4 Channel LDO PMIC with I²C Control

General Description

The ET5934Y is CMOS-based low dropout, low power linear regulator. It's a 4-channels integrated LDO with I²C control. LDO1~4 offer up to 400mA with PMOS pass transistor. LDO1~2 are normal LDO. LDO3~4 are high performance LDO. ET5934Y include 1MHz high speed I²C interface, the function setting is flexible such as output voltage, output discharge, current limit per channel. The chip's enable control support RESET_N pin(Global Reset) control and I²C control.

The ET5934Y is available in QFN12(2.0mm × 2.0mm) package.

Features

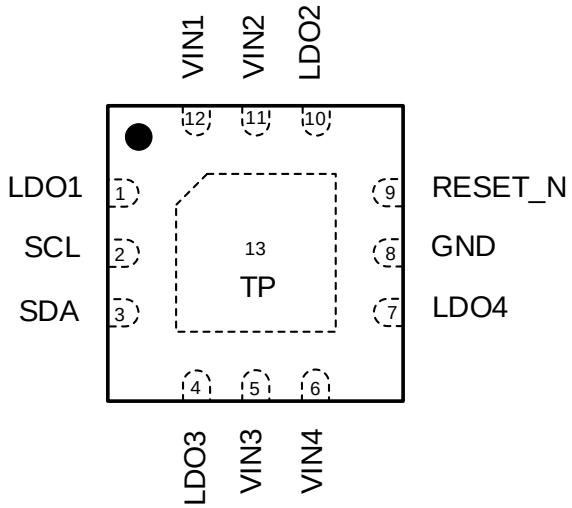
- LDO1~2
  - -- VIN1/VIN2 Input Voltage Range from 1.9V to 5.5V
  - -- Up to 400mA Load Current and Output Voltage Range from 1.38V to 3.75V with Step 10mV
  - -- Low Dropout: 107mV at 400mA Load @V_{OUT} = 2.8V
  - -- Low Noise is 35uVrms
  - -- PSRR Up to 70dB@1kHz
  - -- Very Low Input Quiescent Current of 30μA Typical
- LDO3~4
  - -- VIN3/VIN4 Input Voltage Range from 1.9V to 5.5V
  - -- Up to 400mA Load Current and Output Voltage Range from 1.38V to 3.75V with Step 10mV
  - -- Low Dropout: 107mV at 400mA Load @V_{OUT} = 2.8V
  - -- Low Noise is 8uVrms
  - -- PSRR Up to 90dB@1kHz
  - -- Very Low Input Quiescent Current of 40μA Typical
- With Over-current Protection, Thermal Shutdown, Under Voltage Lock-out and Auto-discharging Circuit
- Built-in 1MHz High Speed I²C Interface
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET5934Y	QFN12 (2.0mm × 2.0mm)	Tape and Reel, 3K/Reel	1

Applications

- Constant-voltage Power Supply for Battery-powered Device
- Constant-voltage Power Supply for Smartphones, Tablets
- Constant-voltage Power Supply for Cameras, DVRs, STB and Camcorders

Pin Configuration



TOP VIEW

Figure1. Pin Configuration

Pin Function

Pin No.	Pin Name	Pin Function
1	LDO1	LDO1 Regulate Output
2	SCL	I^2C Interface Clock
3	SDA	I^2C Interface Data
4	LDO3	LDO3 Regulator Output
5	VIN3	LDO3 Supply Input
6	VIN4	LDO4 Supply Input and Control Circuit Supply Input
7	LDO4	LDO4 Regulator Output
8	GND	Ground
9	RESET_N	Global Reset Control, Active High (RESET_N pin is used to enable basic circuits necessary for controlling the PMIC and reset all the digital block. Maintain low with 0.3uA pull down current source.)
10	LDO2	LDO2 Regulator Output
11	VIN2	LDO2 Supply Input
12	VIN1	LDO1 Supply Input
13	TP	Thermal Pad (Connect to GND plane for better power dissipation)

Block Diagram

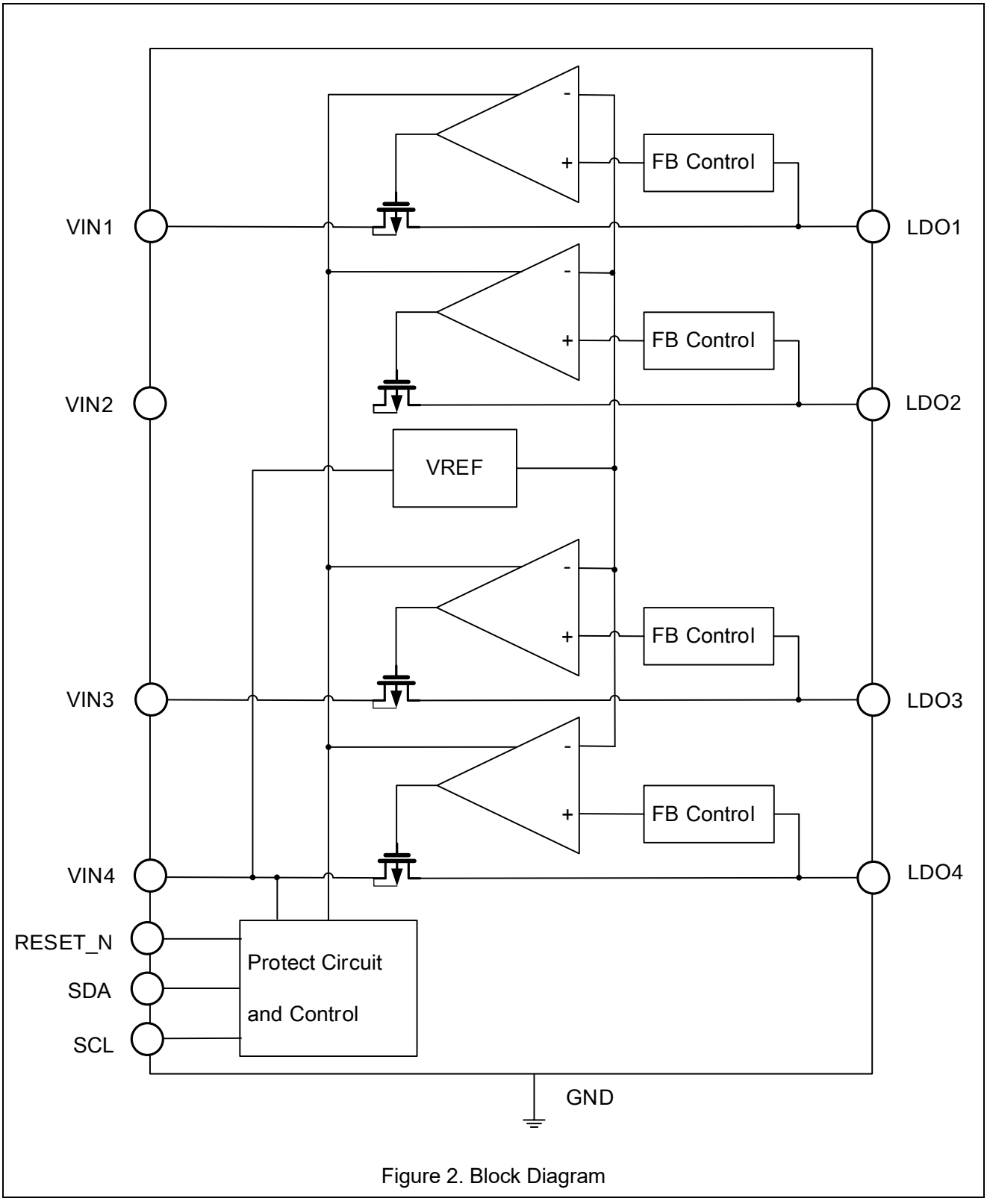


Figure 2. Block Diagram

Functional Description

Power Up and Power Down Control

The recommended power on sequence of ET5934Y is to power on VIN4 first, then power on input power VINx, then set RESET_N to high level, and then enable LDOx. The corresponding power off sequence is to turn off LDOx first, then set RESET_N to low level, then power off input power VINx(x=1,2,3), and finally power off VIN4.

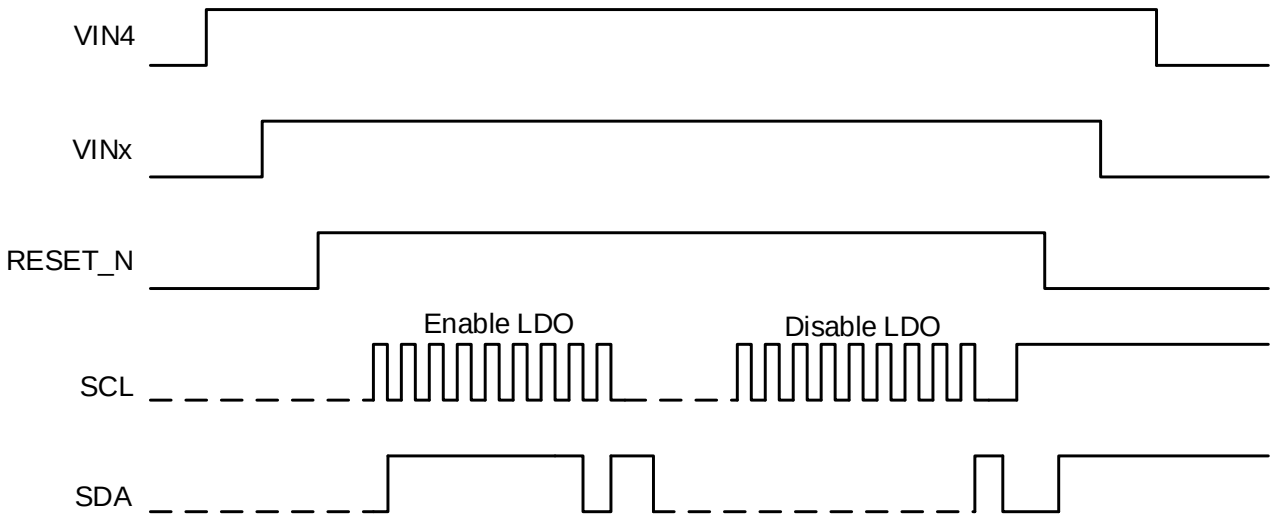


Figure 3. Power Up/Down Sequence Control

Input and Output Capacitor

The LDO1~LDO4 are designed to be stable for ceramic output capacitors with effective capacitance in the range from 0.47μF to 10μF. The recommended $C_{LDO1\sim4}$=1μF.

The device is also stable with multiple capacitors in parallel, VIN3/VIN4 the total effective capacitance in the specified range. In applications where no low input supplies impedance available, the recommended C_{VIN1}= C_{VIN2}= C_{VIN3} =C_{VIN4} =1μF or greater.

Current Limit Protection

For each channel, when output current of LDO output pin is higher than current limit threshold or the output 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. Set related bits to select current limit threshold register.

Thermal Shutdown Protection

Thermal protection disables all the output when the junction temperature rises to approximately +150°C, allowing the device to cool down. When the junction temperature reduces to approximately +120°C all the output circuit is enabled again. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits the heat dissipation of the regulator, protecting it from damage due to overheating.

Auto Discharging

For each channel, when shut down the output, the Auto-discharging circuit will be turned on to discharge the electric charge on output capacitor, and decrease the voltage of output pin in very short time.

The Auto-discharging function is optional. Set related bits to select output discharge function for discharge resistor (LDO_DIS Register).

Serial Port Interface (I2C)

Bus Interface

Baseband processor can transmit data with ET5934Y each other through SDA and SCL port. SDA and SCL composite bus interface, and a pull-up resistor to the power supply should be connected.

Data Validity

When the SCL signal is HIGH, the data of SDA port is valid and stable. Only when the SCL signal is low, the level on the SDA port can be changed.

Start (Re-start) and Stop Working Conditions

When the SCL signal is high, SDA signal from high to low represents start or re-start working conditions, while the SCL signal is high, SDA signal from low to high represents stop working conditions.

Byte format

Each byte of data line contains 8 bits, which contains an acknowledge bit. The first data is transmitted MSB.

Acknowledge

During the writing mode, ET5934Y will send a low-level response signal with one period width to the SDA port. During the reading mode, ET5934Y will not send response signal and the host will send a high response signal one period width to the SDA.

