DATA SHEET

凌陽科技
SUNPLUS

SPY0029A

Linear Regulator

Preliminary

OCT. 15, 2002

Version 0.2

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LINEAR REGULATOR

1. GENERAL DESCRIPTION

The SPY0029A is a voltage regulator IC with ultra-low quiescent current and low voltage detection by CMOS process. It operates to +7.0V input range and delivers up to 50mA.

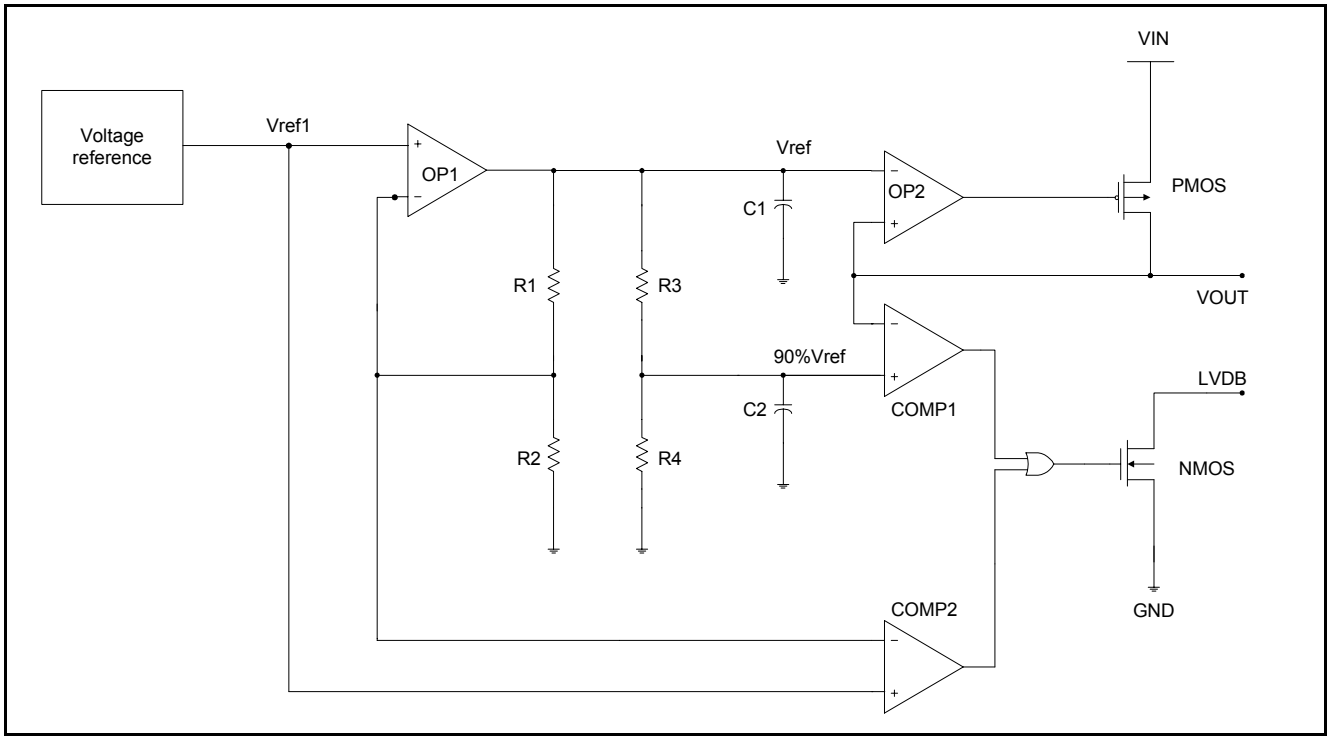
2. APPLICATION

- Battery-powered equipment
- Hand-held communication equipment
- Audio/Video system
- Toys

3. FEATURES

- Low Quiescent Current (Typ. 3μA @ V_{OUT} = 3.3V, V_{IN} = 5.0V)
- High Current Driving Capability
  (Typ. 50mA @ V_{OUT} = 3.3V, V_{IN} = 5.0V)
- Small Dropout Voltage (Typ. 40mV @ V_{OUT} = 3.3V, I_{OUT} = 1.0mA)
- Low Temperature-Drift Coefficient of Output Voltage
  (Typ. ±50ppm/^{0}C)
- Excellent Line Regulation (Typ. 0.15%/V)
- Bonding Options Output Voltage (2.55V, 2.7V, 3.0V, 3.3V)
- High Accuracy Output Voltage (±5%)
- Low Voltage Detection.
  (A. Overload detection, B. Low battery detection)
- 3 pin and 4 pin Types of Package or Dice Form

4. BLOCK DIAGRAM



5. SIGNAL DESCRIPTIONS

5.1. 4 PIN (SOT-92)

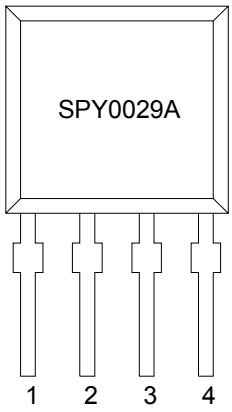
Mnemonic	PIN No.	Type	Description
GND	1	G	Chip Ground
VIN	2	I	Input Voltage.
VOUT	3	O	Output Regulated Voltage.
LVDB	4	O	Low voltage detection, Low activity

5.2. 3 PIN (SOT-89)

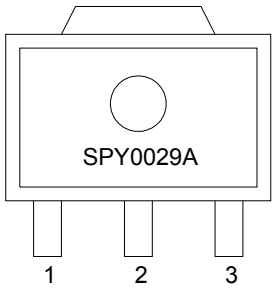
Mnemonic	PIN No.	Type	Description
GND	1	G	Chip Ground
VIN	2	I	Input Voltage.
VOUT	3	O	Output Regulated Voltage.

