt PSRR Voltage Regulator

General Description

The TP142C is a low-dropout (LDO) voltage regulator with enable function that operates from a 1.2V to 5.5V supply. It provides up to 450mA of output current in miniaturized packaging.

The feature of 2μA low quiescent current and 0.5μA shutdown current are ideal for the battery application with long service life. The other features include current limit function, over temperature protection and output discharge function.

Features

- 2μA Ground Current at no Load
- ±2% Output Accuracy
- 450mA Output Current
- 10nA Disable Current (by option)
- Wide Operating Input Voltage Range: 1.2V to 5.5V
- Dropout Voltage: 0.18V at 300mA (V_{OUT}=3.3V)
- Support Fixed Output Voltage 1.2V, 1.5V, 1.6V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V
- Stable with Ceramic or Tantalum Capacitor
- Current Limit Protection
- Over-Temperature Protection
- SOT23-3, SOT23-5, DFN-4(1x1) and DFN-6(2x2) SOT353 Packages Available

Applications

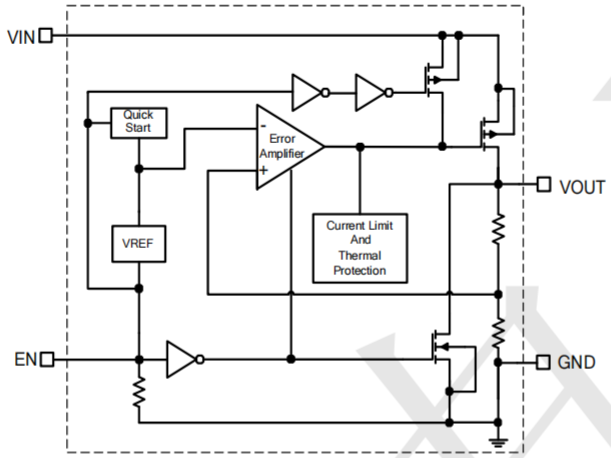
- Portable, Battery Powered Equipment
- Low Power Microcontrollers
- Laptop, Palmtops and PDAs
- Wireless Communication Equipment
- Audio/Video Equipment

Ordering Information

TP142C33C5-1

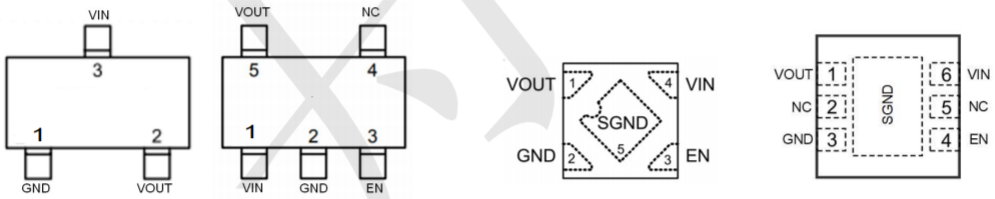
- C5: S5:SOT23-5 Package; S3:SOT23-3 Package; D4:DFN1X1 Package; D6:DFN2X2 Package; C5:SOT353 Package
- 33: Output voltage: 12=1.2V; 15=1.5V; 18=1.8V; 30=3.0V; 33=3.3V; XX=X.XV

BLOCK DIAGRAM



PIN CONFIGURATION

SOT-23-3 SOT-23-5/SOT353 DFN-4L 1x1 DFN-6L 2x2



Pin No				Pin Name	Pin Function
SOT-23-3	SOT-23-5 SOT353	DFN-1X1	DFN-2X2		
1	2	2	3	GND	Ground
2	5	1	1	VOUT	Output of the Regulator
3	1	4	6	VIN	Input of Supply Voltage.
	3	3	4	EN	Enable Control Input.
	4		2,5	NC	No internal connection

Absolute Maximum Rating (T_A=25°C unless otherwise noted)

VIN Pin to GND Pin Voltage		-0.3V to 6.5V
VOUT Pin and EN Pin to GND Pin Voltage		-0.3V to 6V
VOUT Pin to VIN Pin Voltage		-6V to 0.3V
Storage Temperature Range		-60ºC~150ºC
Lead Temperature (Soldering, 10 sec)		260ºC
Junction Temperature		150ºC
Operating Ambient Temperature Range T_A		-40ºC~85ºC
Thermal Resistance Junction to Case, $R\theta_{JC}$	SOT23-3	115°C/W
	SOT23-5	115°C/W
	DFN-4(1x1)	65°C/W
	DFN-6(2x2)	30°C/W
Thermal Resistance Junction to Ambient, $R\theta_{JA}$	SOT23-3	250°C/W
	SOT23-5	250°C/W
	DFN-4(1x1)	195°C/W
	DFN-6(2x2)	165°C/W

Electrical Characteristics (T =25°C unless otherwise noted)