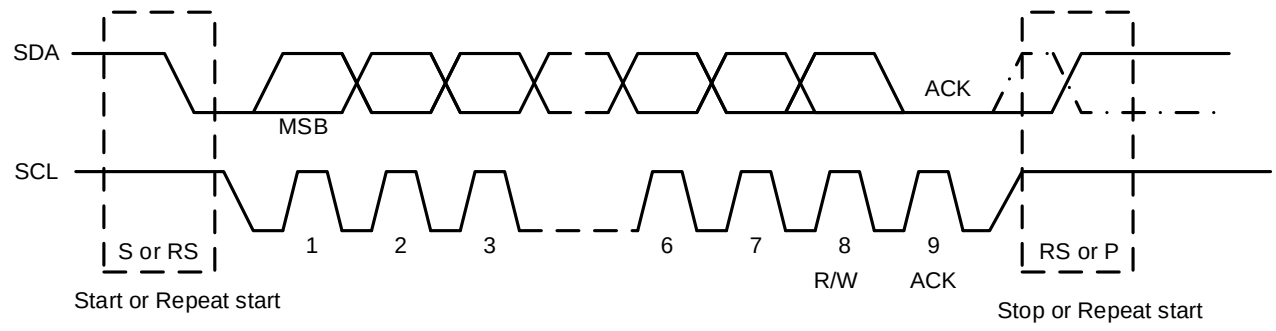


Figure 4. I²C Write Mode

- ACK=Acknowledge
- MSB=Most Significant Bit
- S=Start conditions; RS=Restart conditions; P=Stop conditions
- Fastest transmission speed =1000KBITS/s
- Restart: SDA-level turnover as expressed by the dashed line waveform

I²C Slave Address

The default 7bit I²C slave address is 1100100b(0x64), and 8bit address for the writing register mode is 11001000b(0xC8), the reading register mode is 11001001b(0xC9).

I²C Writing Command Register Interface Protocol (continuous):

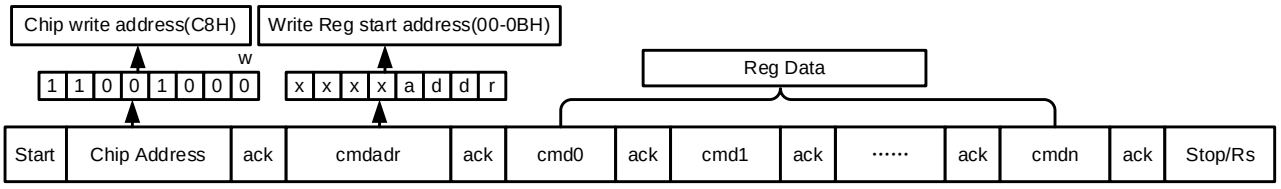


Figure 5. I²C Writing Command Register(Continuous)

- Start=Start conditions
- Chip address=Write register address =1100100+0(w)b
- ack=Acknowledge from ET5934Y
- Write Reg start address byte = cmdadr(xxxx + REG's 4bit addr)
- ack=Acknowledge from ET5934Y
- Reg data 0 = cmd0(Command data0)
- ack=Acknowledge from ET5934Y
- ……
- Reg data n =cmdn(Command datan)
- ack=Acknowledge from ET5934Y
- Stop/Rs=Stop condition/Restart condition

I²C Writing Command Register Interface Protocol (single):

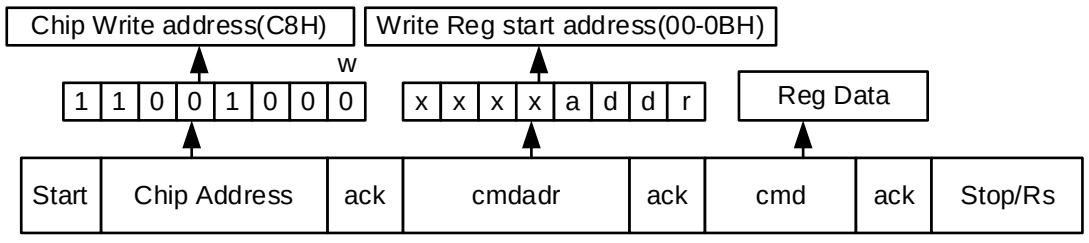


Figure 6. I²C Writing Command Register(Single)

- Start=Start conditions
- Chip address =Write register address=1100100+0(w)b
- ack=Acknowledge from ET5934Y
- Write Reg start address byte = cmdadr(xxxx + REG's 4bit addr)
- ack=Acknowledge from ET5934Y
- Reg data= cmd(Command data)

- ack=Acknowledge from ET5934Y
- Stop/Rs=Stop condition/Restart condition

I²C Reading Command Register Interface Protocol(continuous)

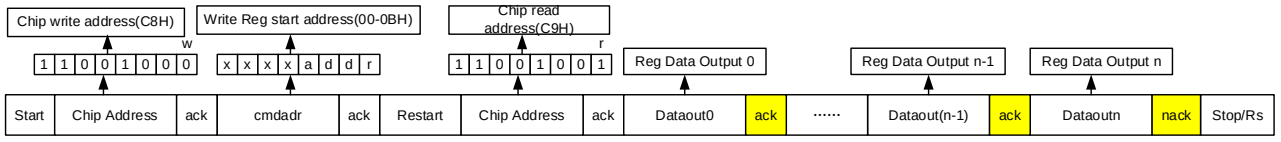


Figure 7. I²C Reading Command Register(Continuous)

- Start=Start conditions
- Chip address =Write register address=1100100+0(w)b
- ack=Acknowledge from ET5934Y
- Write Reg start address byte = cmdadr(xxxx + REG's 4bit addr)
- ack=Acknowledge from ET5934Y
- Restart=Restart condition
- Chip address Read register address=1100100+1(r)b
- ack=Acknowledge from ET5934Y
- Dataout0=Register data output 0
- ack=Acknowledge from host
- ……
- Dataoutn=Register data output n
- nack=No acknowledge from host
- Stop/Rs=Stop condition/Restart condition

I²C Reading Command Register Interface Protocol(single)

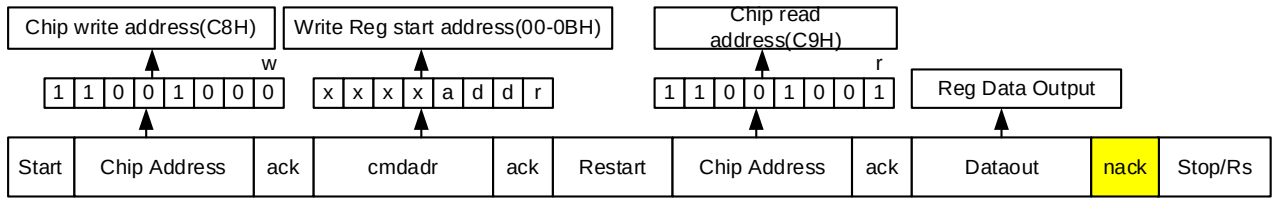


Figure 8. I²C Reading Command Register(Single)

- Start=Start conditions
- Chip address =Write register address=1100100+0(w)b
- ack=Acknowledge from ET5934Y
- Write Reg start address byte = cmdadr(xxxx + REG's 4bit addr)
- ack=Acknowledge from ET5934Y
- Restart=Restart condition

- Chip address read register address=1100100+1(r)b
- ack=Acknowledge from ET5934Y
- Dataout=Register data output
- nack=No acknowledge from host
- Stop/Rs=Stop condition/Restart condition

Register Map

Addr	Name	RST	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x00	CHIPID	0x34	001101						chip_id[1:0]	
0x01	LDO1/2_ILIMIT	0x44	Rev.	ldo2_ilimt[2:0]			Rev.	ldo1_ilimt[2:0]		
0x02	LDO3/4_ILIMIT	0x44	Rev.	ldo4_ilimt[2:0]			Rev.	ldo3_ilimt[2:0]		
0x03	LDO_DIS	0x0F	rdis_en	Rev.			ldo4_dis	ldo3_dis	ldo2_dis	ldo1_dis
0x04	LDO1_VSET	0xA0	ldo1_vset[7:0]							
0x05	LDO2_VSET	0xA0	ldo2_vset[7:0]							
0x06	LDO3_VSET	0xA0	ldo3_vset[7:0]							
0x07	LDO4_VSET	0xA0	ldo4_vset[7:0]							
0x08	LDO_FLT _MASK	0x00	Rev.				ldo4_flt _mask	ldo3_flt _mask	ldo2_flt _mask	ldo1_flt _mask
0x09	LDO_RESET_N	0x00	Rev.	Rev.	Rev.	Rev.	ldo4_en	ldo3_en	ldo2_en	ldo1_en
0x0A	SOFT_RESET	0x00	Rev.	Rev.	Rev.	Rev.	soft_reset[3:0]			
0x0B	STATU	0x00	tsd	Rev.	Rev.	Rev.	ldo4_ocp	ldo3_ocp	ldo2_ocp	ldo1_ocp

Note1: Rev.-- Reserve, keep “0”.

- **0x00 CHIPID Register -- Indicates the Product ID with Revision. Default=0x34 Type: Read only**

  -- chip_id[1:0] Indicates the product ID with revision. Read only.

- **0x01 LDO1/2_ILIMIT Register -- LDO1/2 Current Limit Selection. Default = 0x44 Type: R/W**

  -- The detail current limit threshold value is shown in the table as below:

Bit	Name	Default	Type	Description
7	Rev.	0	R	Reserved
6:4	ldo2_ilimt	100	R/W	LDO2 Current Limit Threshold Value: **000b:** current limit~1000mA short current limit~100mA **001b:** current limit~900mA short current limit~90mA **010b:** current limit~800mA short current limit~80mA **011b:** current limit~700mA short current limit~70mA **100b:** current limit~600mA short current limit~60mA **101b:** current limit~500mA short current limit~50mA **110b:** current limit~400mA short current limit~40mA **111b:** current limit~300mA short current limit~30mA
3	Rev.	0	R	Reserved
2:0	ldo1_ilimt	100	R/W	LDO1 Current Limit Threshold Value: **000b:** current limit~1000mA short current limit~100mA **001b:** current limit~900mA short current limit~90mA **010b:** current limit~800mA short current limit~80mA **011b:** current limit~700mA short current limit~70mA **100b:** current limit~600mA short current limit~60mA **101b:** current limit~500mA short current limit~50mA **110b:** current limit~400mA short current limit~40mA **111b:** current limit~300mA short current limit~30mA

- **0x02 LDO3/4_ILIMIT Register -- LDO3/4 Current Limit Selection. Default = 0x44 Type: R/W**

  -- The detail current limit threshold value is shown in the table as below:

Bit	Name	Default	Type	Description
7	Rev.	0	R	Reserved
6:4	ldo4_ilimt	100	R/W	LDO4 Current Limit Threshold Value: **000b:** current limit~1000mA short current limit~100mA **001b:** current limit~900mA short current limit~90mA **010b:** current limit~800mA short current limit~80mA **011b:** current limit~700mA short current limit~70mA **100b:** current limit~600mA short current limit~60mA **101b:** current limit~500mA short current limit~50mA **110b:** current limit~400mA short current limit~40mA **111b:** current limit~300mA short current limit~30mA
3	Rev.	0	R	Reserved
2:0	ldo3_ilimt	100	R/W	LDO3 Current Limit Threshold Value: **000b:** current limit~1000mA short current limit~100mA **001b:** current limit~900mA short current limit~90mA **010b:** current limit~800mA short current limit~80mA **011b:** current limit~700mA short current limit~70mA **100b:** current limit~600mA short current limit~60mA **101b:** current limit~500mA short current limit~50mA **110b:** current limit~400mA short current limit~40mA **111b:** current limit~300mA short current limit~30mA

- **0x03 LDO_DIS Register -- Discharge Resistor Selection. Default = 0x0F Type: R/W**

  -- Each LDO regulators output discharge resistor enable control.

