

Low-Voltage 500mA LDO

General Description

The ET540XX Series are low voltage 500mA voltage regulator. The input voltage is as low as Min. 1.1V and the output voltage can be set from 0.7V. The output voltage accuracy has been improved to $\pm 0.8\%$ and due to a built-in transistor with low on-resistance. Each of these ICs consists of a voltage reference unit, an error amplifier, a resistor-net for voltage setting, and a current limit circuits for over-current for the destruction prevention by the over-current.

The ET540XX series use a type of outstanding CMOS process to minimize the supply current. A low on-resistance PMOS pass device is equipped for lower dropout voltage. ET540XX also possess the EN function to save more energy and extend the battery life. The EN pin can switch the regulator to standby mode.

Features

- Wide Input Voltage Range: 1.1V to 5V
- Very Low I_Q : 50 μ A (Typical)
- Max Output Current: 500mA
- Fixed Output Voltage: 0.75V, 0.8V, 1.05V, 1.1V, 1.20V, 2.2V, 2.8V, 3.3V
- Other Output Voltage Options Available on Request : 0.7V to 3.8V
- Dropout Voltage 525mV Typical (500mA) @0.8V Output
- Excellent Load/Line Transient Response
- Line Regulation: 0.1%/V (Typical)
- Built-in Fold Back Protection Circuit
- Built-in Constant Slope Circuit
- Built-in Auto-discharging Circuit
- Offered DFN6,DFN4 and SOT23-5 Packages

Applications

- Constant-Voltage Power Supply for Battery-Powered Device
- Constant-Voltage Power Supply for TV, Notebook PC and Home Electric Appliance
- Constant-Voltage Power Supply for Portable Equipment

ET540XX

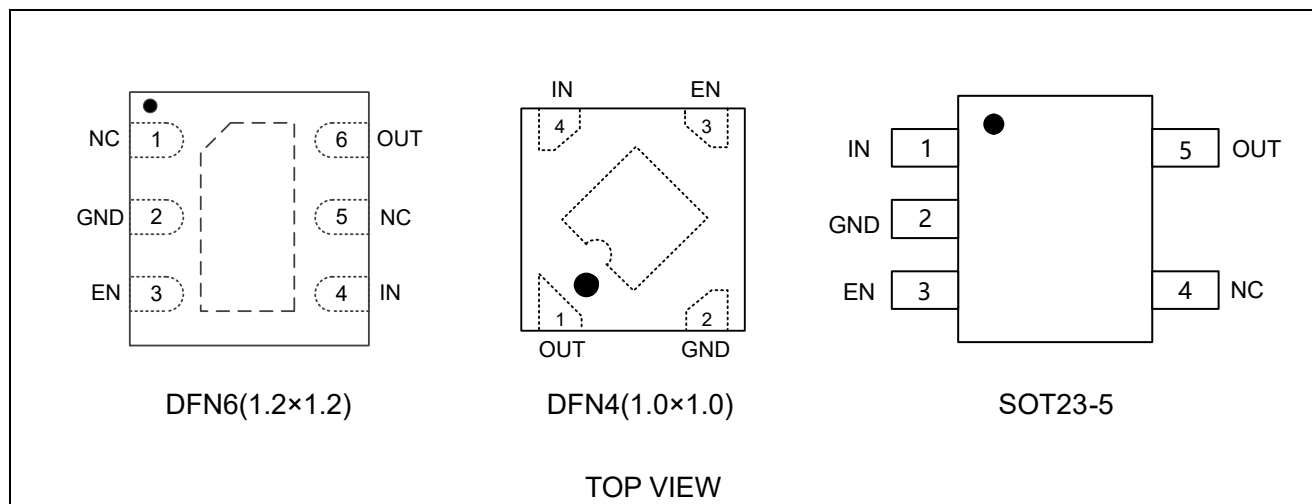
Device information

ET 540 XX X B

<u>XX</u> Output Voltage		<u>X</u> Package		<u>B</u> Auto-discharge Function	
XX	Fixed output X.XV For example, 075 is 0.75V output	Y	DFN6 (1.2×1.2)	B	Auto-discharge
		Y1	DFN4 (1.0×1.0)		
		Blank	SOT23-5		

Part No.	Package	Packing Option	MSL
ET540XXY1B	DFN4 (1×1)	Tape and Reel, 10K/Reel	1
ET540XXYB	DFN6 (1.2×1.2)	Tape and Reel, 3K/Reel	1
ET540XXB	SOT23-5	Tape and Reel, 3K/Reel	3