(V_{IN}=5V, V_{EN}=5V, T_A=25°C, unless otherwise specified) (Note 1)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage		V_{IN}	1.2		5.5	V
DC Output Voltage Accuracy	I_{LOAD}=0.1mA		-2		2	%
SNS Input Current	SNS=V_{OUT}	I_{SNS}		0.5		μA
Dropout Voltage (Note 2)	I_{LOAD}=300mA, V_{OUT}≥3V	V_{DROP_3V}		0.18		V
	I_{LOAD}=300mA, V_{OUT}=2.8V	$V_{DROP_2.8V}$		0.23		
	I_{LOAD}=300mA, V_{OUT}=2.5V	$V_{DROP_2.5V}$		0.23		
	I_{LOAD}=300mA, V_{OUT}=1.8V	$V_{DROP_1.8V}$		0.28		
	I_{LOAD}=300mA, V_{OUT}=1.5V	$V_{DROP_1.5V}$		0.36		
	I_{LOAD}=300mA, V_{OUT}=1.2V	$V_{DROP_1.2V}$		0.45		
GND Current	I_{LOAD}=0mA	I_Q		2		μA
Shutdown GND Current	V_{EN}=0V, V_{OUT}=0V	I_{SD}		0.1	0.5	μA
V_{OUT} Shutdown Leakage Current	V_{EN}=0V, V_{OUT}=0V	I_{LEAK}		0.1	0.5	μA
Enable Threshold Voltage	EN Rising	V_{IH}	1.0			V
	EN Falling	V_{IL}			0.4	
EN Input Current	V_{EN}=5V	I_{EN}		10	100	nA
Line Regulation	I_{LOAD}=30mA, 1.5V≤V_{IN}≤5.5V or (V_{OUT}+0.2V)≤V_{IN}≤5.5V	ΔLINE		0.2		%
Load Regulation	10mA≤I_{LOAD}≤300mA	ΔLOAD		0.2		%
Output Current Limit	V_{OUT}=0V	I_{LIM}	450	500		mA
Power Supply Rejection Ratio	V_{OUT}=1.2V, I_{LOAD}=5mA, V_{IN}=2V, f=100Hz	PSRR		80		dB
	V_{OUT}=1.2V, I_{LOAD}=5mA, V_{IN}=2V, f=1kHz			75		
Output Voltage Noise	V_{IN}=3.5V, I_{LOAD}=0.1A, BW=10Hz to 100kHz, C_{OUT}=1μF, V_{OUT}=1.2V			80		$μV_{RMS}$
	V_{IN}=3.5V, I_{LOAD}=0.1A, BW=10Hz to 100kHz, C_{OUT}=1μF, V_{OUT}=2.8V			120		
Thermal Shutdown Temperature	I_{LOAD}=10mA	T_{SD}		155		°C
Thermal Shutdown Hysteresis	I_{LOAD}=10mA	$ΔT_{SD}$		15		°C
Discharge Resistance	V_{EN}=0V, V_{OUT}=0.1V			100		Ω