Bit	Name	Default	Type	Description
7	rdis_en	0	R/W	Each LDO Regulators Output Discharge Resistor Enable Control. When use the discharge function by register control, should set Bit7(rdis_en) =”1”. When set Bit7 =”1”, ldo1/4_dis=0x0, all LDOs discharge function disable. When set Bit7 =”1”, ldo1/4_dis=0xF, all LDOs discharge function enable.
6:4	Rev.	000	R	Reserved
3	ldo4_dis	1	R/W	LDO4 Discharge Enabled/Disabled Control(rdis_en=1): **0b:** Disable Pull down will not be activated when LDO4 is disabled by any event **1b:** Enable Pull down will be activated when LDO4 is disabled by any event

2	ldo3_dis	1	R/W	LDO3 Discharge Enabled/Disabled Control(rdis_en=1): **0b:** Disable Pull down will not be activated when LDO3 is disabled by any event **1b:** Enable Pull down will be activated when LDO3 is disabled by any event
1	ldo2_dis	1	R/W	LDO2 Discharge Enabled/Disabled Control(rdis_en=1): **0b:** Disable Pull down will not be activated when LDO2 is disabled by any event **1b:** Enable Pull down will be activated when LDO2 is disabled by any event
0	ldo1_dis	1	R/W	LDO1 Discharge Enabled/Disabled Control(rdis_en=1): **0b:** Disable Pull down will not be activated when LDO1 is disabled by any event **1b:** Enable Pull down will be activated when LDO1 is disabled by any event

- **0x04~0x07 LDO1~4 Register -- LDO1~4 Output Voltage Setting Register Default = 0xA0 Type: R/W**

The registers LDO1~4_VSET [7:0] set the voltage of LDO1~4, each voltage has 256 steps, shown as below table, the formula is VLDO1~LDO4=1.380V+(d-18)*0.010V.

LDO1~4 Output Voltage set by LDO1~4_VSET [7:0]		
Dec	**Binary**	**Output Voltage(V)**
0	00000000	Reserved
1	00000001	Reserved
2~17	……	Reserved
18	00010010	1.380
19	00010011	1.390
20	00010100	1.400
21	00010101	1.410
22	00010110	1.420
23	00010111	1.430
……	……	……
160	**10100000(default)**	**2.8V**
161	10100001	2.810
162	10100010	2.820
……	……	……
255	11111111	3.750

- **0x08 LDO_FLT_MASK Register -- LDO Filter Capacitor Mask Control Register. Default = 0x00**

Each LDO filter capacitor mask enable control.

Bit	Name	Default	Type	Description
7:4	Rev.	0000	R	Reserved
3	ldo4_flt_mask	0	R/W	LDO4 Filter Capacitor Mask Enabled/Disabled Control: **0b:** Disable Don't mask LDO4 filter capacitor **1b:** Enable Mask LDO4 filter capacitor, it will accelerate the response speed of dynamic voltage regulation.
2	ldo3_flt_mask	0	R/W	LDO3 Filter Capacitor Mask Enabled/Disabled Control: **0b:** Disable Don't mask LDO3 filter capacitor **1b:** Enable Mask LDO3 filter capacitor, it will accelerate the response speed of dynamic voltage regulation.
1	ldo2_flt_mask	0	R/W	LDO2 Filter Capacitor Mask Enabled/Disabled Control: **0b:** Disable Don't mask LDO2 filter capacitor **1b:** Enable Mask LDO2 filter capacitor, it will accelerate the response speed of dynamic voltage regulation.
0	ldo1_flt_mask	0	R/W	LDO1 Filter Capacitor Mask Enabled/Disabled Control: **0b:** Disable Don't mask LDO1 filter capacitor **1b:** Enable Mask LDO1 filter capacitor, it will accelerate the response speed of dynamic voltage regulation.

- **0x09 LDO_RESET_N Register ----LDOs Chip Enable Control Register. Default = 0x00 Type: R/W**

This register can be written to enable or disable the corresponding LDO regulator.

Bit	Name	Default	Type	Description
7:4	Rev.	000	R	Reserved
3	ldo4_en	0	R/W	LDO4 enable control: **0b:** Disable **1b:** Enable
2	ldo3_en	0	R/W	LDO3 enable control: **0b:** Disable **1b:** Enable
1	ldo2_en	0	R/W	LDO2 enable control: **0b:** Disable **1b:** Enable
0	ldo1_en	0	R/W	LDO1 enable control: **0b:** Disable **1b:** Enable

- **0x0A SOFT_RESET Register ----LDOs Reset Control Register. Default = 0x00 Type: R/W**

Bit	Name	Default	Type	Description
7:4	Rev.	0000	R	Reserved
3:0	soft_reset	0000	W/C	Writing a "1011" begins a soft reset of the device I²C registers to their default values. This bit is cleared upon execution of the reset function. Any other value than "1011" will be ignored.

- **0x0B STATU Register ----Chip Status Register. Default = 0x00 Type: R(2)**

Bit	Name	Default	Type	Description
7	tsd	0	R	Thermal Shutdown Status: **0b:** Normal operation **1b:** A thermal shutdown event detected
6	Rev.	0	R	Reserved
5:4	Rev.	00	R	Reserved
3	ldo4_ocp	0	R	LDO4 OCP Status: **0b:** Clear **1b:** Over current event detected on the LDO4 output while LDO4 is been commanded to be enabled.
2	ldo3_ocp	0	R	LDO3 OCP Status: **0b:** Clear **1b:** Over current event detected on the LDO3 output while LDO3 is been commanded to be enabled.
1	ldo2_ocp	0	R	LDO2 OCP Status: **0b:** Clear **1b:** Over current event detected on the LDO2 output while LDO2 is been commanded to be enabled.
0	ldo1_ocp	0	R	LDO1 OCP Status: **0b:** Clear **1b:** Over current event detected on the LDO1 output while LDO1 is been commanded to be enabled.

Note2: If the VIN is not powered but the LDO is enabled, it will trigger the OCP status position bit.

Absolute Maximum Ratings

Item		Rating	Unit
IN Voltage (VIN1, VIN2, VIN3, VIN4)		-0.3 to 6	V
Other Pin Voltage		-0.3 to V_{IN}+0.3	V
LDO1~4 Maximum Load Current		400	mA
Maximum Power Consumption		1800	mW
Operating Junction Temperature		-40 to 150	°C
Storage Temperature		-65 to 150	°C
Lead Temperature (Soldering, 10 sec)		300	°C
ESD Capacity	HBM(JEDEC JS-001)	±2000	V
	CDM(JEDEC JS-002)	±1500	V

Recommended Operating Conditions

Symbol	Item	Rating	Unit
$V_{VIN1/2/3/4}$	VIN1/2/3/4 Input Voltage[3]	1.9 to 5.5	V
I_{LDOx}	LDO1/2/3/4 Output Current	0 to 400	mA
T_A	Operating Ambient Temperature	-40 to 85	°C
$C_{VIN1/2/3/4}$	VIN1/2/3/4 Effective Input Ceramic Capacitor Value	0.47 to 10	μF
C_{LDOx}	Effective Output Ceramic Capacitor Value	0.68 to 10	μF
ESR	Input and Output Capacitor Equivalent Series Resistance	5 to 100	mΩ

Electrical Characteristics

(Unless otherwise noted, V_{VIN1}=V_{LDO1}+1V, V_{VIN2}=V_{LDO2}+1V, V_{VIN3}=V_{LDO3}+1V, V_{VIN4}=V_{LDO4}+1V, I_{OUT}=1mA, C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1μF, C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1μF, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{VIN} (3)	V_{VIN1}/V_{VIN2}/$V_{VIN3}$$V_{VIN4}$ Voltage Range		1.9		5.5	V
V_{UVLO}	Under-voltage Lock-out	V_{VIN4} Falling	1.35	1.55	1.8	V
V_{UVLO_HYS}	Hysteresis	Under-voltage Lock-out Hysteresis		0.2		V
I_{GND}	GND Current	Active Mode: V_{EN}=$V_{VIN1/2/3/4}$=3.8V, and Enable All LDO by I²C, No Load, V_{OUT}=2.8V	40	70	110	μA
		Disable Mode: V_{EN}=3.8V, $V_{VIN1/2/3/4}$=3.8V, V_{OUT}=2.8V, Disable All LDO by I²C		0.6	3	μA
I_{Q_ON1}	V_{VIN1} Current	Active Mode: V_{EN}=$V_{VIN1/2/3/4}$=3.8V, and Only Enable LDO1 by I²C, No Load, V_{OUT}=2.8V		15	25	μA
I_{Q_ON2}	V_{VIN2} Current	Active Mode: V_{RESET_N}=$V_{VIN1/2/3/4}$=3.8V, and Only Enable LDO2 by I²C, No Load, V_{OUT}=2.8V		15	25	μA
I_{Q_ON3}	V_{VIN3} Current	Active Mode: V_{RESET_N}=$V_{VIN1/2/3/4}$=3.8V, and Only Enable LDO3 by I²C, No Load, V_{OUT}=2.8V		15	25	μA
I_{Q_ON4}	V_{VIN4} Current	Active Mode: V_{RESET_N}=$V_{VIN1/2/3/4}$=3.8V, Enable LDO4 by I²C, No Load, V_{OUT}=2.8V	12	25	40	μA
		Active Mode: V_{RESET_N}=$V_{VIN1/2/3/4}$=3.8V, Disable LDO4 and Enable Other LDO by I²C, No Load, V_{OUT}=2.8V	5	10	22	μA

Electrical Characteristics (continued)

(Unless otherwise noted, V_{VIN1}=V_{LDO1}+1V, V_{VIN2}=V_{LDO2}+1V, V_{VIN3}=V_{LDO3}+1V, V_{VIN4}=V_{LDO4}+1V, I_{OUT}=1mA, C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1μF, C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1μF, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
I_{RESET_N}	RESET_N Pull-down Current	V_{RESET_N}=5.5V, V_{VIN4}=5.5V		0.3	1	μA
V_{RESET_NH}	RESET_N Input Voltage High		0.84			V
V_{RESET_NL}	RESET_N Input Voltage Low				0.4	V
V_{I2CH}	SCL/SDA Input Voltage High		0.84			V
V_{I2CL}	SCL/SDA Input Voltage Low				0.4	V
V_{OL}	SDA Logic Low Output	3mA Sink			0.4	V
F_{SCL}	SCL Clock Frequency				1000	kHz
T_{TSD} (5)	Thermal Shutdown Threshold	T_J Rising		150		°C
T_{HYS} (5)	Thermal Shutdown Hysteresis	T_J Falling from Shutdown		20		°C

LDO1~LDO2

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{DROP_LDO1\sim2}$(4)	Dropout Voltage	I_{OUT} = 400mA, $V_{LDO1/2}$=2.8V, V_{VIN4} =3.8V		107	155	mV
		I_{OUT} = 200mA, $V_{LDO1/2}$=2.8V, V_{VIN4} =3.8V,		52	80	mV
		I_{OUT} = 400mA, $V_{LDO1/2}$=1.8V, V_{VIN4} =3.8V(5)		155	225	mV
		I_{OUT} = 400mA, $V_{LDO1/2}$=2.2V, V_{VIN4} =3.8V(5)		126	180	mV
		I_{OUT} = 400mA, $V_{LDO1/2}$=3V, V_{VIN4} =3.8V(5)		97	140	mV
		I_{OUT} = 400mA, $V_{LDO1/2}$=3.3V, V_{VIN4} =3.8V(5)		92	135	mV
$V_{LDO1\sim2}$	Regulated Output Voltage	I_{OUT}=1mA~400mA, T_A=25°C	-2		2	%
		I_{OUT}=1mA~400mA, T_A = -40°C~85°C	-2.5		2.5	

Electrical Characteristics (continued)