Pin Configuration

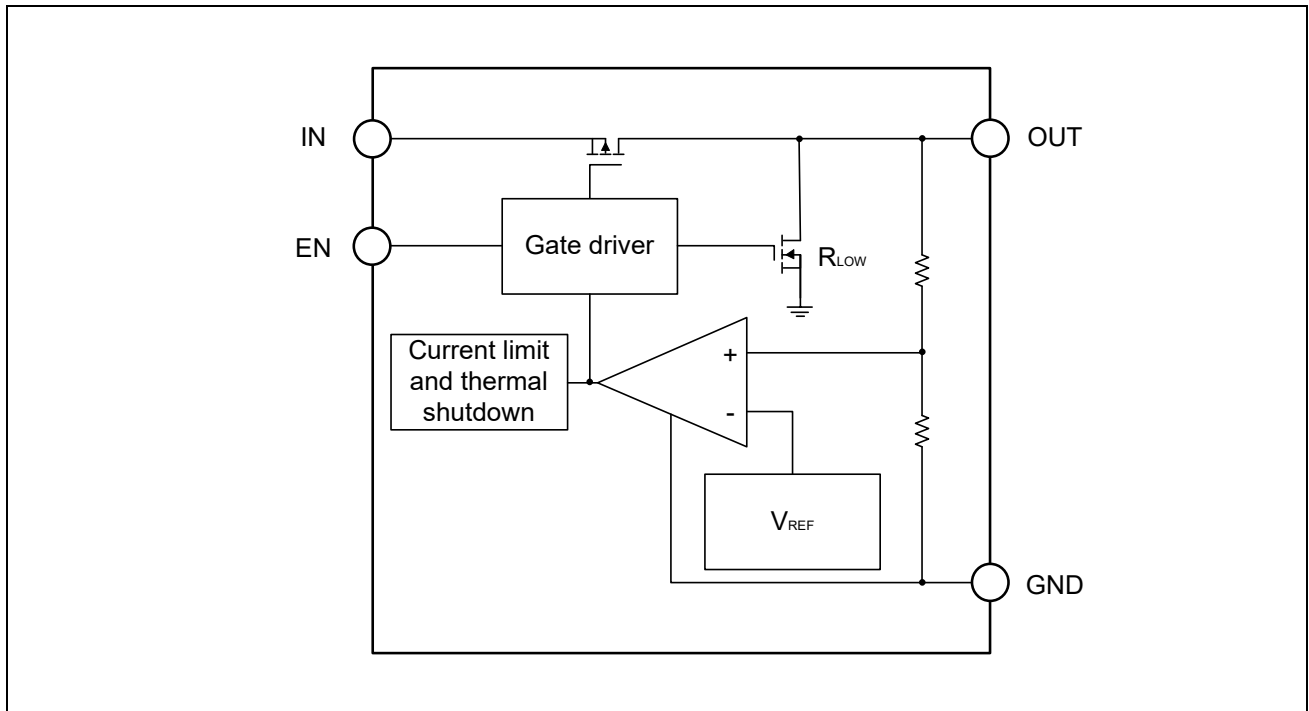


Pin Function

Pin No.			Symbol	Pin Description
DFN6	DFN4	SOT23-5		
1,5	-	4	NC	No Connection
2	2	2	GND	Ground Pin
3	3	3	EN	Chip Enable Pin, "H" Enable
4	4	1	IN	Input Pin
6	1	5	OUT	Output Pin

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Block Diagram



Functional Description

Input Capacitor

A 1 μ F ceramic capacitor is recommended to connect between IN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both IN and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is 1 μ F, ceramic capacitor is recommended, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to OUT and GND pins.

EN Pin Operation

The ET540XX is turned on by setting the EN pin to "H". Since the EN pin is neither pulled down nor pulled up internally, do not set it in floating status. When the EN pin is not used, connect the EN pin with V_{IN} to keep the LDO in operating mode.

Current Limit Protection

When output current of OUT pin is higher than current limit threshold or the OUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a predesigned level to prevent over-current and thermal damage.

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Auto Discharging

When the EN pin set to “L”, the output circuit will be disable immediately, and the Auto-Discharging circuit will be turned on to discharge the electric charge on output capacitor, and decrease the voltage of V_{OUT} in very short time. The Auto-Discharging function is optional.

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
V_{IN}	Input Voltage Range		-0.3 to +6	V
V_{EN}	Enable Voltage Range		-0.3 to +6	V
V_{OUT}	Output Voltage Range		-0.3 to $(V_{IN} + 0.3) \leq 6$	V
T_J	Maximum Junction Temperature		-40 to +150	°C
T_{STG}	Storage Temperature		-65 to +150	°C
T_{SLOD}	Lead Temperature (Soldering, 10 sec)		300	°C
V_{ESD}	HBM (EIA/JESD22-A114-A)		±4.0	KV
	CDM (EIA/JESD22-C101-A)		±1.5	KV
I_{LU}	Latch up Current Maximum Rating (JESD78E)		±200	mA
$P_{DMAX}^{(1)}$	Maximum Power Dissipation	DFN6 (1.2×1.2)	625	mW
		DFN (1.0×1.0)	400	
		SOT23-5	420	

Recommended Operating Conditions

Symbol	Parameter	Rating	Unit
V_{IN}	Input voltage range	$V_{OUT} + V_{DROP}$ to 5	V
I_{OUT}	Output Current	0 to 500	mA
T_A	Operating Ambient Temperature	-40 to +85	°C
C_{IN}	Effective Input Ceramic Capacitor Value	0.47 to 10	μF
C_{OUT}	Effective Output Ceramic Capacitor Value	0.47 to 10	μF
ESR	Input and Output Capacitor Equivalent Series Resistance (ESR)	5 to 100	mΩ

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Electrical Characteristics

$V_{IN}=V_{SET}+1.0V$, $I_{OUT}=1mA$, $C_{IN}=C_{OUT}=1\mu F$, unless otherwise noted. $T_A=25^\circ C$