TYPICAL APPLICATION

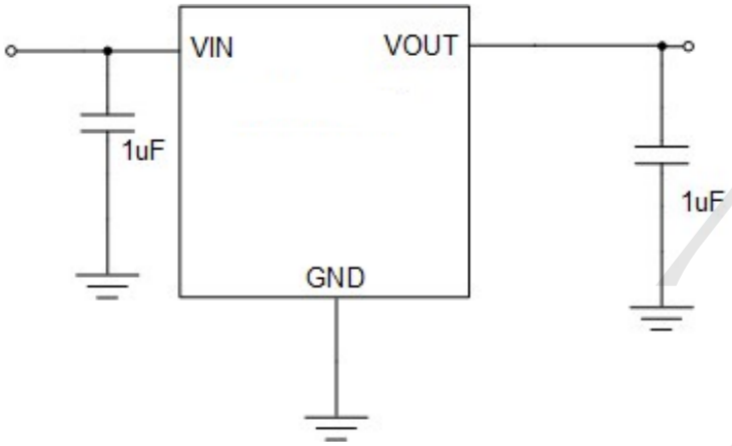


Figure 1: Application circuit of Fixed V_{OUT} LDO

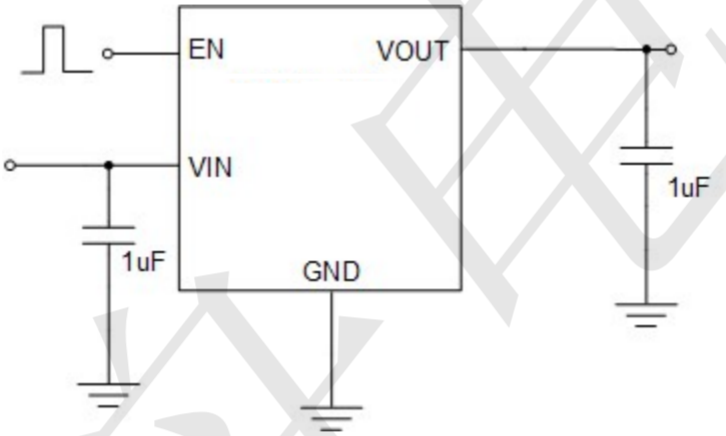


Figure 2: Application circuit of Fixed V_{OUT} LDO with enable function

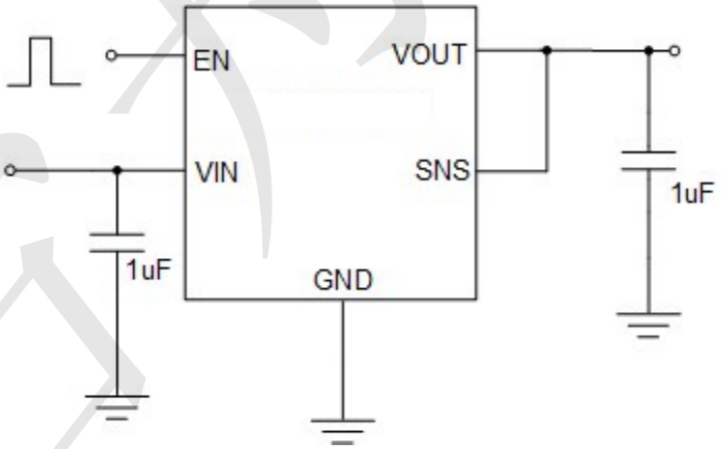
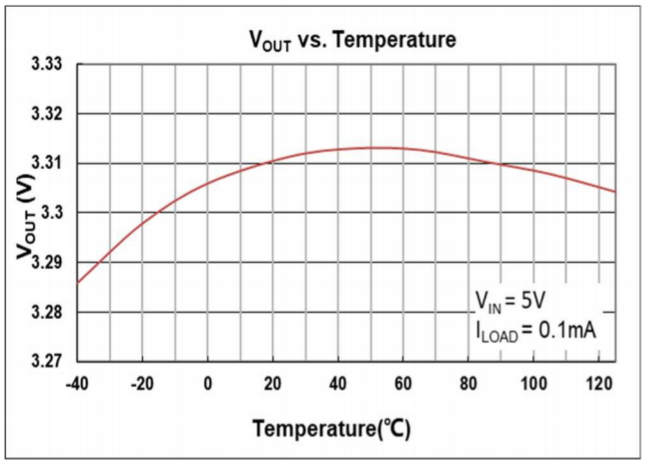
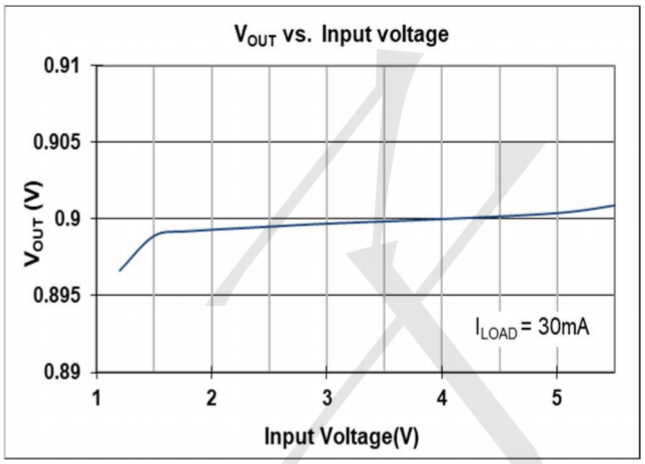
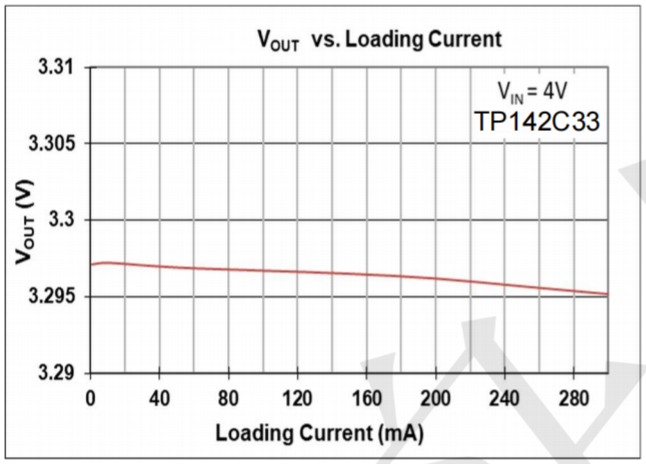
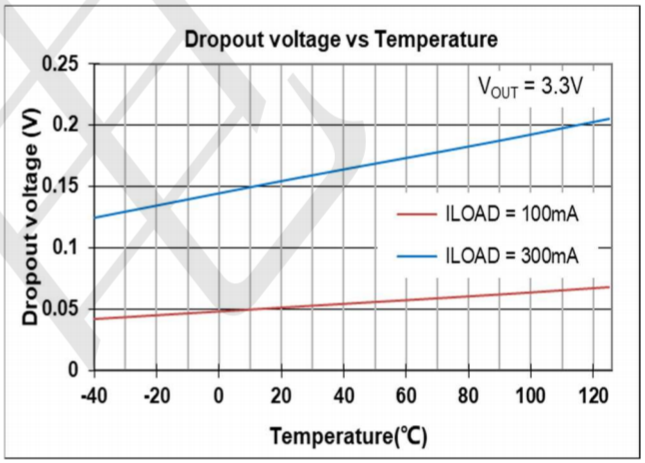