(Unless otherwise noted, V_{VIN1}=V_{LDO1}+1V, V_{VIN2}=V_{LDO2}+1V, V_{VIN3}=V_{LDO3}+1V, V_{VIN4}=V_{LDO4}+1V, I_{OUT}=1mA, C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1μF, C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1μF, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$Reg_{LINE_LDO1\sim2}$	Output Voltage Line Regulation	V_{VIN4}=3.8V, $V_{LDO1/2}$=2.8V, 3.8V≤$V_{VIN1/2}$≤5.5V, I_{OUT} = 10mA （$\Delta V_{LDOx}/\Delta V_{VINx}/V_{LDOx}$）		0.01	0.2	%/V
$Reg_{LOAD_LDO1\sim2}$	Output Voltage Load Regulation	V_{VIN4}=3.8V, $V_{LDO1/2}$=2.8V, I_{OUT} from 1mA to 400mA		13	40	mV
$V_{TRLN_LDO1\sim2}$[5]	Line Transient ($V_{VIN1\sim2}$ to $V_{OUT1\sim2}$)	V_{VIN4}=3.8V, $V_{LDO1/2}$=2.8V, I_{OUT}=1mA, $V_{VIN1/2}$=3.8V to 5.5V in 10us, T_A=25°C		5	20	mV
		V_{VIN4}=3.8V, $V_{LDO1/2}$=2.8V, I_{OUT} = 1mA, $V_{VIN1/2}$ =5.5V to 3.8V in 10us, T_A=25°C		5	20	mV
	Line Transient (V_{VIN4} to $V_{OUT1\sim2}$)	I_{OUT}=1mA, V_{VIN4}=3.8V to 4.8V in 10us, T_A=25°C		5	10	mV
		I_{OUT}=1mA, V_{VIN4}=4.8V to 3.8V in 10us, T_A=25°C		5	10	mV
$V_{TRLD_LDO1\sim2}$[5]	Load Transient	$V_{LDO1/2}$=2.8V, V_{VIN4}=3.8V, $V_{VIN1/2}$ =3.8V, I_{OUT} from 1mA to 400mA in 10us, T_A=25°C		30	60	mV
		$V_{LDO1/2}$=2.8V, V_{VIN4}=3.8V, $V_{VIN1/2}$ =3.8V, I_{OUT} from 400mA to 1mA in 10us, T_A=25°C		30	60	mV
$I_{OUT_LDO1\sim2}$	Output Current		400			mA
$I_{LMT_LDO1\sim2}$	Over Current Limit	Default Current Limit Register, V_{VIN4}=3.8V, $V_{VIN1/2}$=V_{LDOx_VSET}+1V, T_A=25°C	400	600	1000	mA
$I_{SHORT_LDO1\sim2}$	Short Current Limit	Default Current Limit Register, V_{VIN4}=3.8V, $V_{LDO1/2}$=0V, T_A=25°C	30	60	100	mA

Electrical Characteristics (continued)

(Unless otherwise noted, V_{VIN1}=V_{LDO1}+1V, V_{VIN2}=V_{LDO2}+1V, V_{VIN3}=V_{LDO3}+1V, V_{VIN4}=V_{LDO4}+1V, I_{OUT}=1mA, C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1μF, C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1μF, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$PSRR_{_ldo1/2}$ (5)	Power Supply Rejection Ratio ($V_{VIN1/2}$ to $V_{OUT1/2}$)	f=100Hz, I_{OUT}=20mA, V_{VIN4}=V_{LDOx_VSET}+1V, T_A=25°C		60		dB
		f=1kHz, I_{OUT}=20mA, V_{VIN4}= V_{LDOx_VSET}+1V, T_A=25°C		70		
		f=10kHz, I_{OUT}=20mA, V_{VIN4}= V_{LDOx_VSET}+1V, T_A=25°C		65		
		f=100Hz, I_{OUT}=20mA, V_{VIN4}= V_{LDOx_VSET}+1V, T_A=25°C		50		
		f=1MHz, I_{OUT}=20mA, V_{VIN4}= V_{LDOx_VSET}+1V, T_A=25°C		40		
	Power Supply Rejection Ratio (V_{VIN4} to $V_{OUT1/2}$)	f=1kHz, I_{OUT}=20mA, V_{VIN4}= V_{LDOx_VSET}+1V, T_A=25°C		80		dB
		f=1MHz, I_{OUT}=20mA, V_{VIN4}= V_{LDOx_VSET}+1V, T_A=25°C		40		
$e_{N_LDO1/2}$ (5)	Output Noise	10Hz to 100kHz, I_{OUT} =200mA, $V_{LDO1/2}$ =2.8V, V_{VIN4}=$V_{VIN1/2}$= 3.8V, T_A=25°C		35		μV_{RMS}
$R_{LOW_LDO1/2}$	Output Resistance of Auto Discharge at Off State	V_{RESET_N}=0V, or Shutdown by I^2C, V_{VIN4}=$V_{VIN1/2}$=3.8V, I_{OUT}=10mA	20	50	80	Ω
$t_{ON_LDO1/2}$ (5)	Output Turn-on Delay Time	V_{VIN4}=3.8V, from V_{RESET_N}> V_{IH} to V_{OUT} = 95% of $V_{OUT(NOM)}$		200	400	μs

Electrical Characteristics (continued)

(Unless otherwise noted, $V_{VIN1}=V_{LDO1}+1V$, $V_{VIN2}=V_{LDO2}+1V$, $V_{VIN3}=V_{LDO3}+1V$, $V_{VIN4}=V_{LDO4}+1V$, $I_{OUT}=1mA$, $C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1\mu F$, $C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1\mu F$, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)

LDO3

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{DROP_LDO3}(4)	Dropout Voltage	I_{OUT} =400mA, V_{LDO3}=2.8V, V_{VIN4}=3.8V		107	155	mV
		I_{OUT} = 200mA, V_{LDO3}=2.8V, V_{VIN4}=3.8V		52	80	mV
		I_{OUT} = 400mA, V_{LDO3}=1.8V, V_{VIN4}=3.8V(5)		155	225	mV
		I_{OUT} = 400mA, V_{LDO3}=2.2V, V_{VIN4}=3.8V(5)		126	180	mV
		I_{OUT} = 400mA, V_{LDO3}=3V, V_{VIN4}=3.8V(5)		97	140	mV
		I_{OUT} = 400mA, V_{LDO3}=3.3V, V_{VIN4}=3.8V(5)		92	135	mV
V_{LDO3}	Regulated Output Voltage	I_{OUT}=1mA~400mA,T_A=25°C	-2		2	%
		I_{OUT}=1mA~400mA, T_A = -40°C~85°C	-2.5		2.5	
Reg_{LINE_LDO3}	Output Voltage Line Regulation	V_{VIN4}=3.8V, V_{LDO3}=2.8V, 3.8V≤V_{VIN3}≤5.5V, I_{OUT} = 10mA （$\Delta V_{LDOx}/\Delta V_{VINx}/V_{LDOx}$）		0.01	0.2	%/V
Reg_{LOAD_LDO3}	Output Voltage Load Regulation	V_{VIN4}=3.8V, V_{LDO3}=2.8V, I_{OUT} from 1mA to 400mA		10	40	mV
V_{TRLN_LDO3}(5)	Line Transient (V_{VIN3} to V_{OUT3})	V_{VIN4}=3.8V, V_{LDO3}=2.8V, I_{OUT}=1mA, T_A=25°C V_{VIN3} =3.8V to 5.5V in 10us,		5	20	mV
		V_{VIN4}=3.8V, V_{LDO3}=2.8V, I_{OUT}= 1mA, T_A=25°C V_{VIN3} =5.5V to 3.8V in 10us,		5	20	mV
	Line Transient (V_{VIN4} to V_{OUT3})	I_{OUT}=1mA, T_A=25°C V_{VIN4}=3.8V to 4.8V in 10us,		5	10	mV
		I_{OUT}=1mA, T_A=25°C V_{VIN4}=4.8V to 3.8V in 10us,		5	10	mV

Electrical Characteristics (continued)

(Unless otherwise noted, V_{VIN1}=V_{LDO1}+1V, V_{VIN2}=V_{LDO2}+1V, V_{VIN3}=V_{LDO3}+1V, V_{VIN4}=V_{LDO4}+1V, I_{OUT}=1mA, C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1μF, C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1μF, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{TRLD_LDO3}(5)	Load Transient	V_{LDO3}=2.8V, V_{VIN3}=V_{VIN4}=3.8V, I_{OUT} from 1mA to 400mA in 10us, T_A=25°C		30	60	mV
		V_{LDO3}=2.8V, V_{VIN3}=V_{VIN4}=3.8V, I_{OUT} from 400mA to 1mA in 10us, T_A=25°C		30	60	mV
I_{OUT_LDO3}	Output Current		400			mA
I_{LMT_LDO3}	Over Current Limit	Default Current Limit Register, V_{VIN4}=3.8V, V_{VIN3}= V_{LDO3}+1V, T_A=25°C	400	600	1000	mA
I_{SHORT_LDO3}	Short Current Limit	Default Current Limit Register, V_{VIN4}=3.8V, V_{LDO3}=0V, T_A=25°C	30	60	100	mA
$PSRR_{LDO3}$(5)	Power Supply Rejection Ratio (V_{VIN3} to V_{OUT3})	f=100Hz, I_{OUT}=20mA, V_{VIN4}=3.8V, V_{VIN3}= V_{LDO3}+1V, T_A=25°C		80		dB
		f=1kHz, I_{OUT}=20mA, V_{VIN4}=3.8V, V_{VIN3}= V_{LDO3}+1V, T_A=25°C		90		
		f=10kHz, I_{OUT}=20mA, V_{VIN4}=3.8V, V_{VIN3}= V_{LDO3}+1V, T_A=25°C		75		
		f=100Hz, I_{OUT}=20mA, V_{VIN4}=3.8V, V_{VIN3}= V_{LDO3}+1V, T_A=25°C		65		
		f=1MHz, I_{OUT}=20mA, V_{VIN4}=3.8V, V_{VIN3}= V_{LDO3}+1V, T_A=25°C		40		
	Power Supply Rejection Ratio (V_{VIN4} to V_{OUT3})	f=1kHz, I_{OUT}=20mA, V_{VIN4}=3.8V, V_{VIN3}= V_{LDO3}+1V, V_{VIN3}= 2.8V, T_A=25°C		105		dB
		f=1MHz, I_{OUT}=20mA, V_{VIN4}=3.8V, V_{VIN3}= V_{LDO3}+1V, V_{VIN3}= 2.8V, T_A=25°C		60		

Electrical Characteristics (continued)

(Unless otherwise noted, V_{VIN1}=V_{LDO1}+1V, V_{VIN2}=V_{LDO2}+1V, V_{VIN3}=V_{LDO3}+1V, V_{VIN4}=V_{LDO4}+1V, I_{OUT}=1mA, C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1μF, C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1μF, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
e_{N_LDO3}(5)	Output Noise	10Hz to 100kHz, I_{OUT} =200mA, V_{LDO3} =2.8V, V_{VIN4}=V_{VIN3}= 3.8V, T_A=25°C		8		μV_{RMS}
R_{LOW_LDO3}	Output Resistance of Auto Discharge at Off State	V_{RESET_N}=0V, or Shutdown by I²C, V_{VIN4}=V_{VIN3}=3.8V, I_{OUT}=10mA	20	50	80	Ω
t_{ON_LDO3}(5)	Output Turn-on Delay Time	V_{VIN4}=3.8V, from V_{RESET_N}> V_{IH} to V_{OUT} = 95% of $V_{OUT(NOM)}$		200	400	μs

LDO4

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{DROP_LDO4}(4)	Dropout Voltage	I_{OUT} =400mA, V_{LDO4}=2.8V		107	155	mV
		I_{OUT} = 200mA, V_{LDO4}=2.8V		52	80	mV
		I_{OUT} = 400mA, V_{LDO4}=1.8V(5)		155	225	mV
		I_{OUT} = 400mA, V_{LDO4}=2.2V(5)		126	180	mV
		I_{OUT} = 400mA, V_{LDO4}=3V(5)		97	140	mV
		I_{OUT} = 400mA, V_{LDO4}=3.3V(5)		92	135	mV
V_{LDO4}	Regulated Output Voltage	I_{OUT}=1mA~400mA,T_A=25°C	-2		2	%
		I_{OUT}=1mA~400mA, T_A = -40°C~85°C	-2.5		2.5	
Reg_{LINE_LDO4}	Output Voltage Line Regulation	3.8V≤V_{VIN4}≤5.5V, I_{OUT} = 10mA （$\Delta V_{LDOx}/\Delta V_{VINx}/V_{LDOx}$）		0.01	0.2	%/V
Reg_{LOAD_LDO4}	Output Voltage Load Regulation	V_{VIN4} =3.8V, I_{OUT} from 1mA to 400mA		10	40	mV
V_{TRLN_LDO4}(5)	Line Transient	V_{LDO4}=2.8V, I_{OUT} =1mA, V_{VIN4} =3.8V to 5.5V in 10us, T_A=25°C		5	20	mV
		V_{LDO4}=2.8V, I_{OUT} = 1mA, V_{VIN4} =5.5V to 3.8V in 10us, T_A=25°C		5	20	mV

Electrical Characteristics (continued)