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Voltage	$V_{IN}^{(1)}$		1.1		5	V
Output Voltage	V_{OUT}	$V_{SET}\geq 1.0$, $T_A=25^\circ C$	$\times 0.98$		$\times 1.02$	V
		$V_{SET}< 1.0$, $T_A=25^\circ C$	$\times 0.98$		$\times 1.02$	V
		$V_{SET}\geq 1.0$, $-40^\circ C\leq T_A\leq 85^\circ C$	$\times 0.975$		$\times 1.025$	V
		$V_{SET}< 1.0$, $-40^\circ C\leq T_A\leq 85^\circ C$	$\times 0.975$		$\times 1.025$	V
Output Current	I_{OUT}	$V_{IN}=V_{SET}+1V$	500			mA
Load Regulation	RegLoad	$V_{IN}=V_{SET}+1V$, $1mA\leq I_{OUT}\leq 500mA$		25	45	mV
Line Regulation	RegLine	$V_{SET}+0.5V\leq V_{IN}\leq 3.6V$ ($V_{IN}\geq 1.4V$)		0.10	0.25	%/V
Dropout Voltage	$V_{DROP}^{(2)}$	$V_{SET}=0.8V$, $I_{OUT}=500mA$, V_{OUT} dropping to $0.98\times V_{SET}$		525		mV
		Other refer to the following table				
Supply Current	I_{Q_ON}	$I_{OUT}=0mA$		50		μA
Standby Current	I_{Q_OFF}	$V_{EN}=0V$		0.1	5	μA
Power Supply Ripple Rejection	PSRR ⁽³⁾	$f=1kHz$, Ripple 0.2Vp-p $V_{IN}=V_{SET}+1V$, $I_{OUT}=30mA$		70		dB
Short Current Limit	I_{SC}	$V_{OUT}=0V$		110		mA
EN Pull-down Current	I_{EN}				1	μA
EN Input Voltage High	V_{ENH}	$V_{IN}=1.1\sim 5V$	0.9			V
EN Input Voltage Low	V_{ENL}	$V_{IN}=1.1\sim 5V$			0.4	V
Output Noise	$e_n^{(3)}$	$BW=10Hz$ to $100kHz$ $I_{OUT}=30mA$, $V_{OUT}=0.8V$		40		μV_{rms}
Auto-Discharge Resistance	R_{DIS}	$V_{IN}=2.0V$, $V_{EN}=0V$		40		Ω

Notes:

1: The maximum input voltage should take into account the maximum power consumption ($P_{D(MAX)}$). The calculation formula is as follows:

$$P_{D(MAX)} = (V_{IN(MAX)} - V_{OUT}) \times I_{OUT}$$

The maximum power consumption of the DFN4 is 400mW.

$$V_{IN(MAX)} = 400mW / I_{OUT} + V_{OUT}$$

For example:

If $V_{OUT}= 1.2V$, $I_{OUT}=400mA$, the maximum input voltage is $V_{IN(MAX)}=400mW / 400mA+1.2=2.2V$

2: V_{DROP} FT test method: test the V_{OUT} voltage at $V_{SET} + V_{DROPMAX}$ with output current.

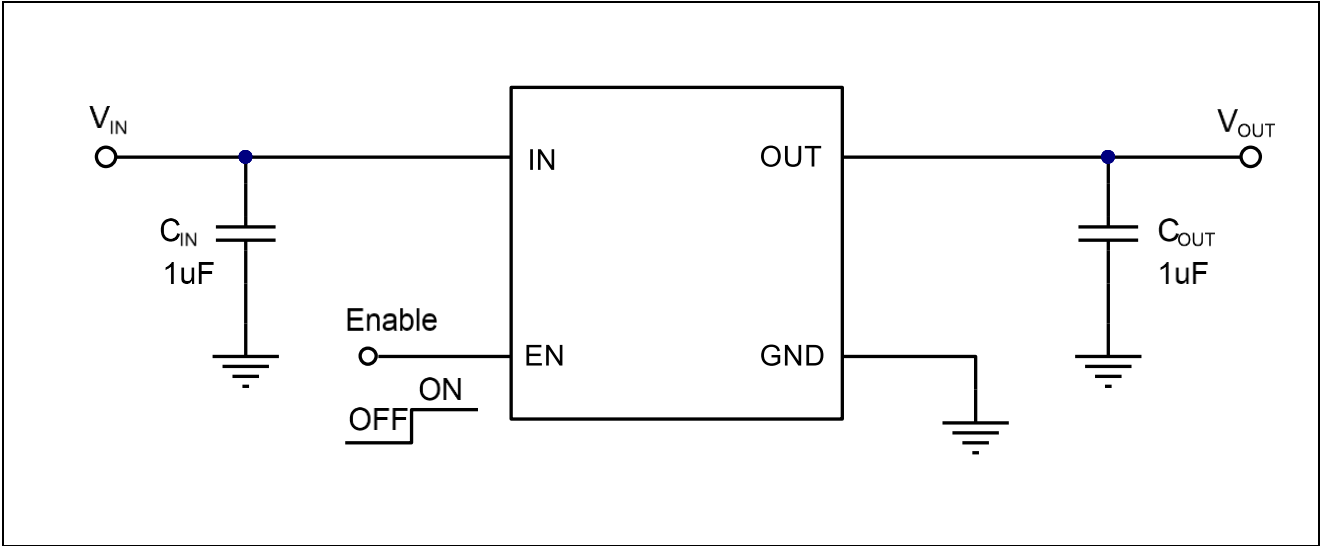
3: Guaranteed by design and characterization. not a FT item.