5.3. PIN Configuration

SOT-92



SOT-89



6. ELECTRICAL SPECIFICATIONS

6.1. Absolute Maximum Ratings

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	+7.0V	V
Output Voltage	V_{OUT}	-0.3 ~ (V_{IN} + 0.3)	V
Operating Temperature	T_{OPT}	0 - 70	℃
Storage Temperature	T_{STG}	-40 - 125	℃

Note: Stresses beyond those given in the Absolute Maximum Rating table may cause operational errors or damage to the device. For normal operational conditions see Electrical Characteristic

6.2. DC Characteristic

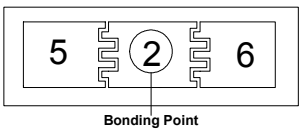
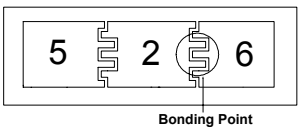
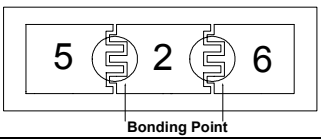
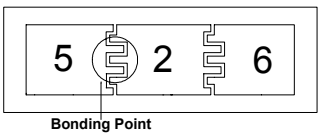
(V_{OUT} (target) = 3.3V / 3.0V / 2.7V / 2.55V, Typical values are at T_{OPT} = 25ºC)

Item	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	V_{IN} = 5.0V, 10μA≦ I_{OUT} ≦10mA , V_{OUT} = 3.3V	$\frac{Vout - Vout(target)}{Vout(target)}$	-5.0	-	5.0	%
Output Current	V_{IN} = 5.0V , V_{OUT} = 3.3V	I_{OUT}	35	50	-	mA
Load Regulation	V_{IN} = 5.0V, 1mA ≦ I_{OUT} ≦ 50mA , V_{OUT}=3.3V	$\triangle V_{OUT}$	-	40	60	mV
Dropout Voltage	I_{OUT} = 1mA, Vin = V_{OUT} (normal), V_{DIF} = V_{IN} - V_{OUT} , V_{OUT} = 3.3V	V_{DIF}	-	40	60	mV
Quiescent Current	V_{IN} = 5.0V , V_{OUT} = 3.3V	I_{SS}	-	3.0	6.0	μA
Line Regulation	I_{OUT} = 1mA, V_{OUT} + 0.5V ≦ V_{IN} ≦ 7.0V , V_{OUT} = 3.3V	$\frac{\Delta Vout}{\Delta Vin \times Vout}$	-	0.15	-	%/V
Input Voltage	V_{OUT} = 3.3V	V_{IN}	-	-	7.0	V
Temperature Coefficient	I_{OUT} = 10mA, 0°C ≦ T_{OPT} ≦ 70°C , V_{OUT} = 3.3V	$\frac{\Delta Vout}{\Delta T}$	-	±50	-	ppm/℃
Low Voltage Detection Threshold	(A) $1-\frac{Vout}{Vout(Normal)}$, V_{OUT} = 3.3V	V_{DET}	5.0	10	15	%
	(B) △V = V_{OUT} (Normal) - V_{IN} , V_{OUT} = 3.3V	△V	-	±60	-	mV
LVDB Output Voltage Low (Open Nmos Drain)	I_{SINK} = 1mA , V_{OUT} = 3.3V	VO_L	-	-	0.4	V

Note: V_{OUT} (normal) @ V_{IN} = 5.0V, I_{OUT} = 1mA , Vout = 3.3V , T_{OPT} = 25 °C

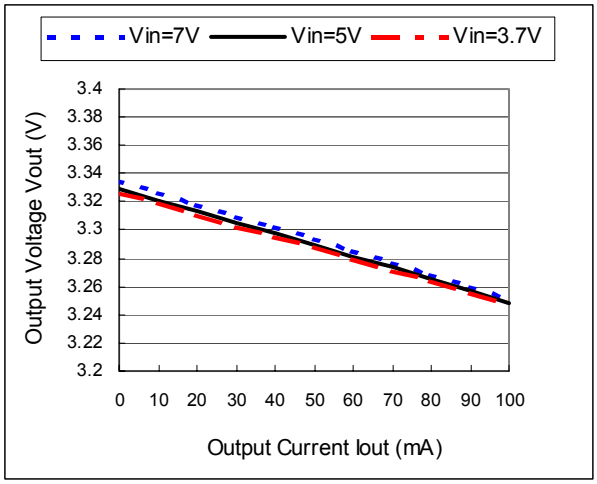
6.3. Bonding Option (several output voltage)

Option	Output voltage	Power source bonding PAD no.
1	3.3V	2 (note1)
2	3.0V	2 & 6 (note 2)
3	2.7V	2 & 5 & 6 (note 3)
4	2.55V	2 & 5 (note 4)