(Unless otherwise noted, V_{VIN1}=V_{LDO1}+1V, V_{VIN2}=V_{LDO2}+1V, V_{VIN3}=V_{LDO3}+1V, V_{VIN4}=V_{LDO4}+1V, I_{OUT}=1mA, C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1μF, C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1μF, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{TRLD_LDO4}(5)	Load Transient	V_{LDO4}=2.8V, V_{VIN4} =3.8V, I_{OUT} from 1mA to 400mA in 10us, T_A=25°C		30	60	mV
		V_{LDO4}=2.8V, V_{VIN4}=3.8V, I_{OUT} from 400mA to 1mA in 10us, T_A=25°C		30	60	mV
I_{OUT_LDO4}	Output Current		400			mA
I_{LMT_LDO4}	Over Current Limit	Default Current Limit Register, V_{VIN4}= V_{LDO4}+1V, T_A=25°C	400	600	1000	mA
I_{SHORT_LDO4}	Short Current Limit	Default Current Limit Register, V_{LDO4}=0V, T_A=25°C	30	60	100	mA
$PSRR_{_LDO4}$(5)	Power Supply Rejection Ratio (V_{VIN4} to V_{OUT4})	f=100Hz, I_{OUT}=20mA, V_{VIN4}= V_{LDO4}+1V, T_A=25°C		80		dB
		f=1kHz, I_{OUT}=20mA, V_{VIN4}= V_{LDO4}+1V, T_A=25°C		90		
		f=10kHz, I_{OUT}=20mA, V_{VIN4}= V_{LDO4}+1V, T_A=25°C		75		
		f=100Hz, I_{OUT}=20mA, V_{VIN4}= V_{LDO4}+1V, T_A=25°C		65		
		f=1MHz, I_{OUT}=20mA, V_{VIN4}= V_{LDO4}+1V, T_A=25°C		40		
e_{N_LDO4}(5)	Output Noise	10Hz to 100kHz, I_{OUT} =200mA, V_{LDO4} =2.8V, V_{VIN4}= 3.8V, T_A=25°C		8		μV_{RMS}
R_{LOW_LDO4}	Output Resistance of Auto Discharge at Off State	V_{RESET_N}=0V, or shutdown by I^2C, V_{VIN4}=3.8V, I_{OUT}=10mA	20	50	80	Ω
t_{ON_LDO4}(5)	Output Turn-on Delay Time	From V_{RESET_N} > V_{IH} to V_{OUT} = 95% of $V_{OUT(NOM)}$		200	400	μs

Note3: Here V_{VINx} means internal circuit can work normal (V_{VIN4}>V_{UVLO}).

If V_{VINx} <V_{LDOx}, output voltage follows V_{VINx} (I_{OUT}=1mA), circuit is safety.

The minimum V_{VINx} voltage of this chip is 1.9V. if you need better performance, it is recommended that V_{VINx}≥V_{LDOx}+1V.

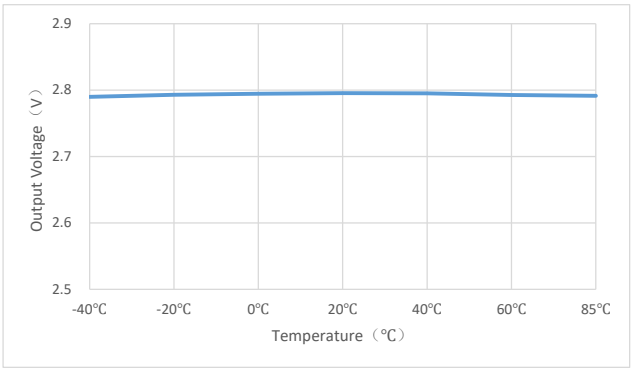
Note4: V_{DROP_LDOx} FT test method:

Test the V_{OUT} voltage at V_{LDOx}_vset +$V_{DROPMAX}$ with output current.

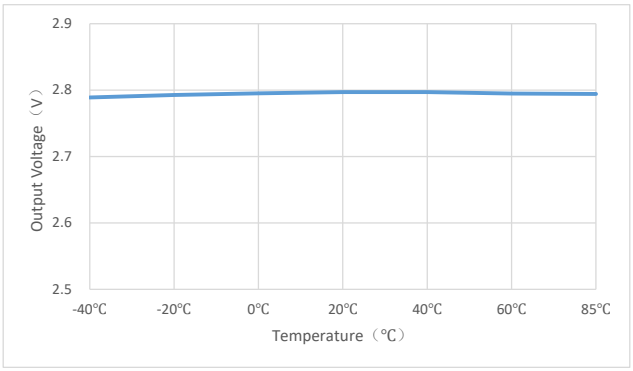
Note5: Guaranteed by design and characterization, not a FT item.

Typical Characteristics

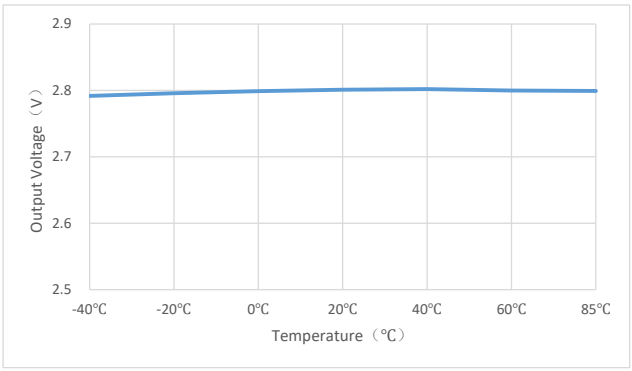
(Unless otherwise noted, $V_{VIN1}=V_{LDO1}+1V$, $V_{VIN2}=V_{LDO2}+1V$, $V_{VIN3}=V_{LDO3}+1V$, $V_{VIN4}=V_{LDO4}+1V$, $I_{OUT}=1mA$, $C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1\mu F$, $C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1\mu F$, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)



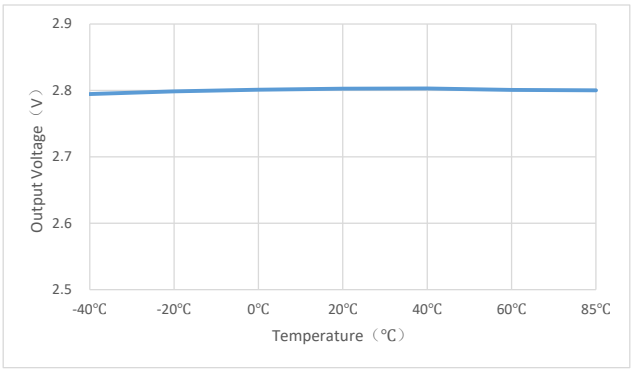
LDO1 Output Voltage VS Temperature



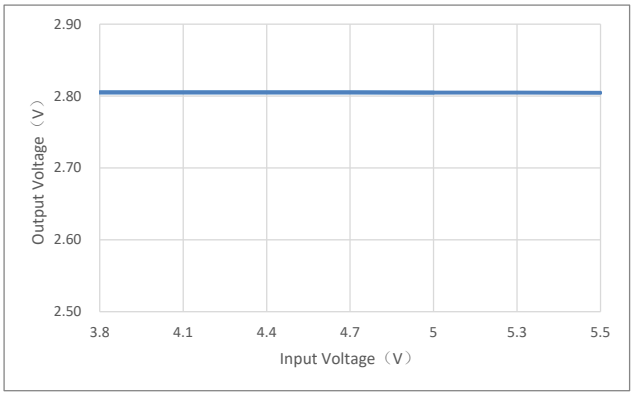
LDO2 Output Voltage VS Temperature



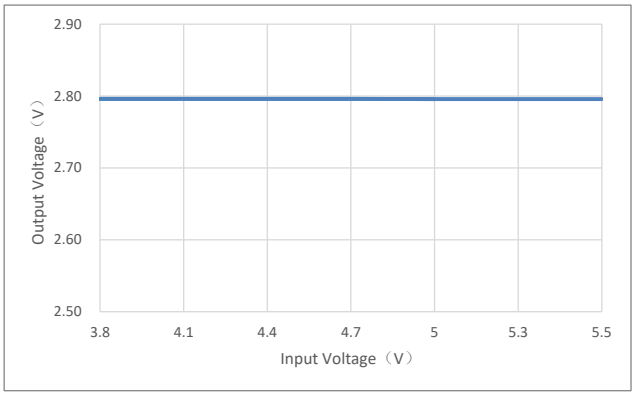
LDO3 Output Voltage VS Temperature



LDO4 Output Voltage VS Temperature



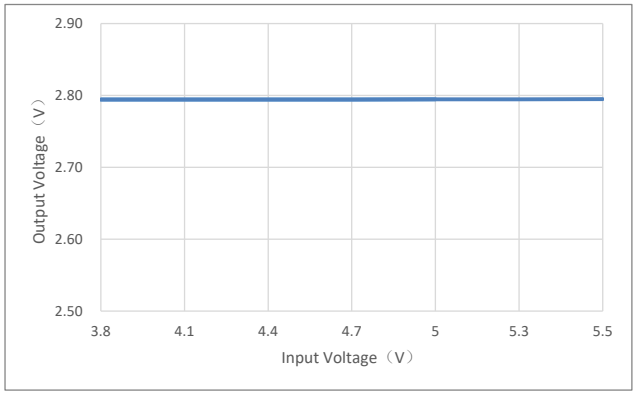
LDO1 Output Voltage VS Input Voltage



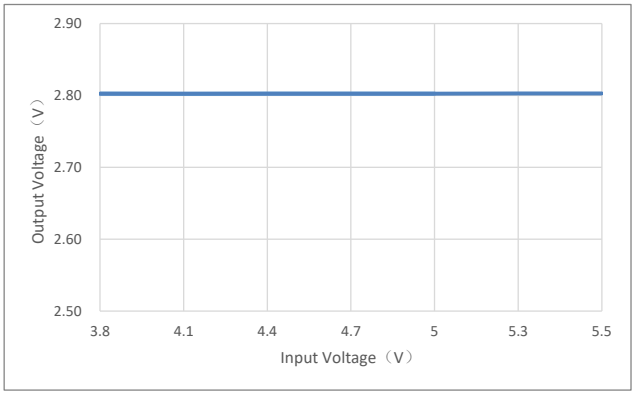
LDO2 Output Voltage VS Input Voltage

Typical Characteristics(Continued)

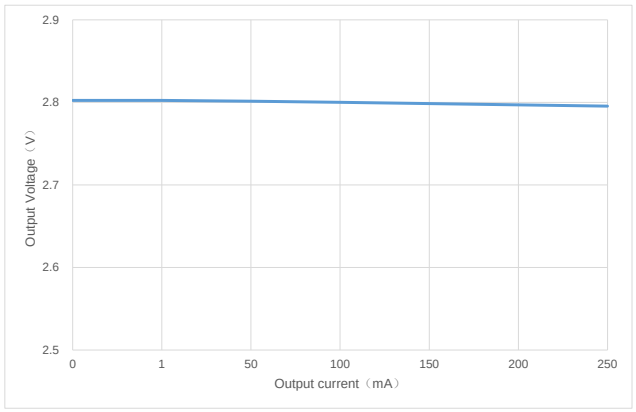
(Unless otherwise noted, $V_{VIN1}=V_{LDO1}+1V$, $V_{VIN2}=V_{LDO2}+1V$, $V_{VIN3}=V_{LDO3}+1V$, $V_{VIN4}=V_{LDO4}+1V$, $I_{OUT}=1mA$, $C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1\mu F$, $C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1\mu F$, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)