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Dropout Voltage by Output Voltage

Output Voltage $V_{OUT}(V)$	Dropout Voltage V_{DROP} (V)		
	Condition	Typ	Max
$0.7 \leq V_{OUT} < 0.8$	$I_{OUT}=500mA$	0.55	0.78
$0.8 \leq V_{OUT} < 0.9$		0.50	0.65
$0.9 \leq V_{OUT} < 1.0$		0.42	0.55
$1.0 \leq V_{OUT} < 1.2$		0.38	0.48
$1.2 \leq V_{OUT} < 1.5$		0.34	0.44
$1.5 \leq V_{OUT}$		0.25	0.35

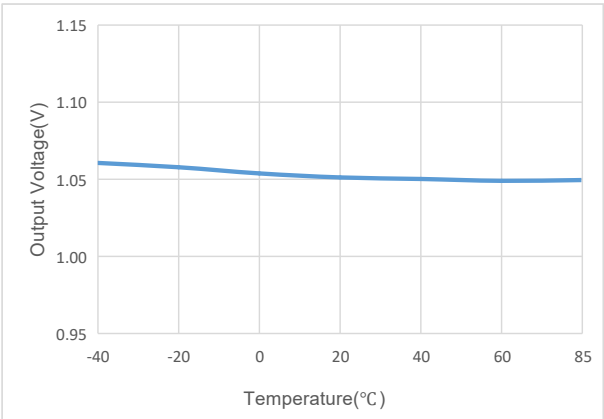
Application Circuits



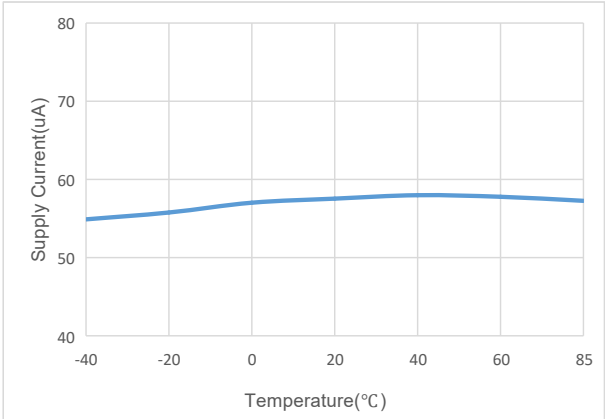
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Typical Characteristics

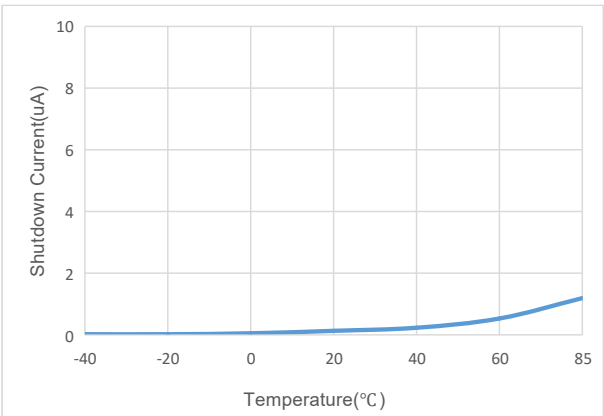
($V_{OUT}=1.05V$, $V_{IN}=2.05V$, $C_{IN}=C_{OUT}=1\mu F$, $T_A= -40^{\circ}C\sim+85^{\circ}C$)