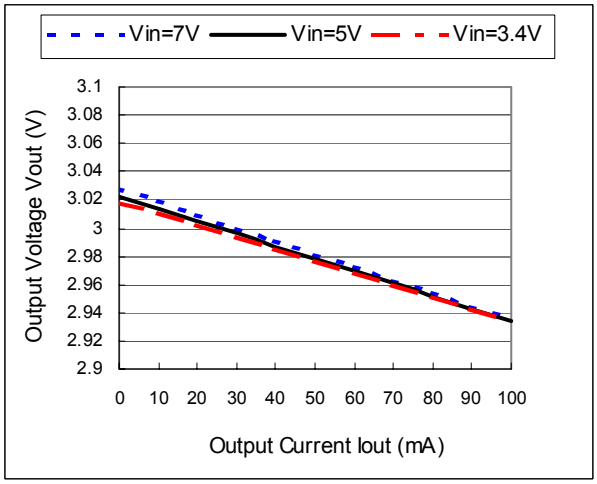
Note 1	Note 2	Note 3	Note 4
			

6.4. Typical Operating Characteristics

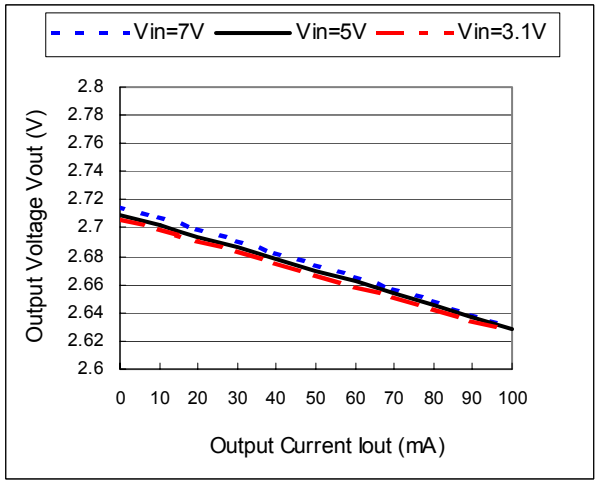
6.4.1. Output voltage vs. output current (Vout = 3.3V)



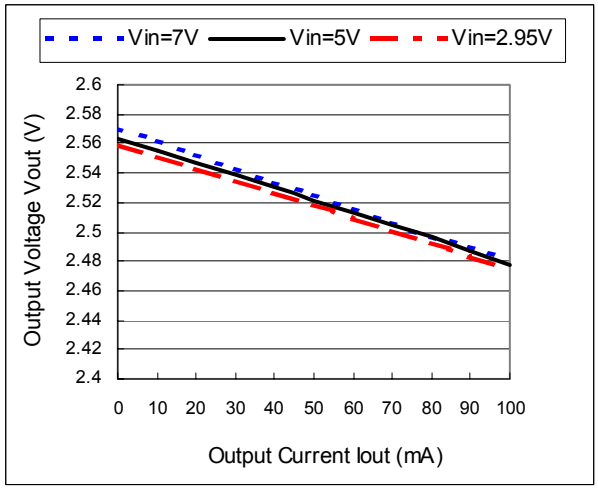
6.4.2. Output voltage vs. output current (Vout = 3.0V)



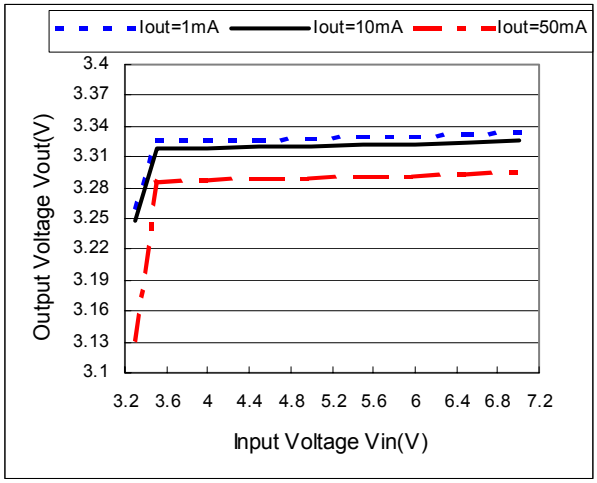
6.4.3. Output voltage vs. output current (Vout = 2.7V)



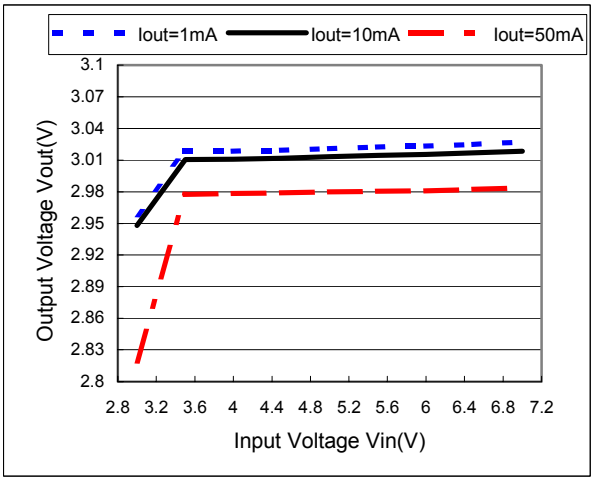
6.4.4. Output voltage vs. output current (Vout = 2.55V)