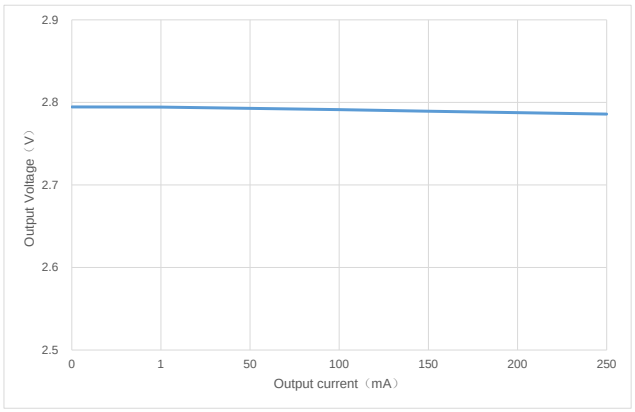
LDO3 Output Voltage VS Input Voltage



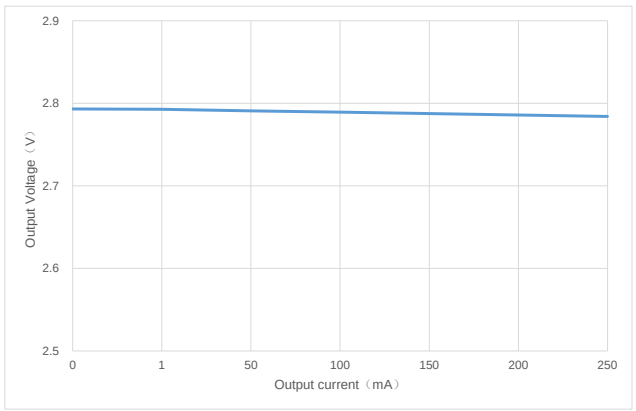
LDO4 Output Voltage VS Input Voltage



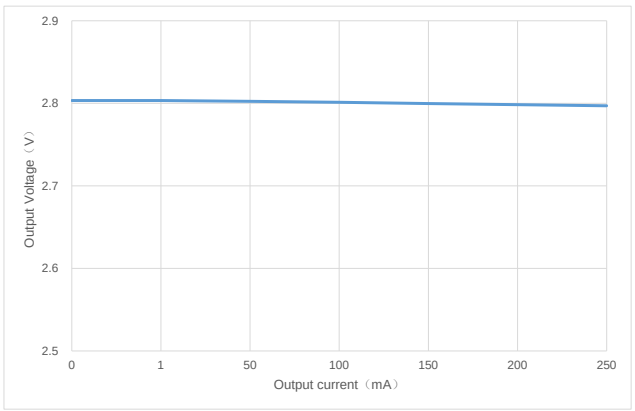
LDO1 Output Voltage VS Output Current



LDO2 Output Voltage VS Output Current



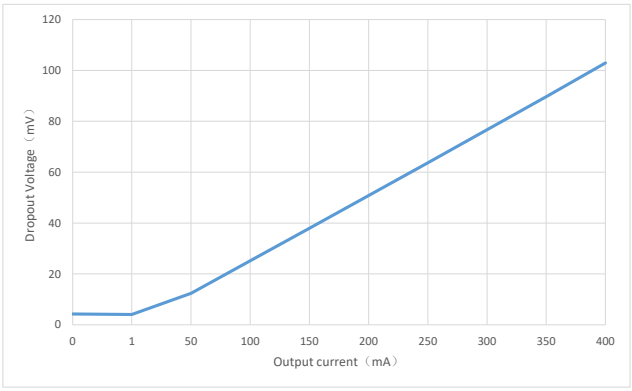
LDO3 Output Voltage VS Output Current



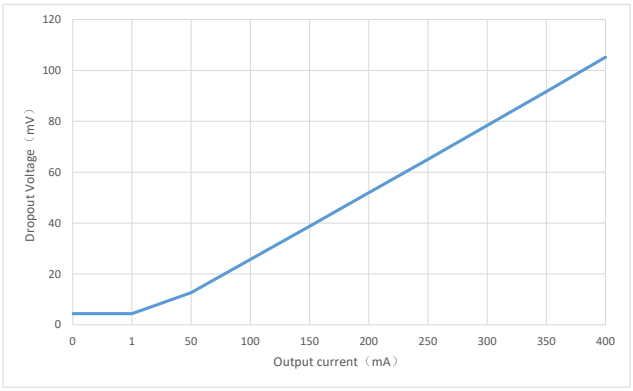
LDO4 Output Voltage VS Output Current

Typical Characteristics(Continued)

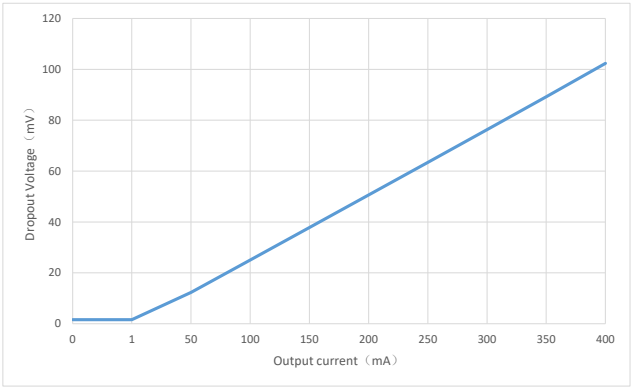
(Unless otherwise noted, $V_{VIN1}=V_{LDO1}+1V$, $V_{VIN2}=V_{LDO2}+1V$, $V_{VIN3}=V_{LDO3}+1V$, $V_{VIN4}=V_{LDO4}+1V$, $I_{OUT}=1mA$, $C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1\mu F$, $C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1\mu F$, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)



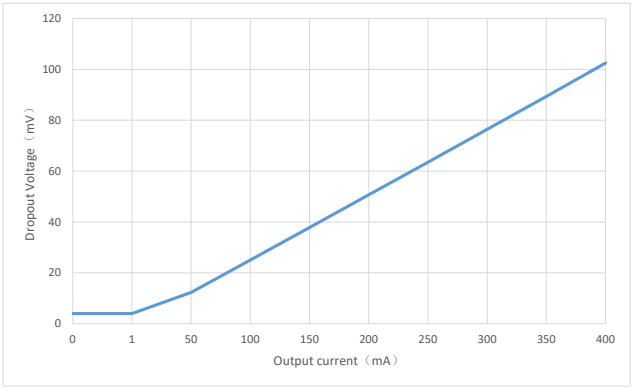
LDO1 Dropout Voltage VS Output Current



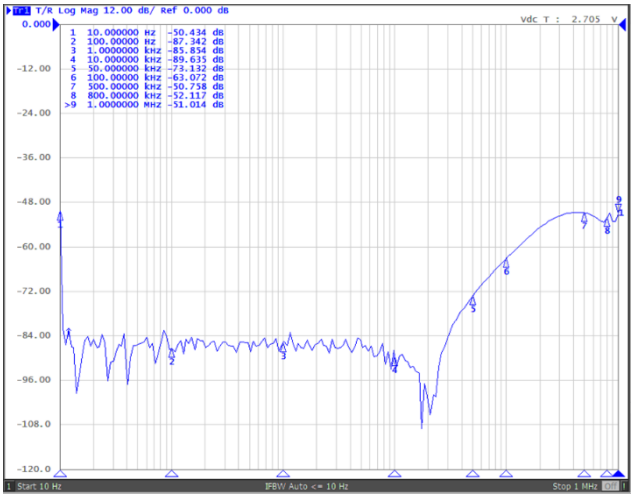
LDO2 Dropout Voltage VS Output Current



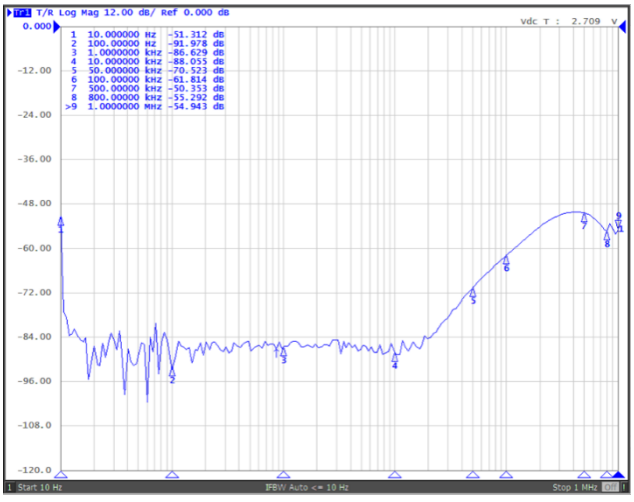
LDO3 Dropout Voltage VS Output Current



LDO4 Dropout Voltage VS Output Current



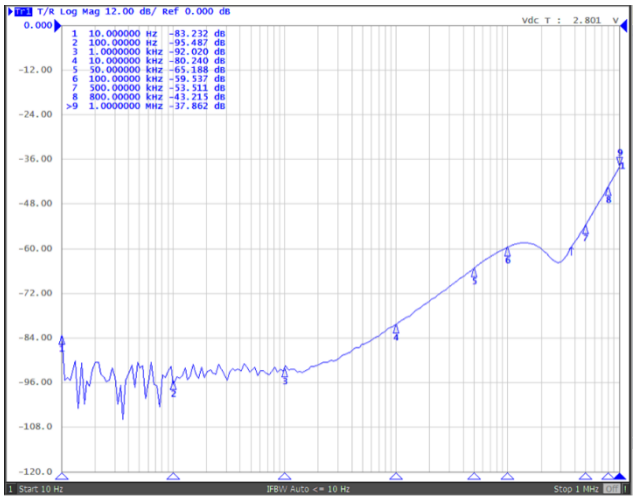
LDO1 PSRR



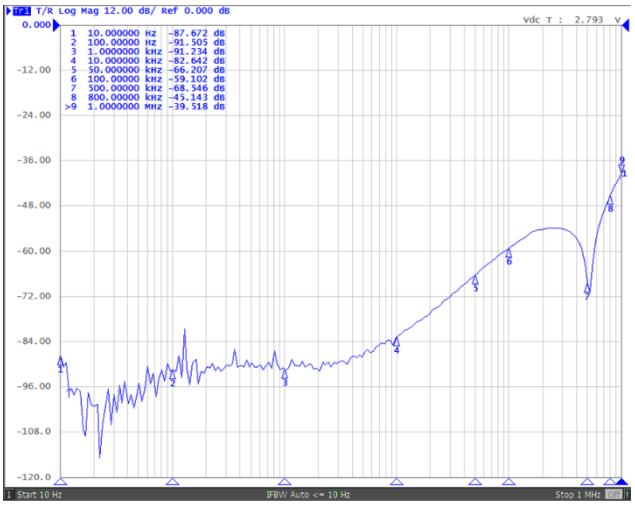
LDO2 PSRR

Typical Characteristics(Continued)

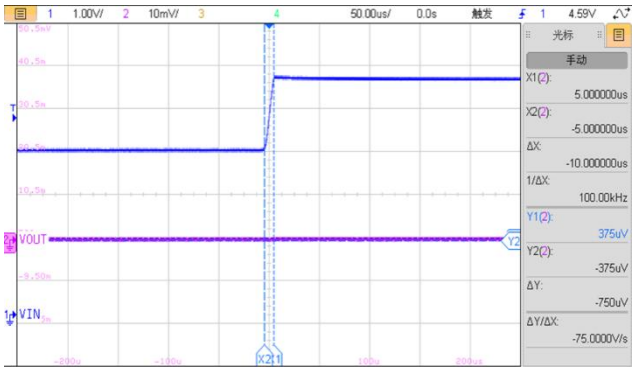
(Unless otherwise noted, $V_{VIN1}=V_{LDO1}+1V$, $V_{VIN2}=V_{LDO2}+1V$, $V_{VIN3}=V_{LDO3}+1V$, $V_{VIN4}=V_{LDO4}+1V$, $I_{OUT}=1mA$, $C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1\mu F$, $C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1\mu F$, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)