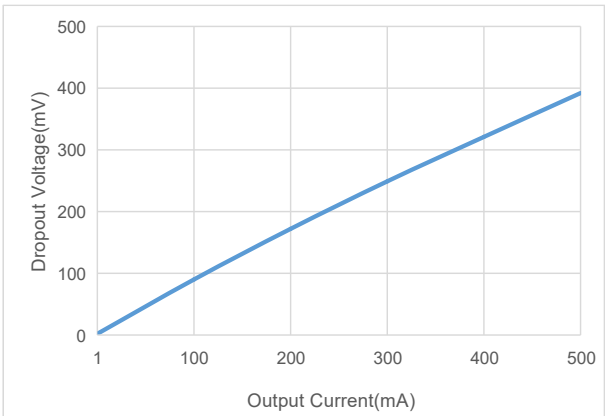
Output Voltage VS Temperature



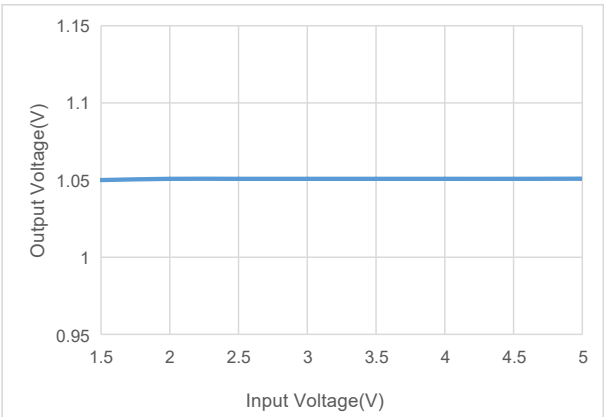
Supply Current VS Temperature



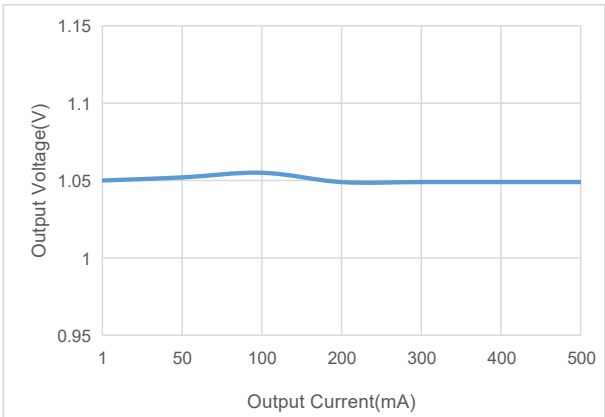
Shutdown Current VS Temperature



Dropout Voltage VS Output Current



Output Voltage VS VIN Input Voltage

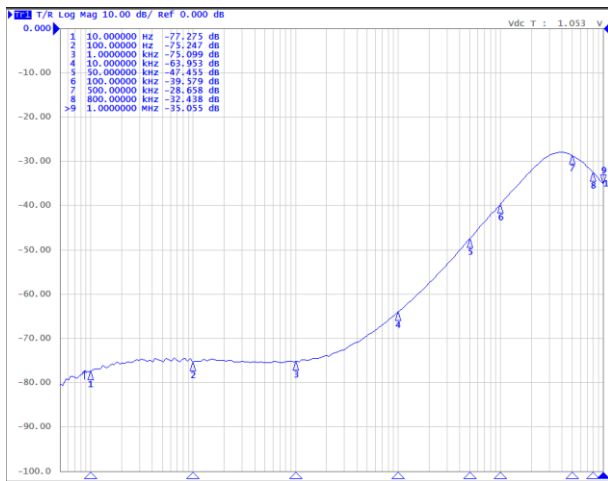


Output Voltage VS Output Current

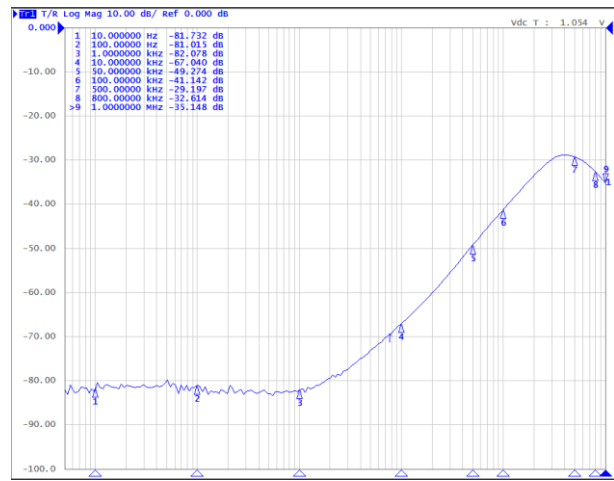
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Typical Characteristics(Continued)

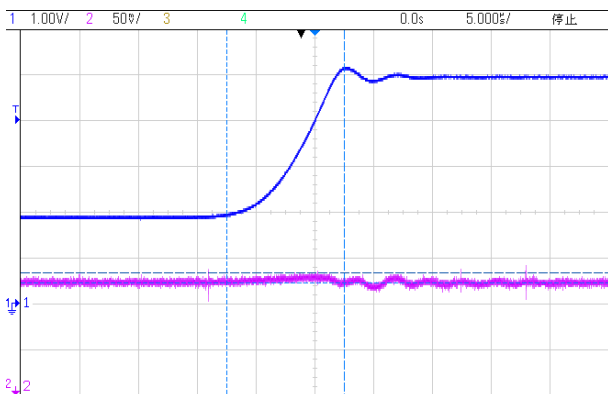
($V_{OUT}=1.05V$, $V_{IN}=2.05V$, $C_{IN}=C_{OUT}=1\mu F$, $T_A=-40^{\circ}C\sim+85^{\circ}C$)



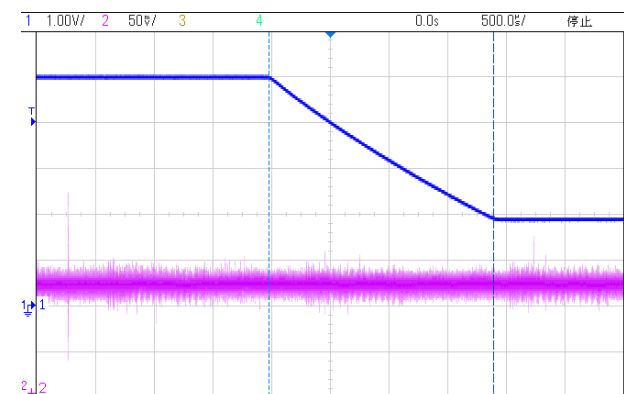
VIN=2.0V PSRR



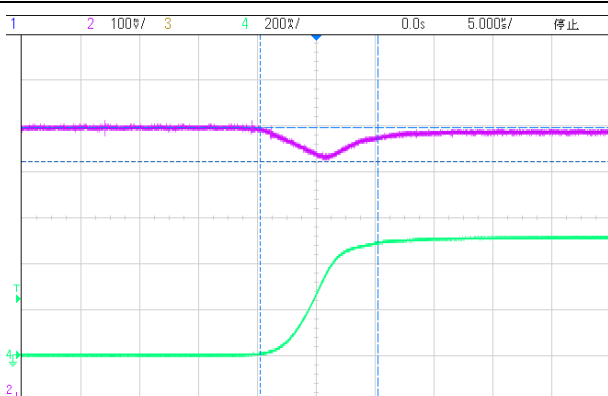
VIN=2.5V PSRR



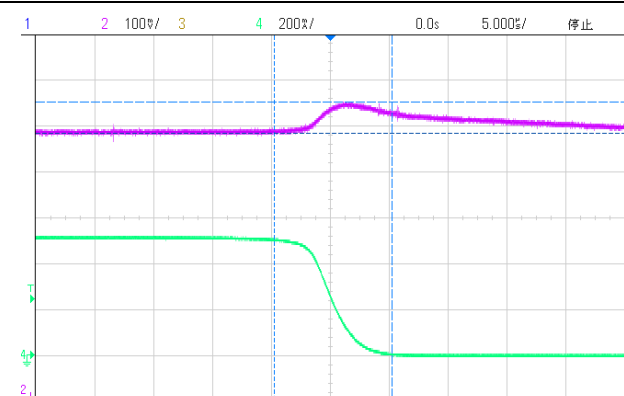
Line Transient(2.05V~5.0V 10us)



Line Transient(5V~2.05V 10us)



Load Transient(1mA~0.5A 10us)