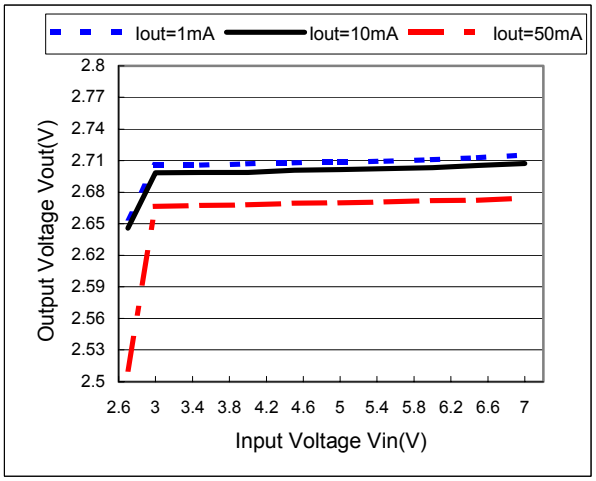
6.4.5. Output voltage vs. input voltage (Vout = 3.3V)



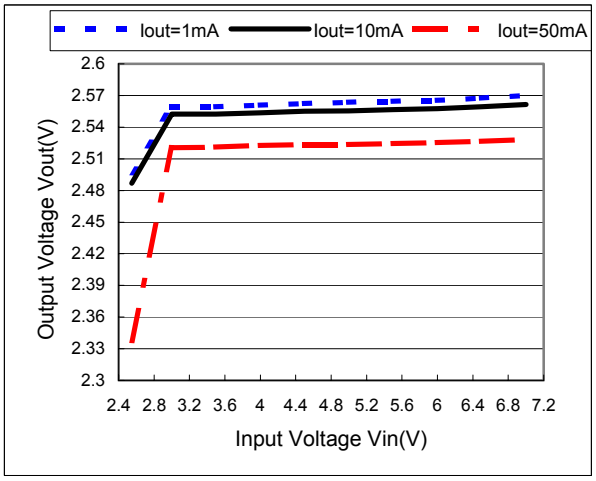
6.4.6. Output voltage vs. input voltage (Vout = 3.0V)



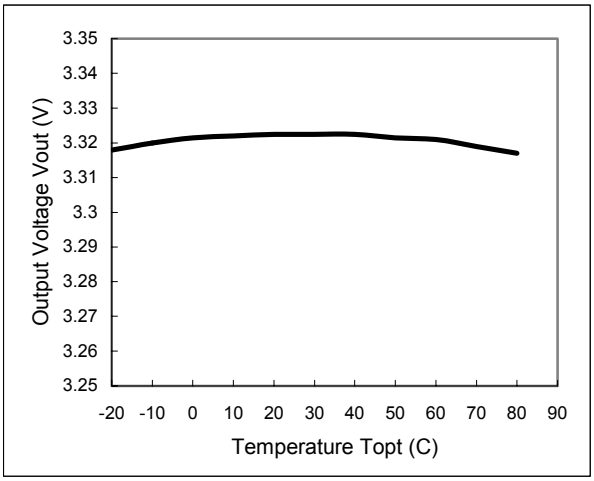
6.4.7. Output voltage vs. input voltage (Vout = 2.7V)



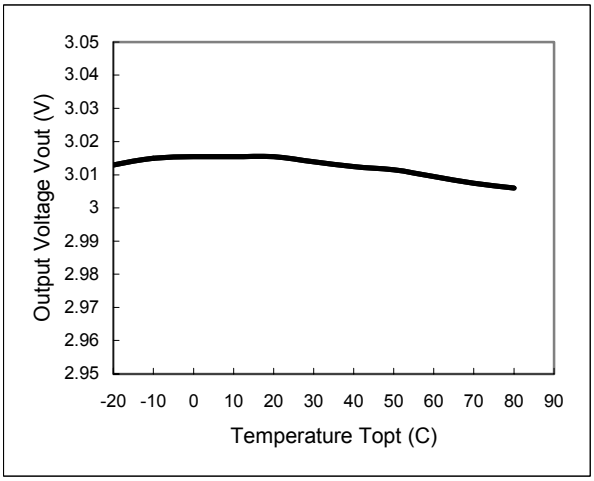
6.4.8. Output voltage vs. input voltage (Vout = 2.55V)



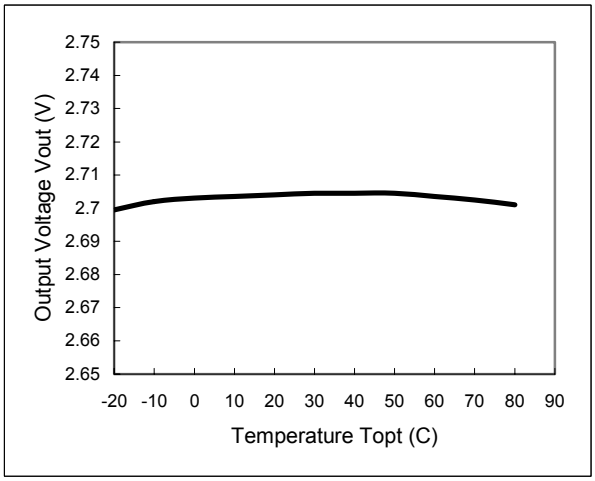
6.4.9. Output voltage vs. temperature (Vout = 3.3V)