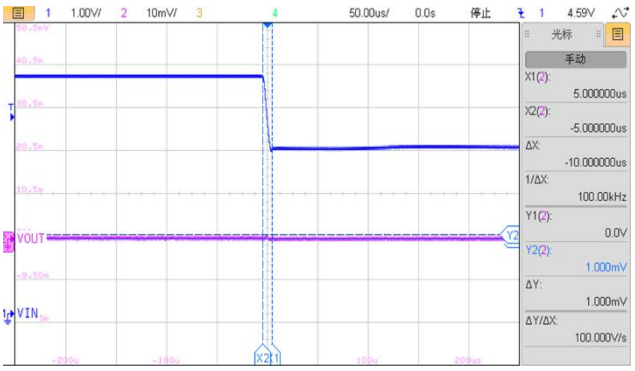
LDO3 PSRR



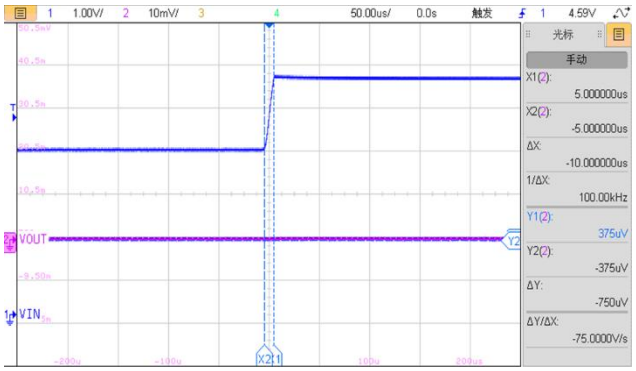
LDO4 PSRR



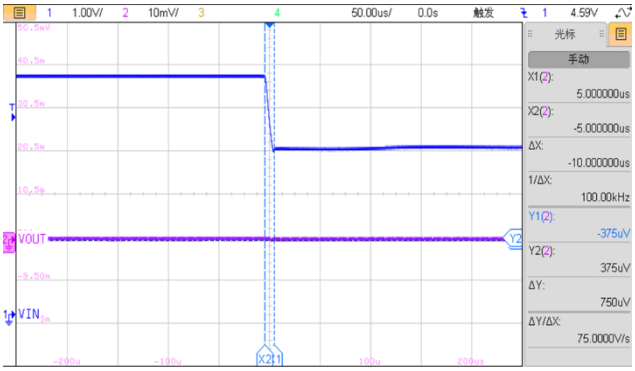
LDO1 V_{IN}=3.8V to 5.5V，I_{OUT}=1mA



LDO1 V_{IN}=5.5V to 3.8V，I_{OUT}=1mA



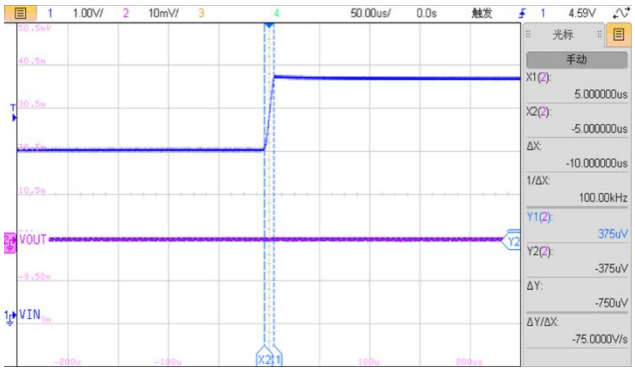
LDO2 V_{IN}=3.8V to 5.5V，I_{OUT}=1mA



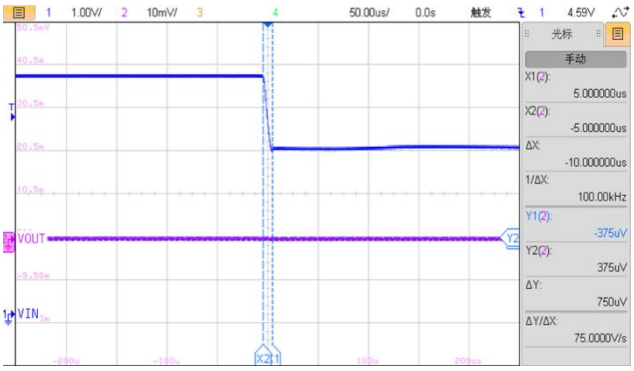
LDO2 V_{IN}=5.5V to 3.8V，I_{OUT}=1mA

Typical Characteristics(Continued)

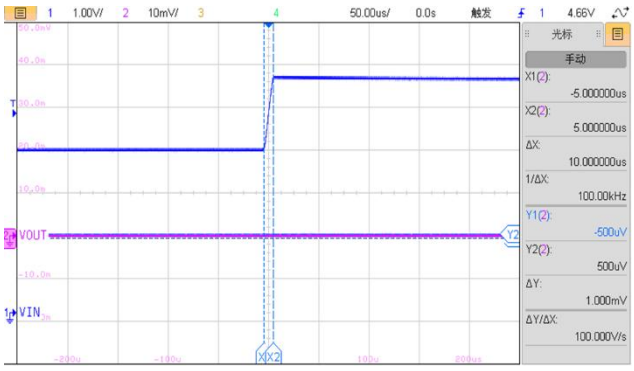
(Unless otherwise noted, $V_{VIN1}=V_{LDO1}+1V$, $V_{VIN2}=V_{LDO2}+1V$, $V_{VIN3}=V_{LDO3}+1V$, $V_{VIN4}=V_{LDO4}+1V$, $I_{OUT}=1mA$, $C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1\mu F$, $C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1\mu F$, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)



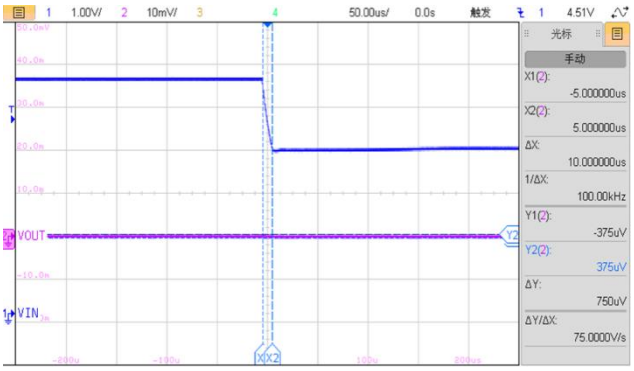
LDO3 V_{IN}=3.8V to 5.5V，I_{OUT}=1mA



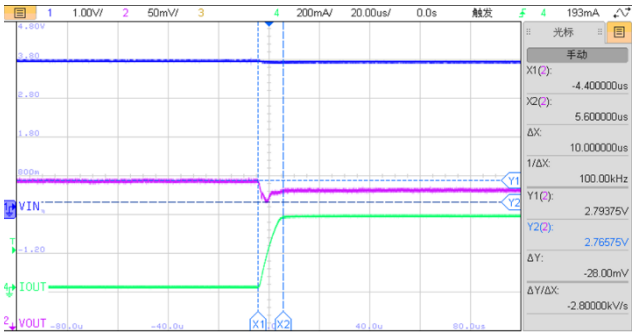
LDO3 V_{IN}=5.5V to 3.8V，I_{OUT}=1mA



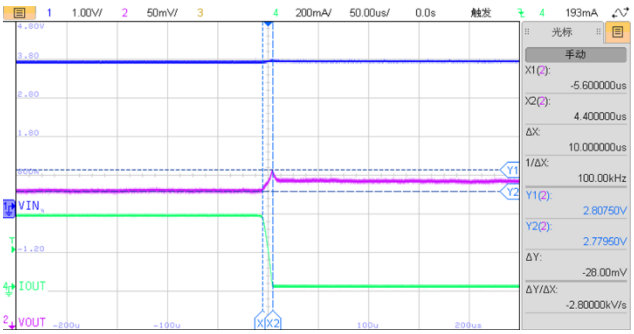
LDO4 V_{IN}=3.8V to 5.5V，I_{OUT}=1mA



LDO5 V_{IN}=5.5V to 3.8V，I_{OUT}=1mA



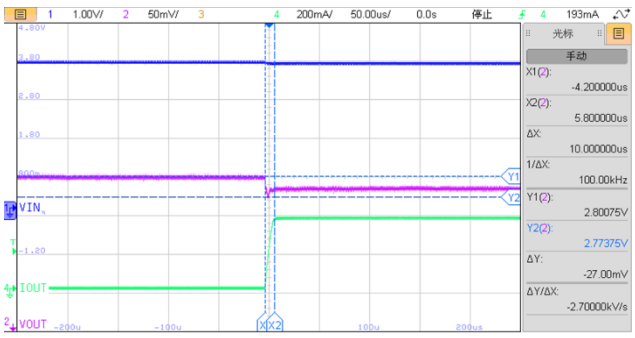
LDO1 V_{IN}=3.8V, I_{OUT}=1mA to 400mA



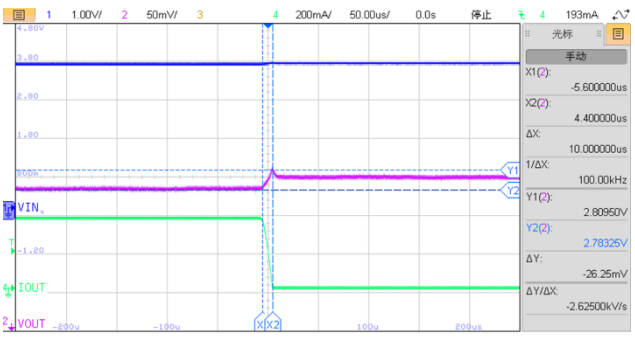
LDO1 V_{IN}=3.8V, I_{OUT}=400mA to 1mA

Typical Characteristics(Continued)

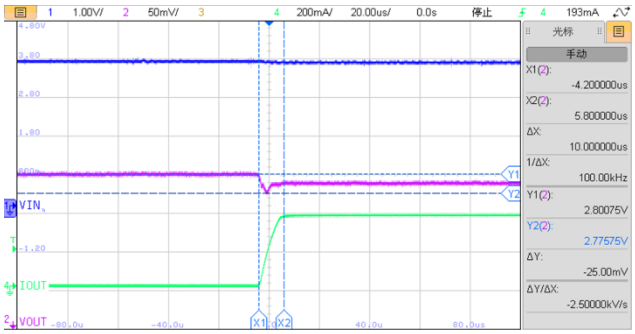
(Unless otherwise noted, $V_{VIN1}=V_{LDO1}+1V$, $V_{VIN2}=V_{LDO2}+1V$, $V_{VIN3}=V_{LDO3}+1V$, $V_{VIN4}=V_{LDO4}+1V$, $I_{OUT}=1mA$, $C_{VIN1}=C_{VIN2}=C_{VIN3}=C_{VIN4}=1\mu F$, $C_{LDO1}=C_{LDO2}=C_{LDO3}=C_{LDO4}=1\mu F$, T_A = -40°C~85°C. Typical values are at T_A=25 ºC)