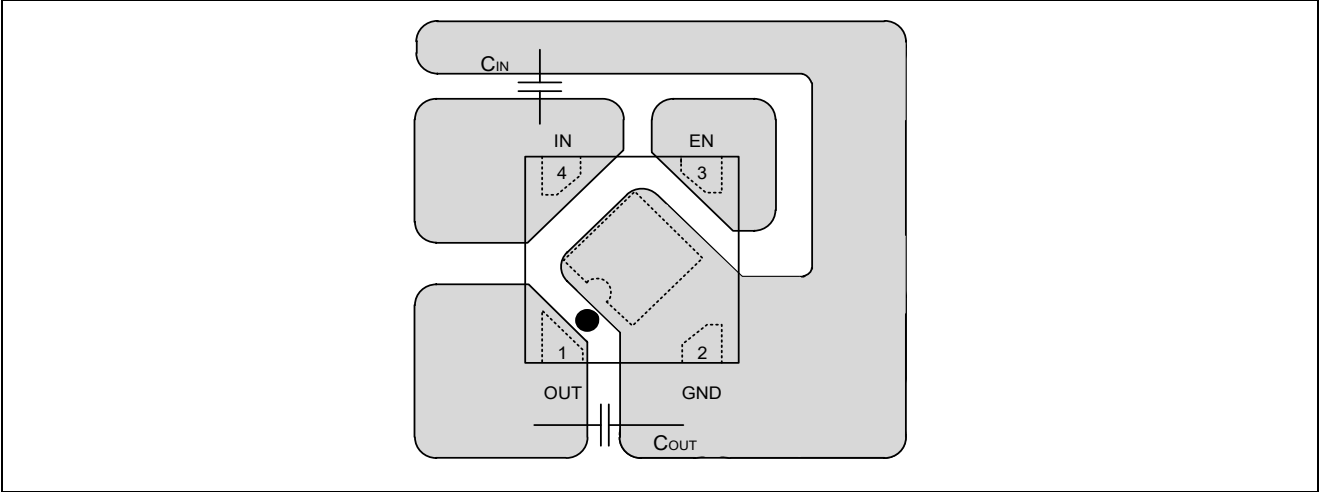


Load Transient(0.5A~1mA 10us)

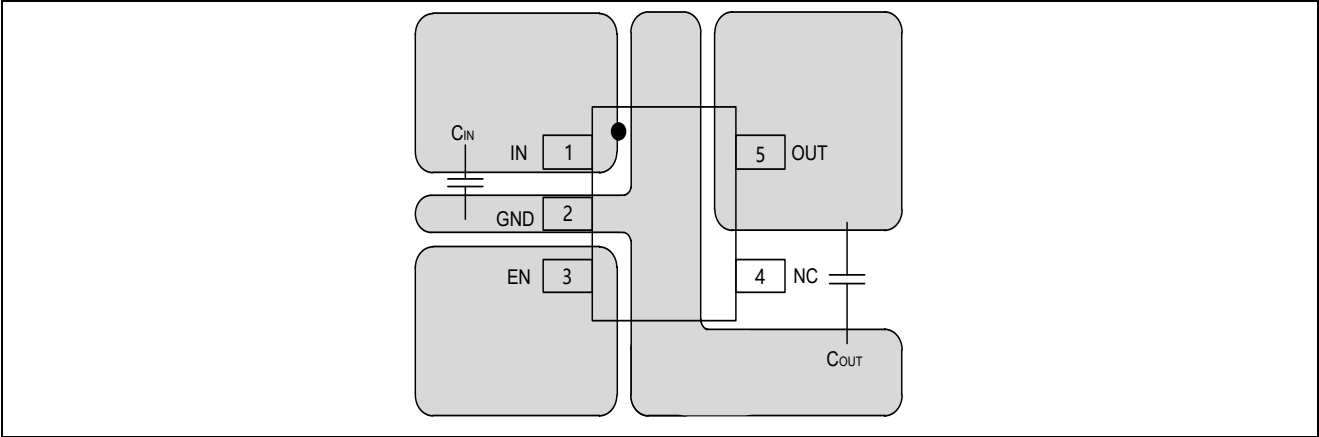
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PCB Layout Guide