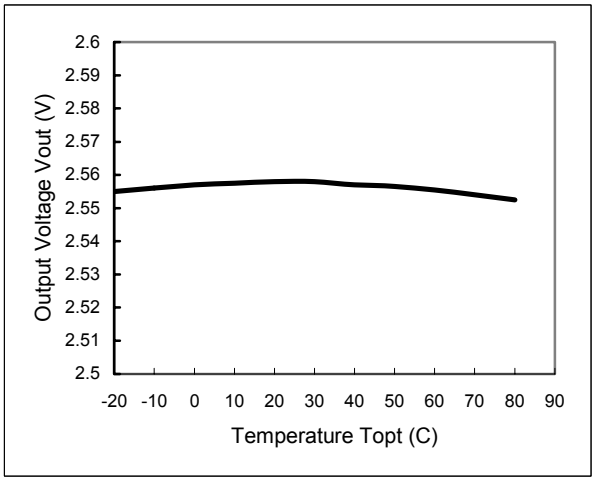
6.4.10. Output voltage vs. temperature (Vout = 3.0V)



6.4.11. Output voltage vs. temperature (Vout = 2.7V)

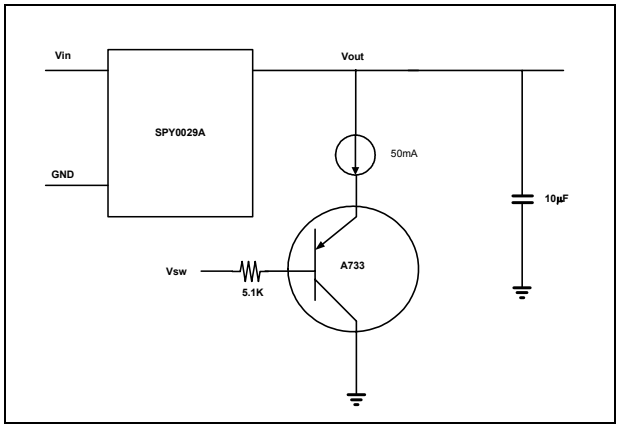


6.4.12. Output voltage vs. Temperature (Vout = 2.55V)

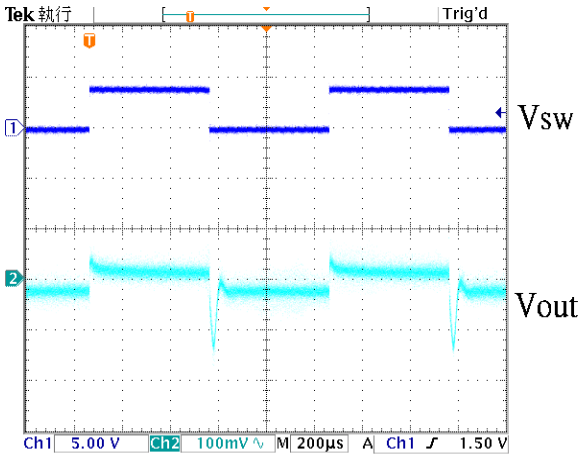


6.4.13. Load –transient response test module

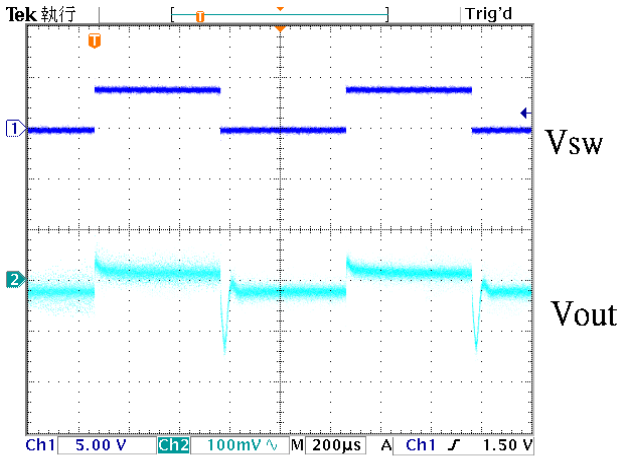
(V_{IN} = 5V, I_{OUT} = 0 to 50mA, C_{LOAD} = 10µF)



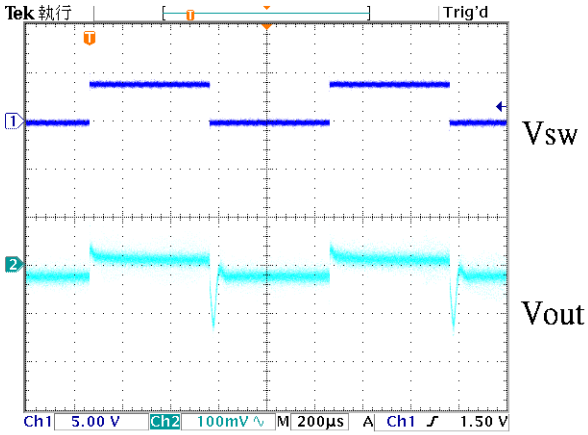
6.4.14. Load –transient response; Vout = 3.3V