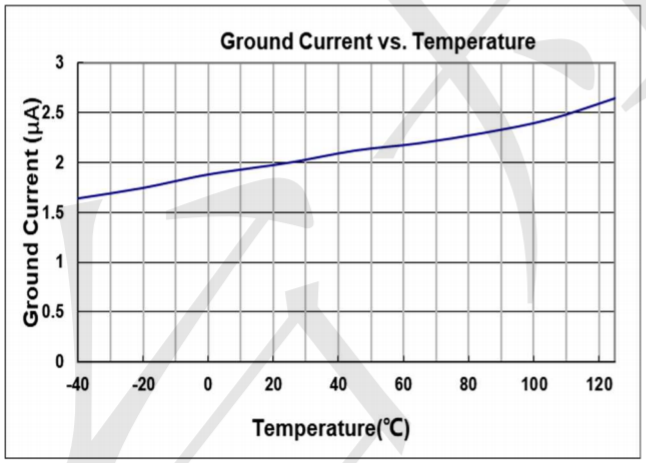
Figure 3: Application circuit of Fixed V_{OUT} LDO with enable and sense functions

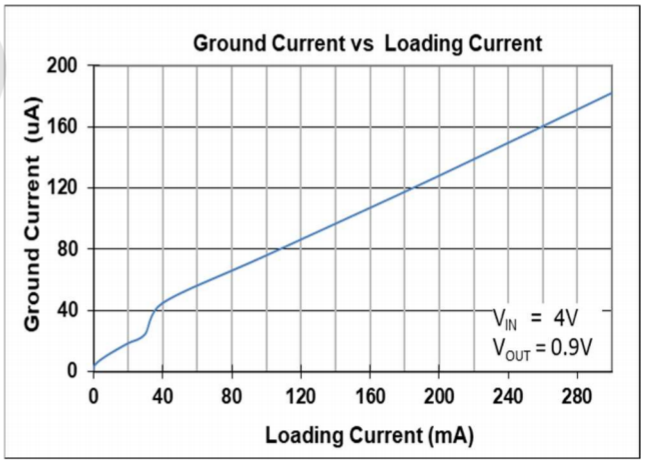

VOUT vs. Temperature
VOUT (V)
3.33
3.32
3.31
3.3
3.29
3.28
3.27
-40 -20 0 20 40 60 80 100 120
Temperature(℃)
VIN = 5V
ILOAD = 0.1mA

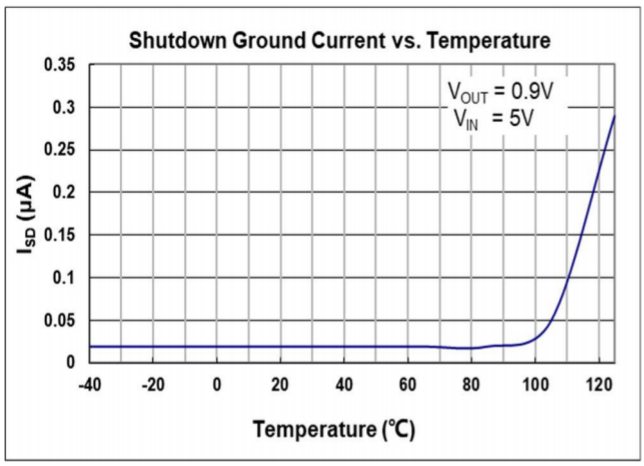

VOUT vs. Input voltage
VOUT (V)
0.91
0.905
0.9
0.895
0.89
1 2 3 4 5
Input Voltage(V)
ILOAD = 30mA

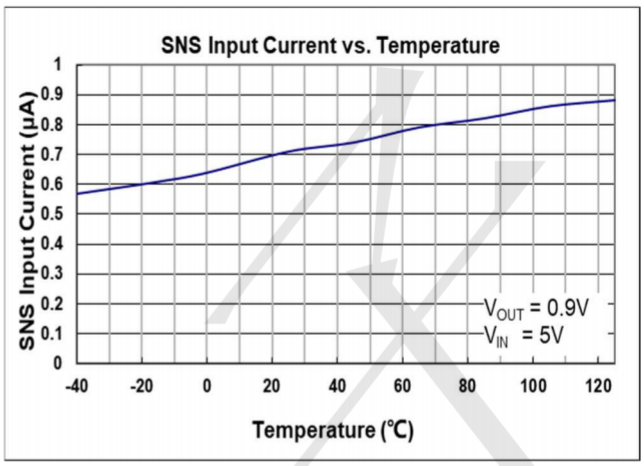

VOUT vs. Loading Current
VOUT (V)
3.31
3.305
3.3
3.295
3.29
0 40 80 120 160 200 240 280
Loading Current (mA)
VIN = 4V
TP142C33

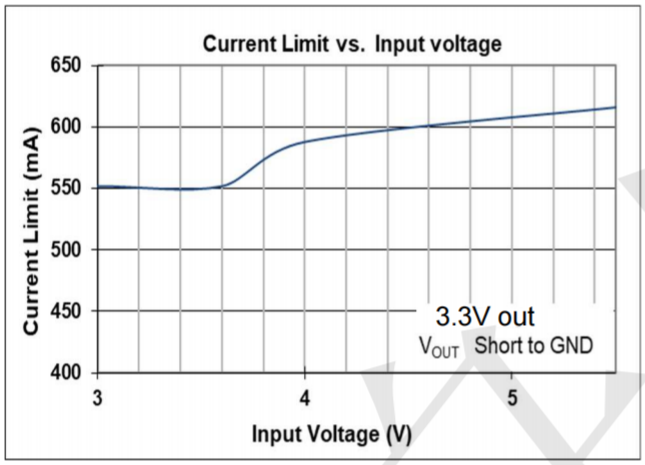

Dropout voltage vs Temperature
Dropout voltage (V)
0.25
0.2
0.15
0.1
0.05
0
-40 -20 0 20 40 60 80 100 120
Temperature(℃)
VOUT = 3.3V
ILOAD = 100mA
ILOAD = 300mA