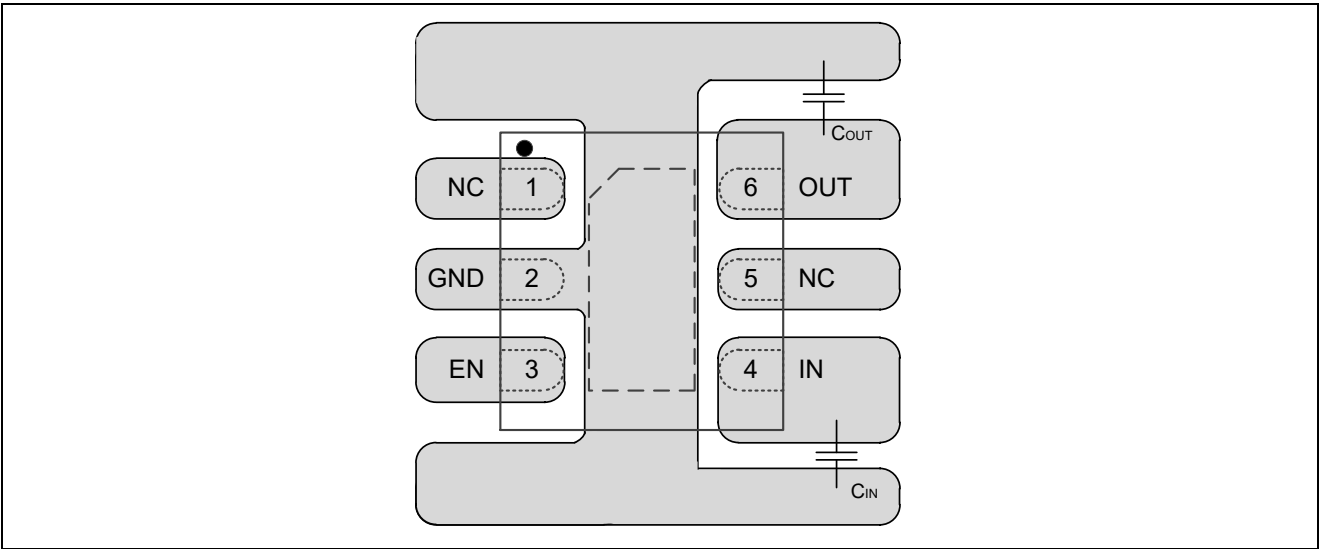
DFN4



SOT23-5



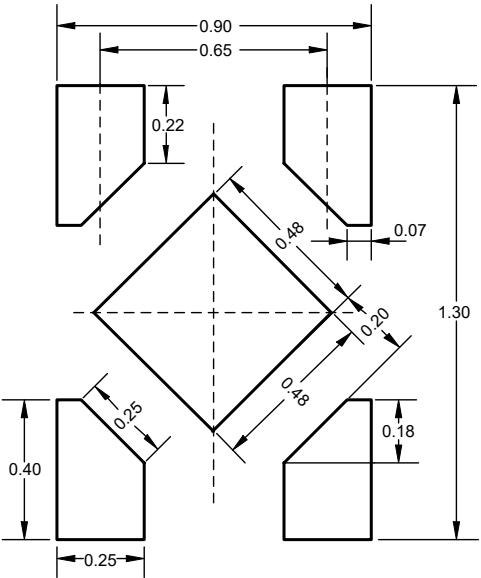
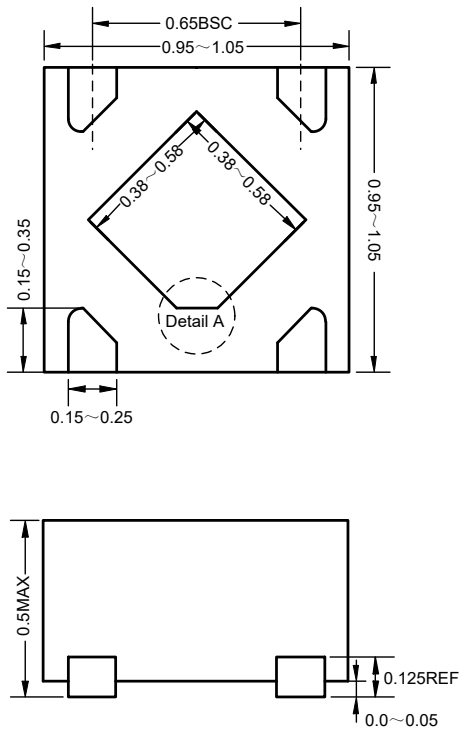
DFN6



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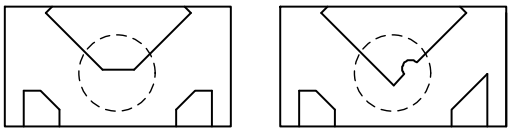
Package Dimension

DFN4



Recommended Land Pattern

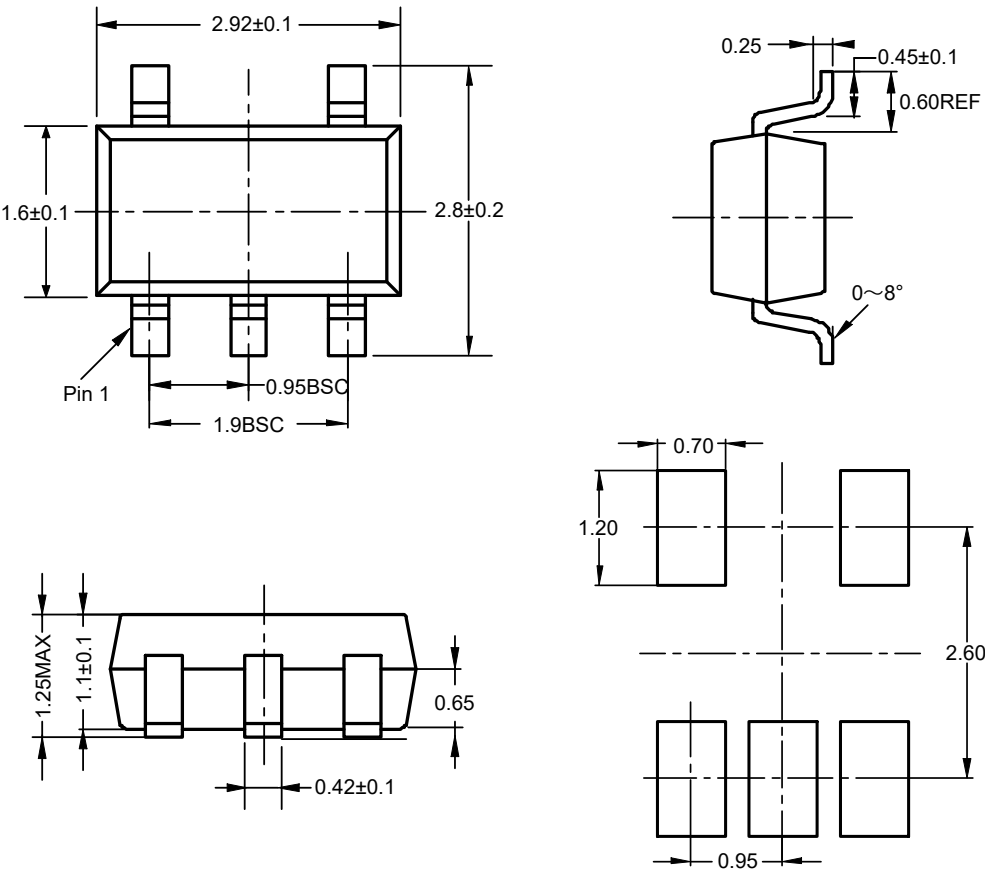
Detail A: (PIN1 shape)