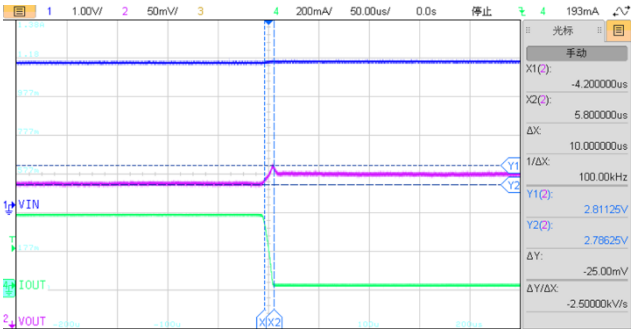
LDO2 V_{IN}=3.8V, I_{OUT}=1mA to 400mA



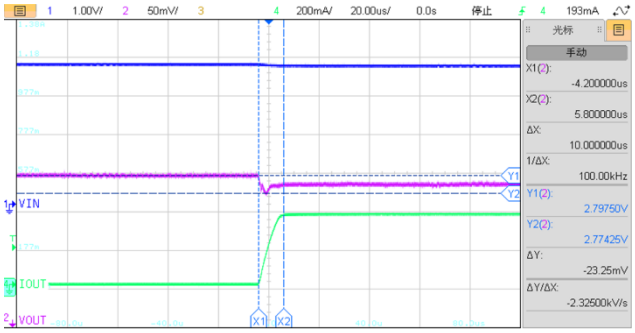
LDO2 V_{IN}=3.8V, I_{OUT}=400mA to 1mA



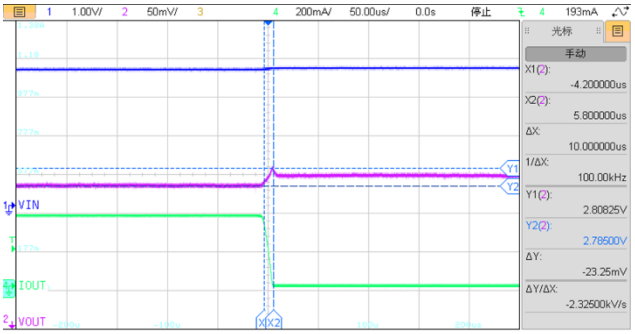
LDO3 V_{IN}=3.8V, I_{OUT}=1mA to 400mA



LDO3 V_{IN}=3.8V, I_{OUT}=400mA to 1mA



LDO4 V_{IN}=3.8V, I_{OUT}=1mA to 400mA



LDO4 V_{IN}=3.8V, I_{OUT}=400mA to 1mA

Application Circuits

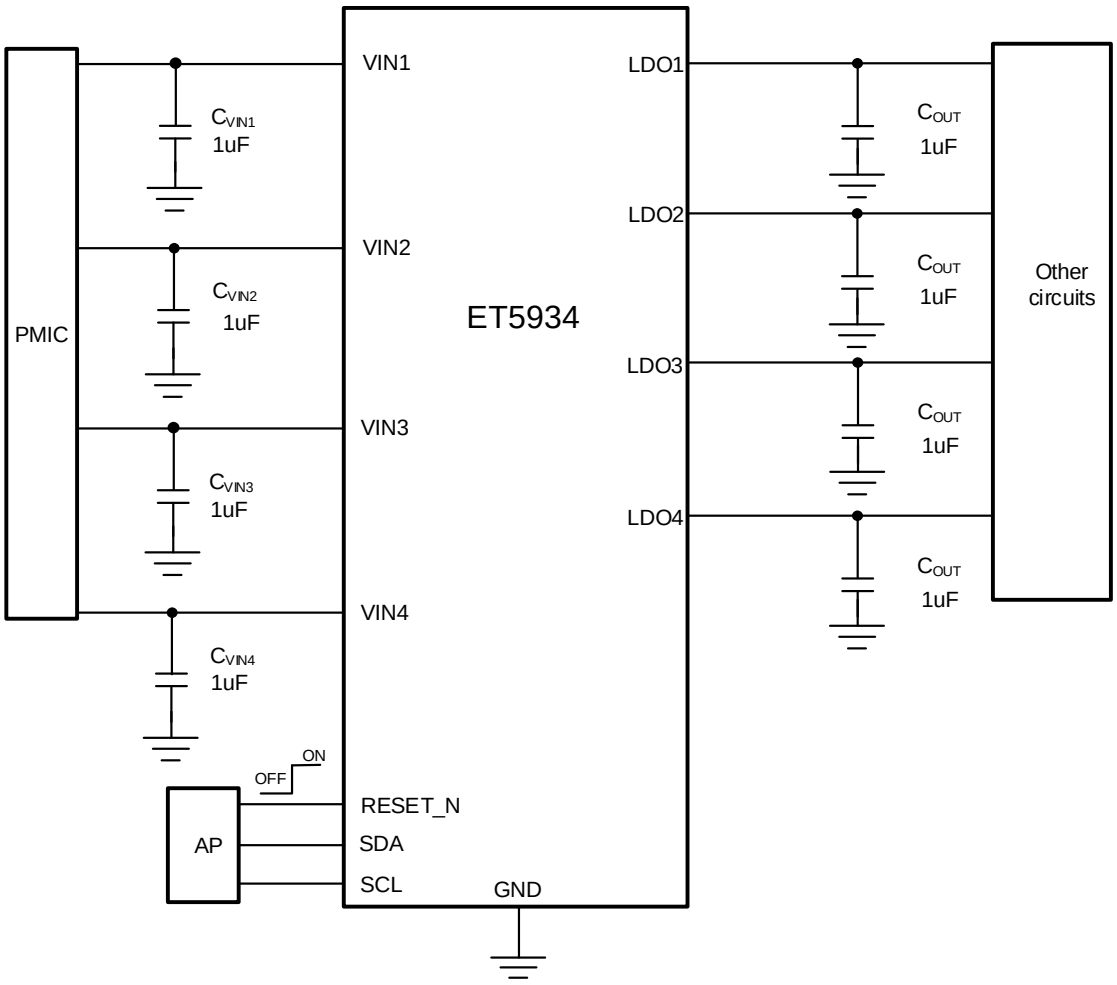


Figure 9. Application Circuit

Note6: Resistances (V_{VDD_IO}=1.2V, R_{PU}=1.8K; V_{VDD_IO}=1.8V, R_{PU}=2.7K) are need to connect from DC power supply (VDD_IO) to SDA and SCL.

Recommended PCB Layout

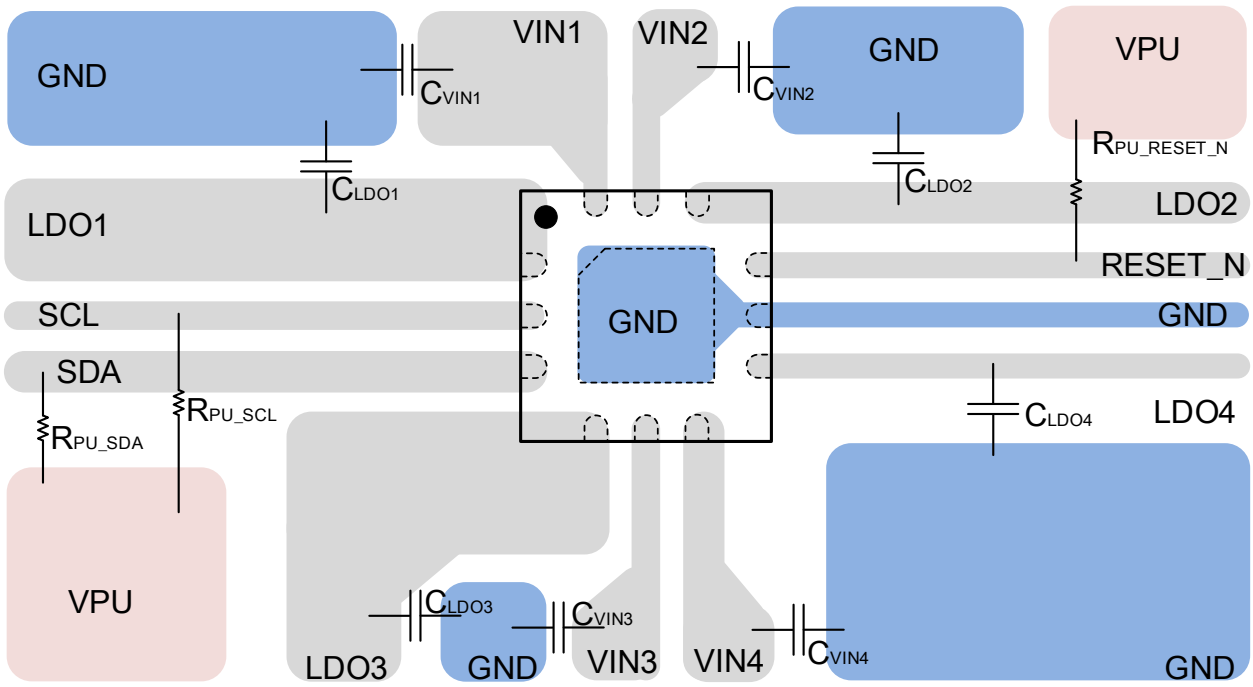
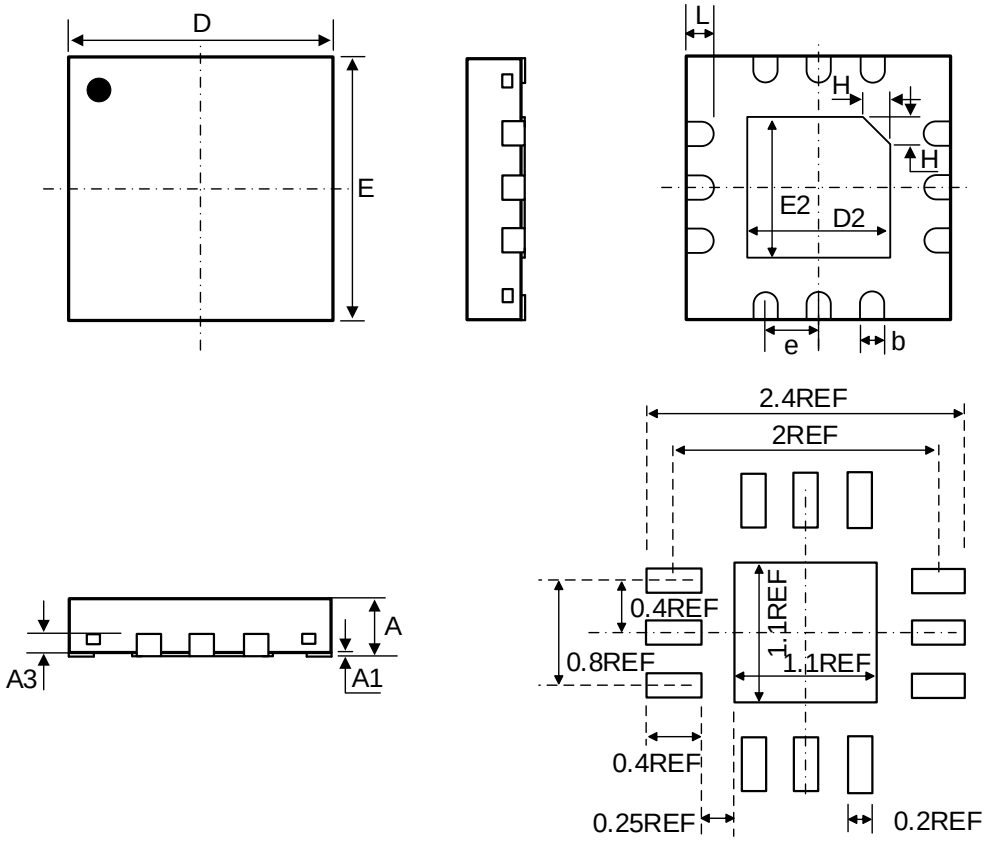


Figure 10. Recommended PCB Layout

Package Dimension

QFN12(2.0mm × 2.0mm)



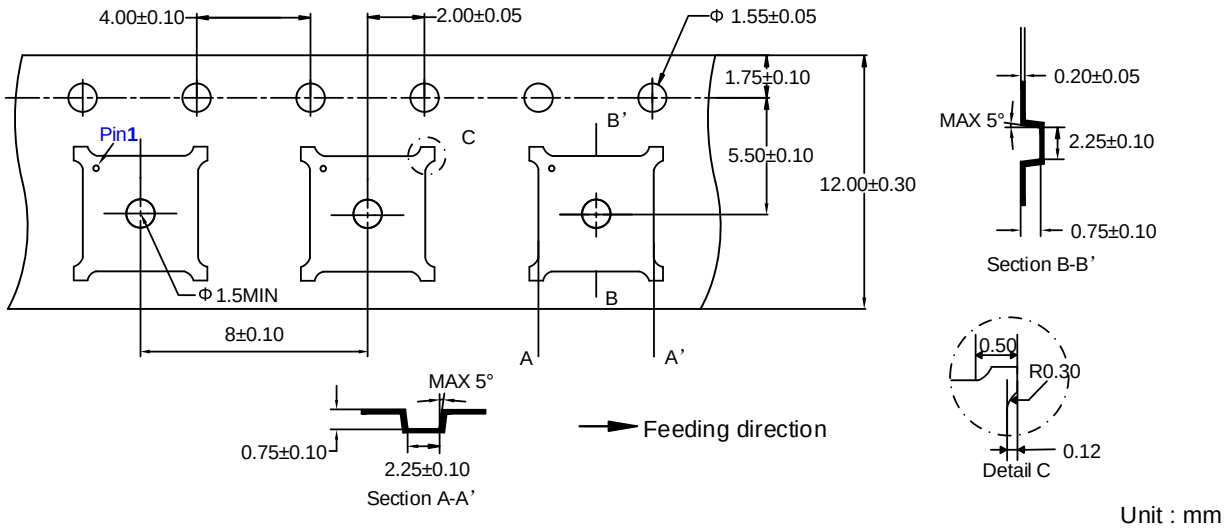
COMMON DIMENSIONS

(Unit: mm)

SYMBOL	MIN	NOM	MAX
A	0.40	0.45	0.50
A1	0.00	0.02	0.05
A3		0.152REF	
b	0.15	0.20	0.25
D	1.95	2.00	2.05
E	1.95	2.00	2.05
D2	1.00	1.10	1.20
E2	1.00	1.10	1.20
e	0.35	0.40	0.45
H		0.20REF	
L	0.15	0.20	0.25

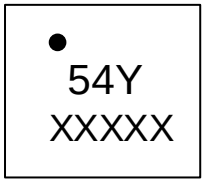
Tape Information

QFN12 (2.0mm × 2.0mm)



Unit : mm

Marking Information



54Y = Part Number

XXXXX = Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2026-04-10	Official Version	Ma Rui Jie	Yang Xiao Xu	Liu Jia Ying
1.1	2026-05-28	Update EC table	Ma Rui Jie	Yang Xiao Xu	Liu Jia Ying