Ground Current vs. Temperature
Ground Current (μA)
3
2.5
2
1.5
1
0.5
0
-40 -20 0 20 40 60 80 100 120
Temperature(℃)

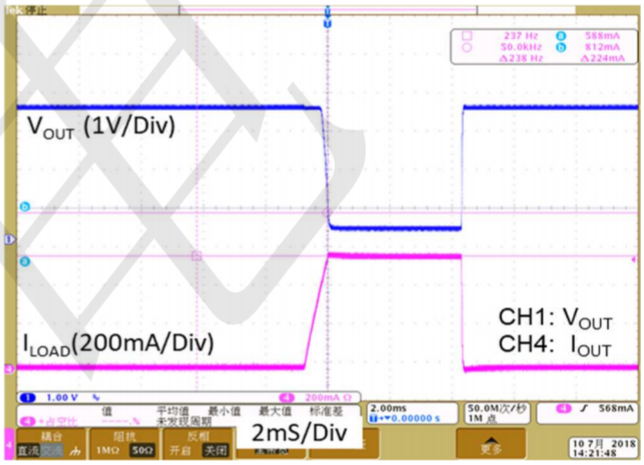

Ground Current vs Loading Current
Ground Current (uA)
200
160
120
80
40
0
0 40 80 120 160 200 240 280
Loading Current (mA)
VIN = 4V
VOUT = 0.9V