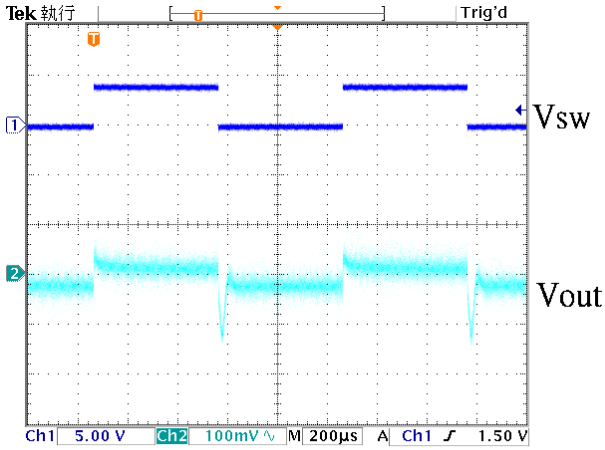
6.4.15. Load –transient response; Vout = 3.0V



6.4.16. Load –transient response; Vout = 2.7V

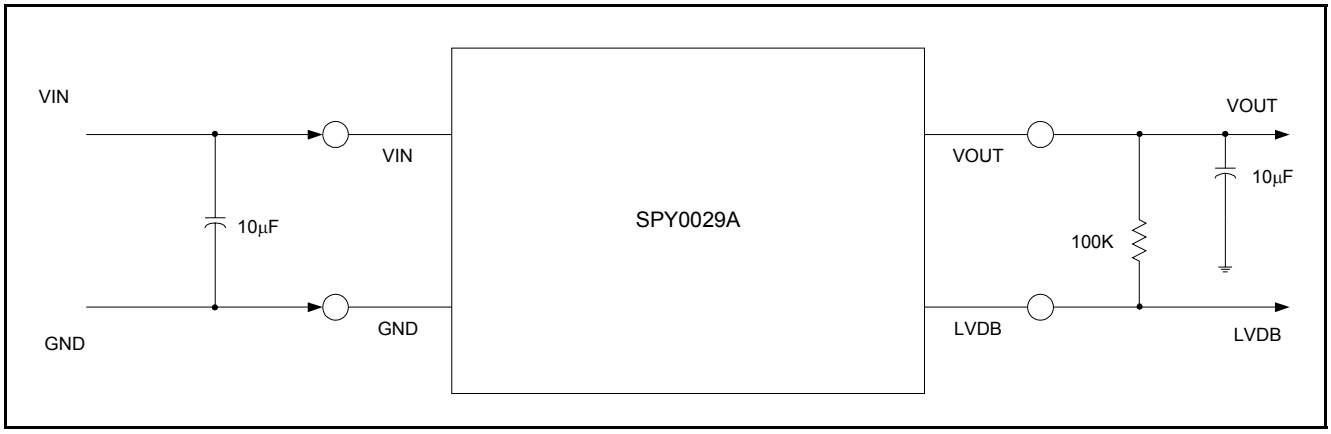


6.4.17. Load –transient response; Vout = 2.55V

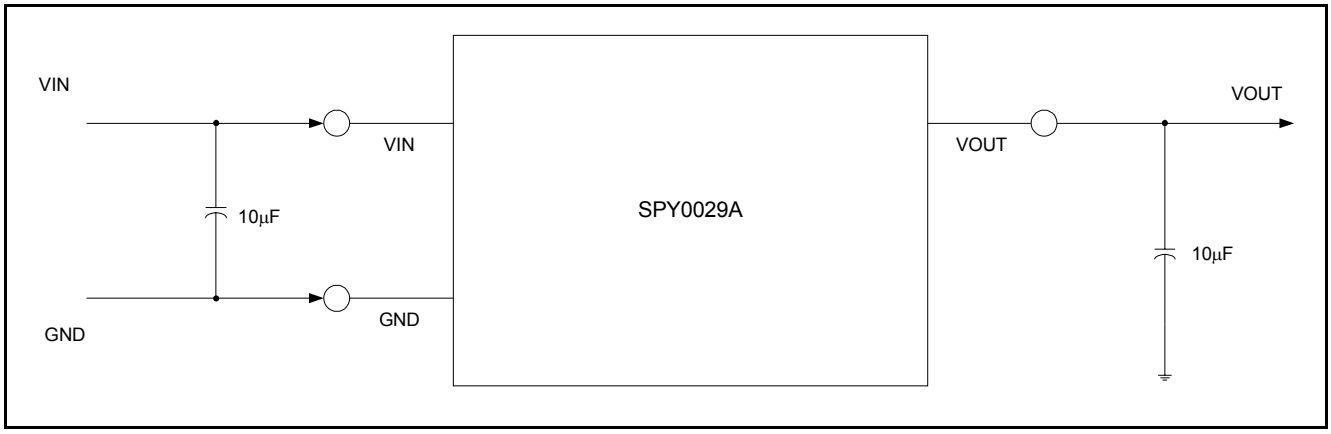


6. APPLICATION CIRCUIT

6.1. 4 PIN (with Low Voltage Detected Function)