Unit: mm

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SOT23-5

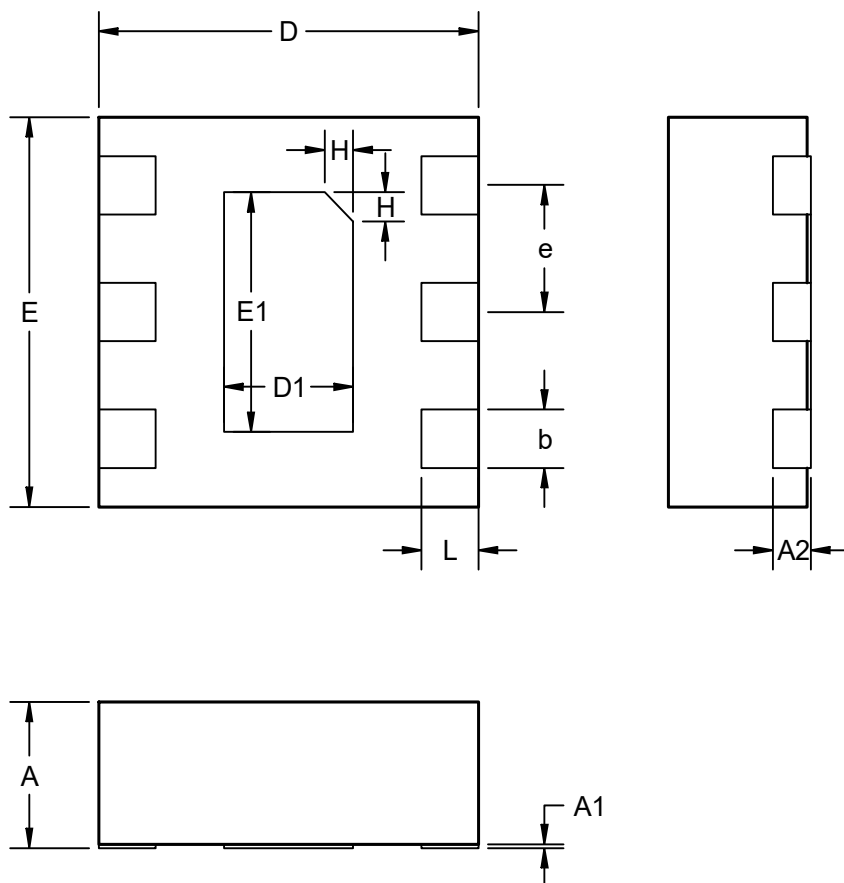


Recommended Land Pattern

Unit: mm

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DFN6



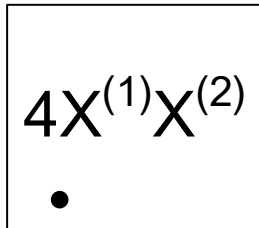
COMMON DIMENSIONS

(Unit : mm)

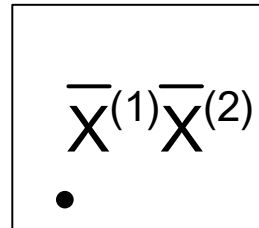
SYMBOL	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0	0.02	0.05
A2	0.10REF		
b	0.13	0.18	0.23
D	1.10	1.20	1.30
D1	0.25	0.30	0.35
E	1.10	1.20	1.30
E1	0.89	0.94	0.99
e	0.30	0.40	0.50
H	0.15REF		
L	0.15	0.20	0.25

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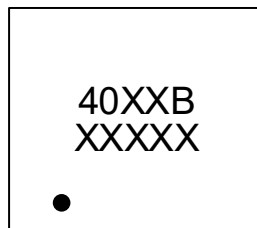
Marking Information



ET540XXYB
 $X^{(1)}$ = V_{OUT} Version
 $X^{(2)}$ = Tracking Number



ET540XXY1B
 $\bar{X}^{(1)}$ = V_{OUT} Version
 $\bar{X}^{(2)}$ = Tracking Number



ET540XXB
XX = V_{OUT} Version
XXXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2017-08-10	Original version	Liuyg	Liuyg	Zhuji
1.1	2017-11-22	Add Mark Specification	Liuyg	Liuyg	Zhuji
1.2	2017-12-01	Add DFN4,SOT23-5 package	Liuyg	Liuyg	Zhuji
1.3	2018-06-21	Change the AMR VIN to 6V	Liuyg	Liuyg	Liujy
1.4	2019-09-05	Revise Vout in label information	Wuxj	Wuxj	Liujy
1.5	2022-7-20	Update Typeset	Tugz	Liuyg	Liujy
1.6	2023-10-11	Update package picture/500mA	Shibo	Liuyg	Liujy
1.7	2025-10-9	Device information update	Shibo	Liu Yi Guo	Liujy
1.8	2026-07-27	Add Tape and Marking	Xu tao	Yang xiaoxu	Liujy