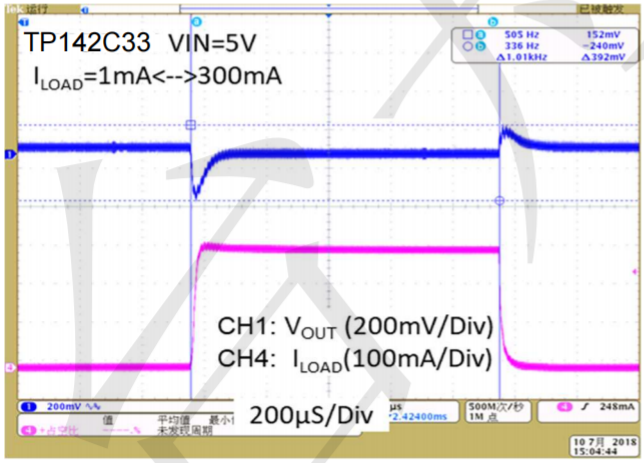




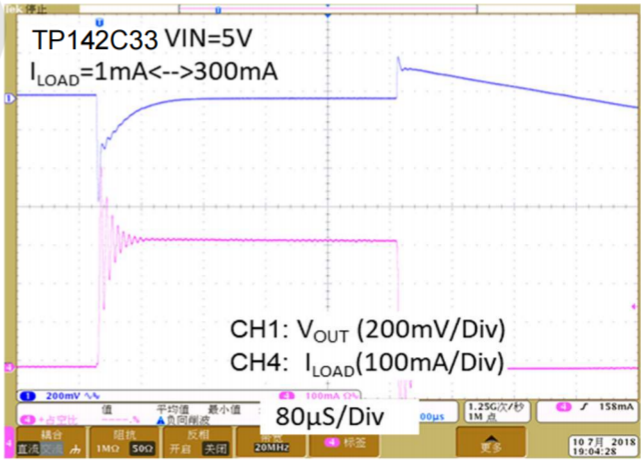
Current Limit Response



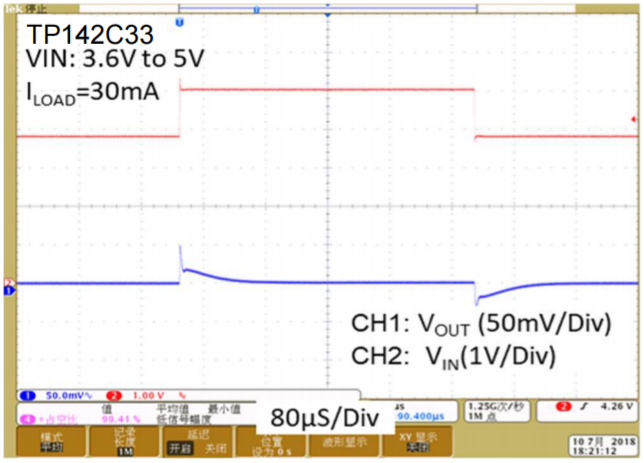
Load Transient Response I



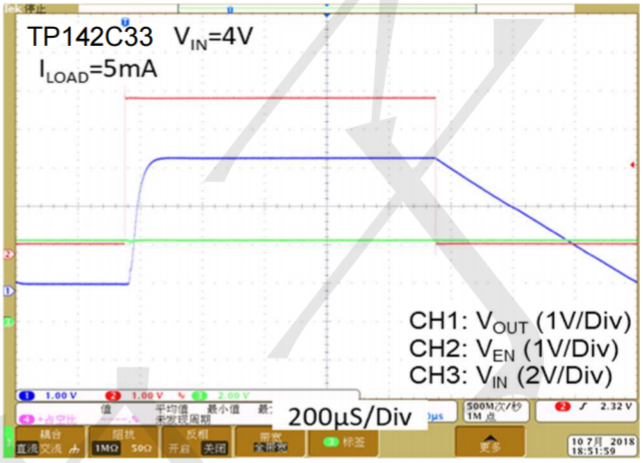
Load Transient Response II



Line Transient Response

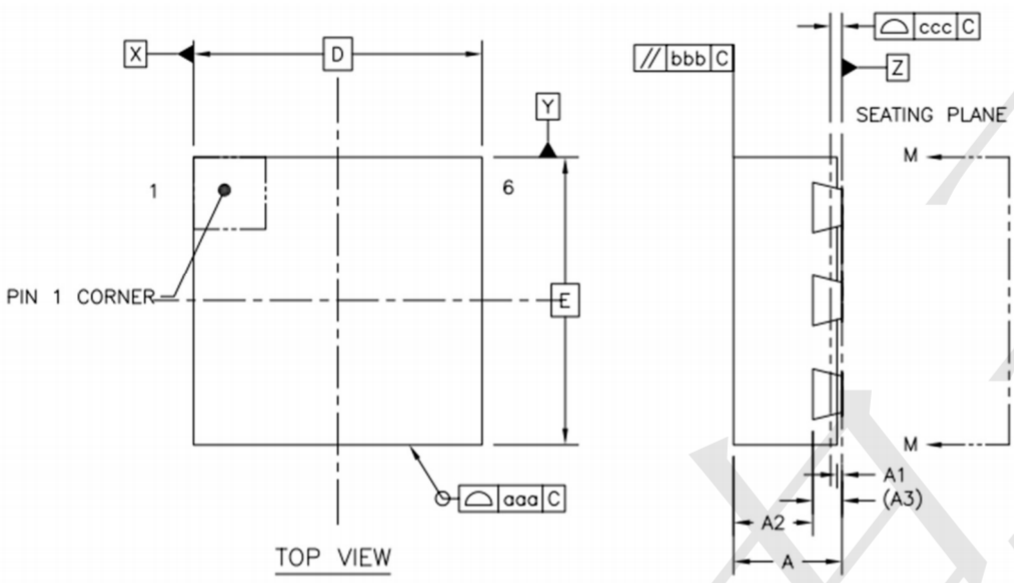


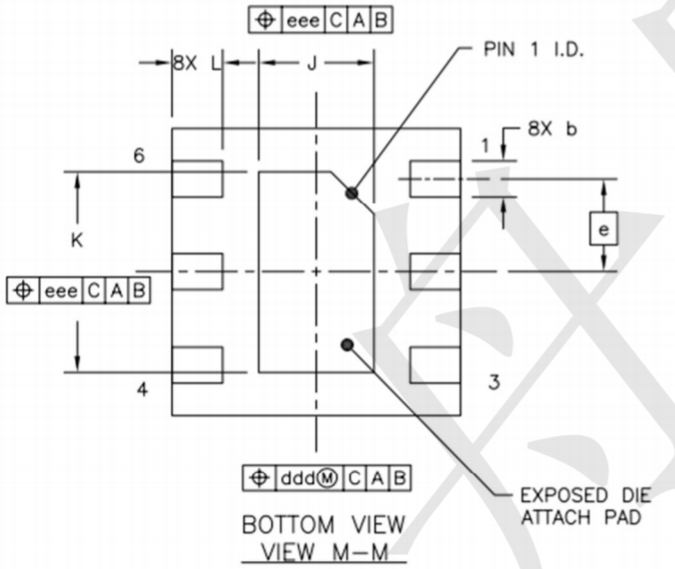
V_{OUT} Turn On/Off by EN



Package informantion

DFN2X2-6L Outline Dimensions





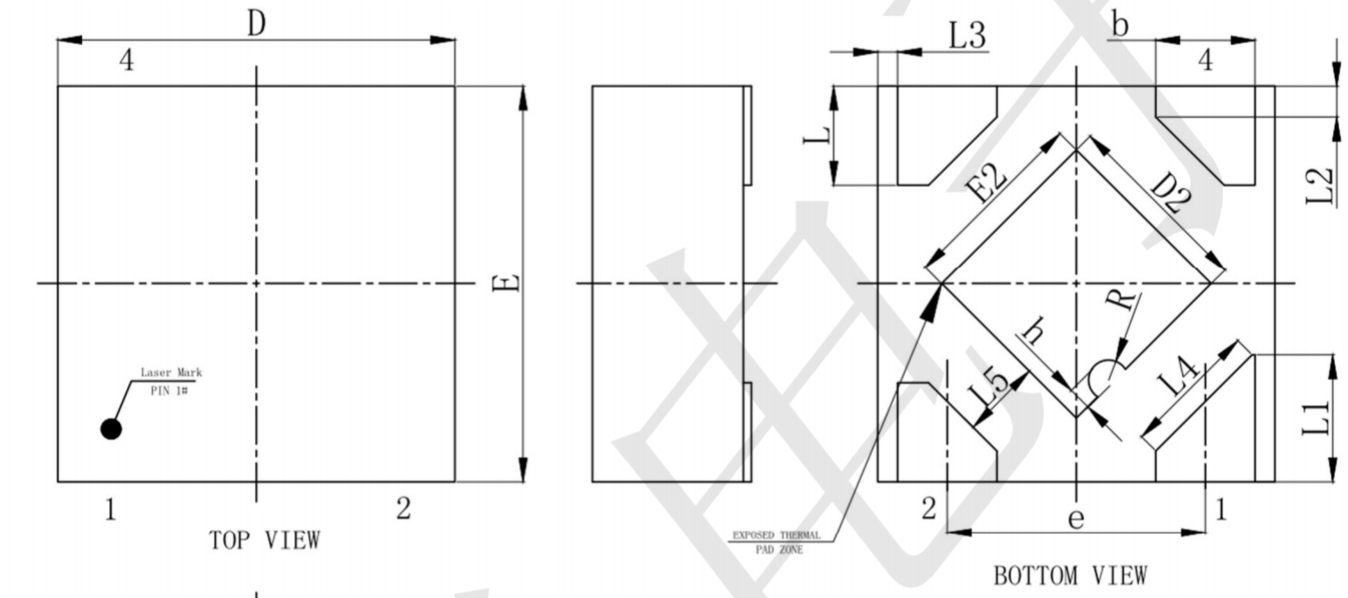
DESCRIPTION		SYMBOL	MILLIMETER		
			MIN	NOM	MAX
TOTAL THICKNESS		A	0.7	0.75	0.8
STAND OFF		A1	0	0.035	0.05
MOLD THICKNESS		A2	---	0.55	0.575
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.20	0.25	0.30
BODY SIZE	X	D		2 BSC	
	Y	E		2 BSC	
LEAD PITCH		e		0.65 BSC	
EP SIZE	X	J	0.75	0.8	0.85
	Y	K	1.35	1.4	1.45
LEAD LENGTH		L	0.30	0.35	0.40
PACKAGE EDGE TOLERANCE		aaa		0.05	
MOLD FLATNESS		bbb		0.1	
COPLANARITY		ccc		0.08	
LEAD OFFSET		ddd		0.1	
EXPOSED PAD OFFSET		eee		0.1	