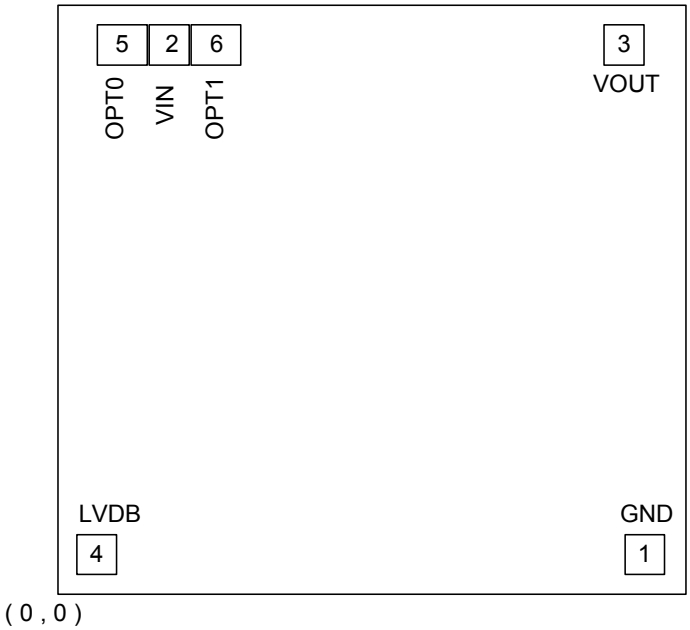


6.2. 3 PIN (no Low Voltage Detected Function)



7. PACKAGE/PAD LOCATIONS

7.1. PAD Assignment



Chip Size: 1050μm × 1180μm

This IC substrate should be connected to VSS

Note1: Chip size included scribe line.

Note2: To ensure that the IC functions properly, please bond all of VDD and VSS pins.

Note3: The 0.1μF capacitor between VDD and VSS should be placed to IC as close as possible.

7.2. Ordering Information

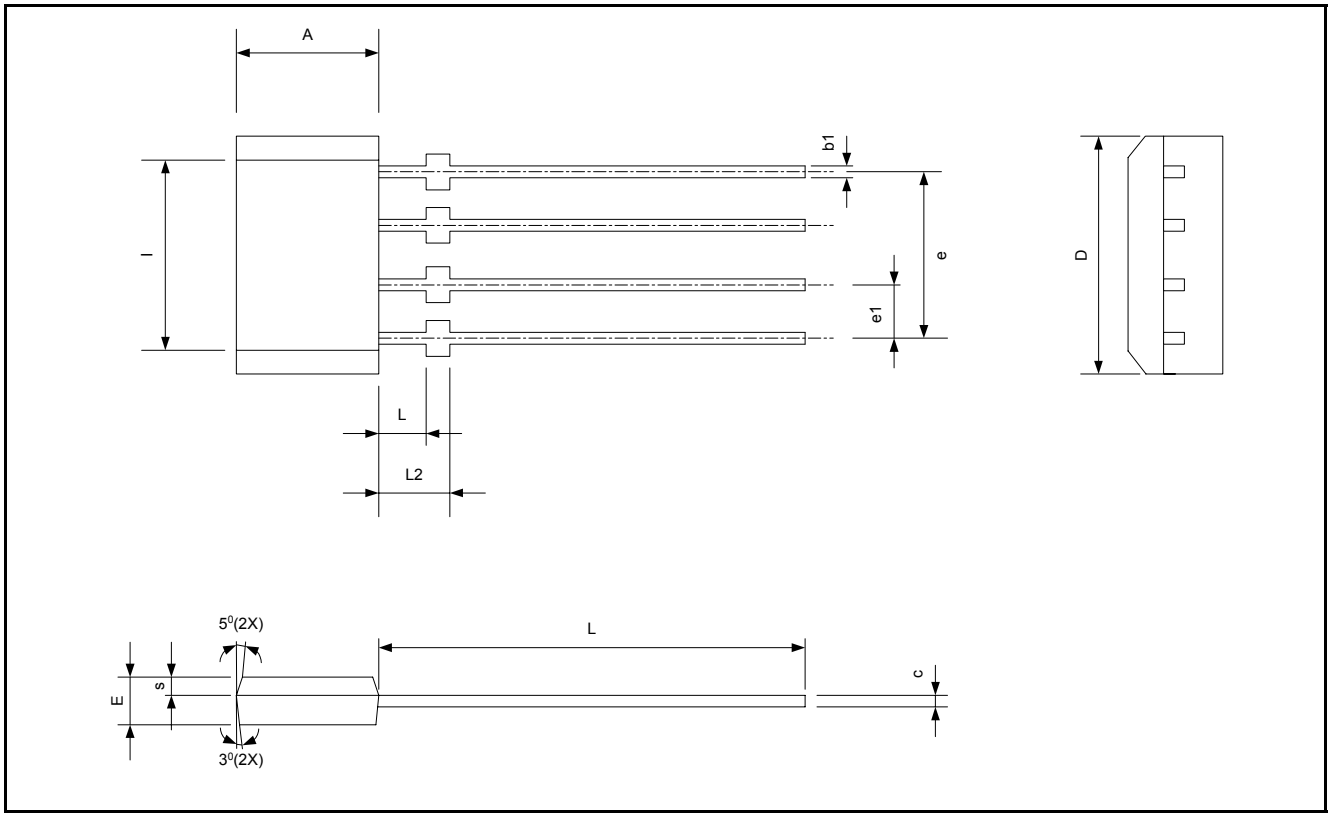
Product Number	Package Type
SPY0029A-C	Chip form
SPY0029A-PE01	Package form - SOT89
SPY0029A-PE02	Package form - SOT92