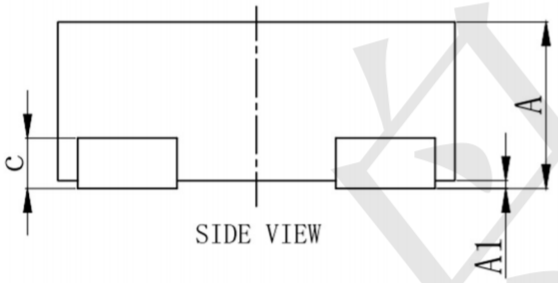
NOTES

1.0 COPLANARITY APPLIES TO LEADS, CORNER LEADS AND DIE ATTACH PAD.

Package information

4-pin DFN-4L Outline Dimensions

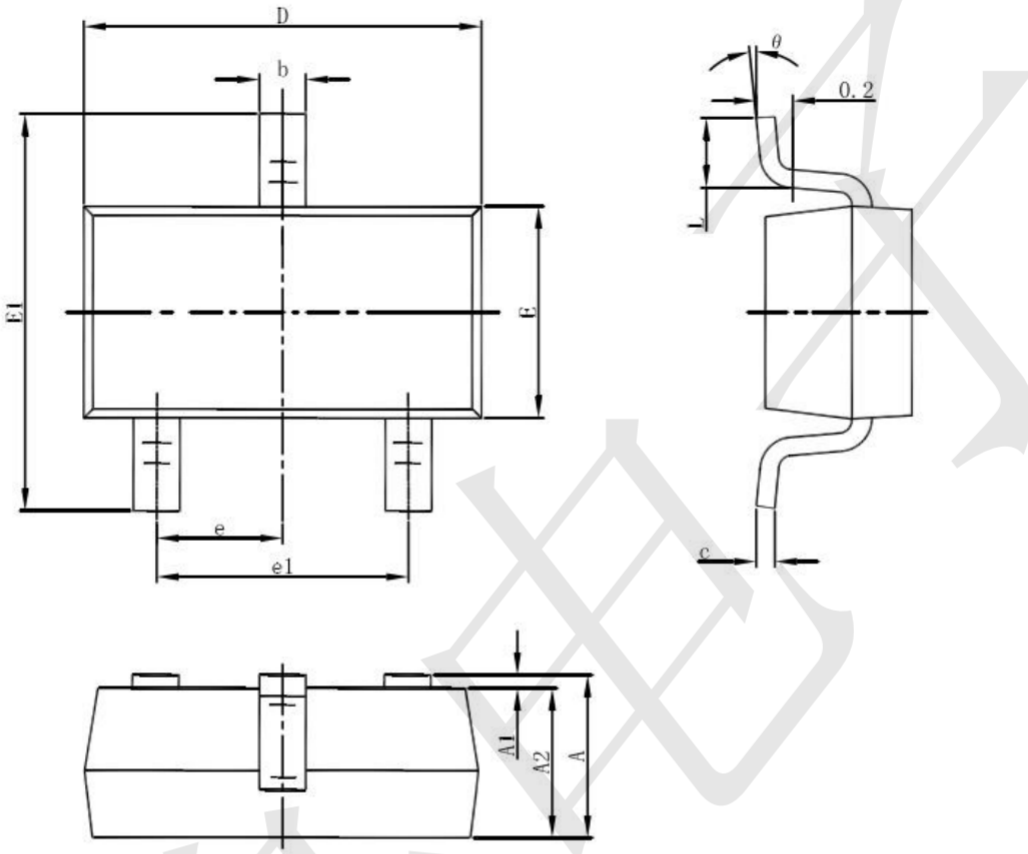




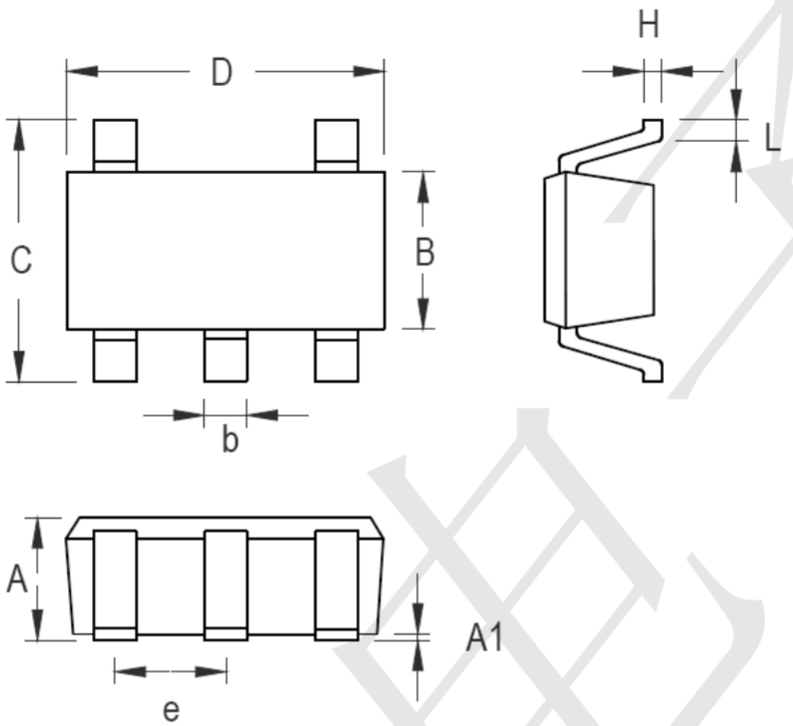
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.35	-	0.40
A1	0.00	0.02	0.05
b	0.20	0.25	0.30
c	0.07	0.12	0.17
D	0.95	1.00	1.05
D2	0.38	0.48	0.58
e	0.65BSC		
E	0.95	1.00	1.05
E2	0.38	0.48	0.58
L	0.20	0.25	0.30
L1	0.27	0.32	0.37
L2	0.077REF		
L3	0.05REF		
L4	0.34REF		
L5	0.20REF		
R	0.05REF		
h	0.06REF		

Package informantion

3-pin SOT23-3 Outline Dimensions



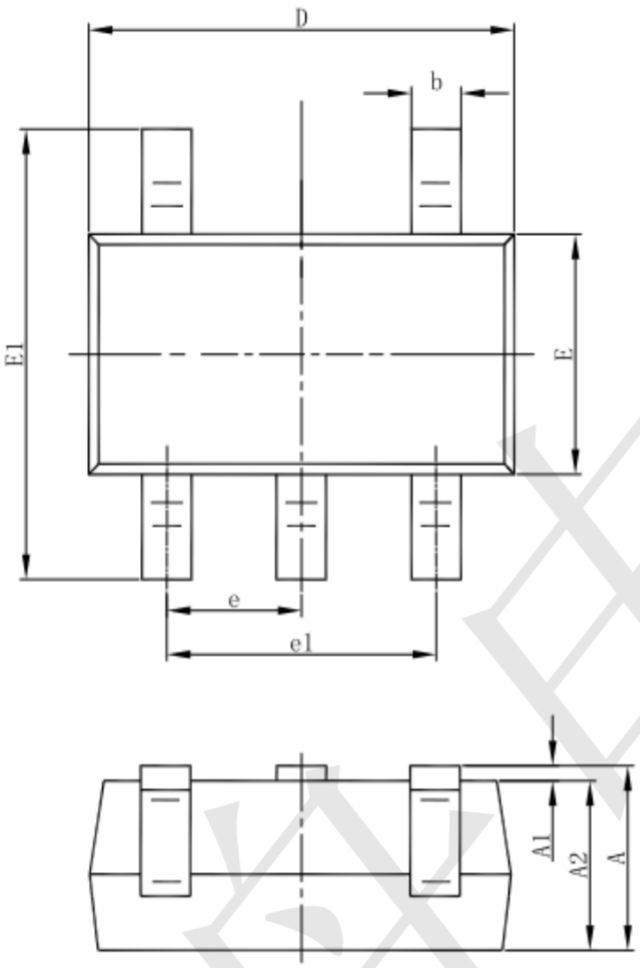
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.031	0.044
A1	0.000	0.100	0.000	0.004
B	1.150	1.350	0.045	0.054
b	0.150	0.400	0.006	0.016
C	1.800	2.450	0.071	0.096
D	1.800	2.250	0.071	0.089
e	0.650		0.026	
H	0.080	0.260	0.003	0.010
L	0.210	0.460	0.008	0.018

Package information

3-pin SOT23-5 Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°