7.3. PAD Locations

PAD No.	PAD Name	X	Y
1	GND	821	110
2	VIN	363	972
3	VOUT	770	972
4	LVDB	153	105
5	OPT0	153	972
6	OPT1	573	972

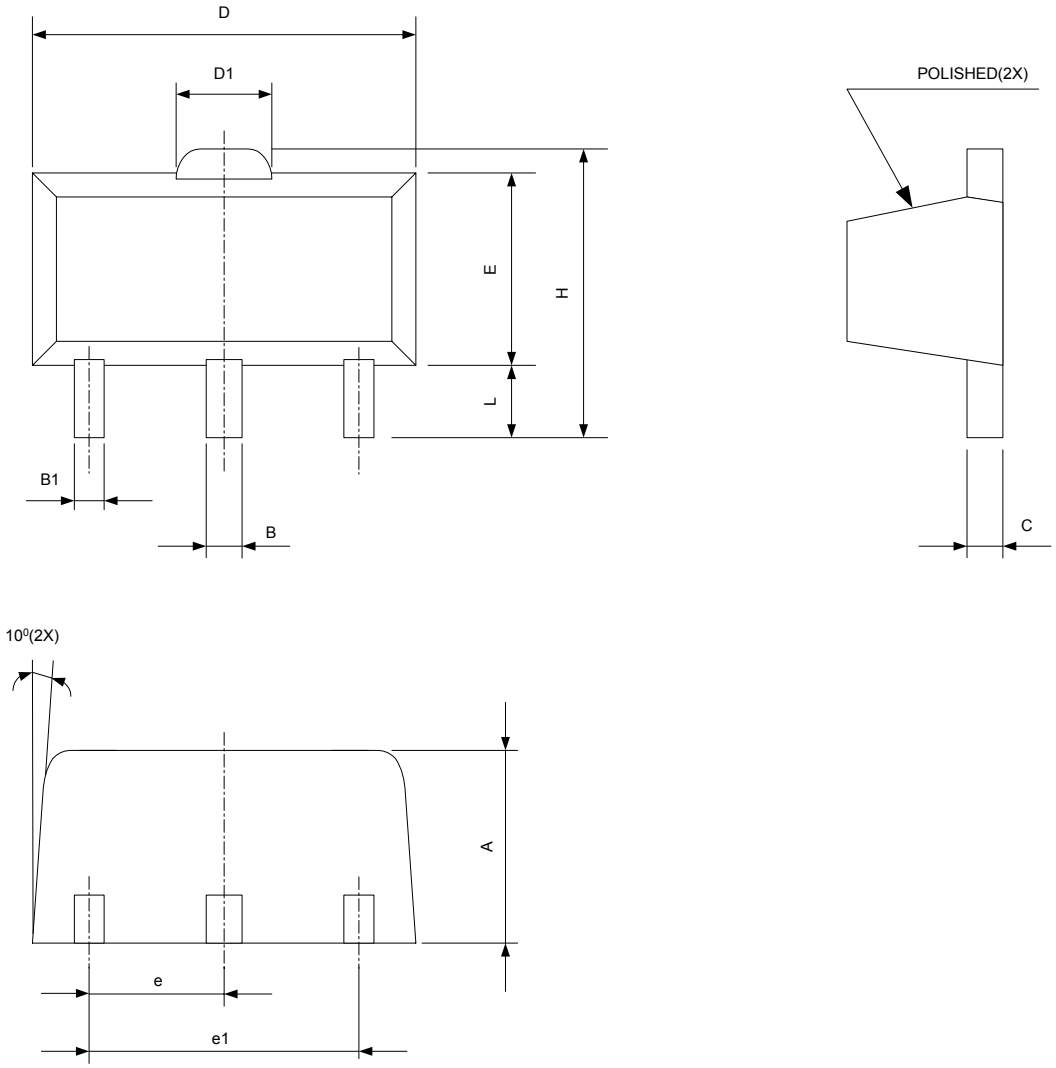
7.4. Package Information

7.4.1. 4 PIN SOT92 package size



Symbol	Min.	Nom.	Max.	Unit
A	3.60	3.65	3.70	Millimeter
b1	0.35	0.38	0.41	Millimeter
c	0.351	0.381	0.411	Millimeter
D	5.17	5.22	5.27	Millimeter
e	3.78	3.81	3.84	Millimeter
e1	1.24	1.27	1.30	Millimeter
E	1.50	1.55	1.60	Millimeter
I	4.04	4.20	4.34	Millimeter
L	13.8	14.3	14.8	Millimeter
L1	0.814	0.914	1.014	Millimeter
L2	1.342	1.442	1.542	Millimeter
s	0.70	0.73	0.76	Millimeter

7.4.2. 3 PIN SOT89 package size



Symbol	Min.	Max.	Unit
A	1.40	1.60	Millimeter
B	0.44	0.56	Millimeter
B1	0.36	0.48	Millimeter
C	0.35	0.44	Millimeter
D	4.40	4.60	Millimeter
D1	1.35	1.83	Millimeter
E	2.29	2.60	Millimeter
H	3.94	4.25	Millimeter
e	1.50 BSC		Millimeter
e1	3.00 BSC		Millimeter
L	0.89	1.2	Millimeter

9. DISCLAIMER

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10. REVISION HISTORY

Date	Revision #	Description	Page
JUL. 10, 2002	0.1	Original	12
OCT.15, 2002	0.2	1. Update quiescent current = 3.0μA in Features	3
		2. Update quiescent current = 3.0μA in DC characteristic	5
		3. Add V_{OUT} = 3.3V into test conditions of DC characteristic	5
		4. Add Note1 figure into bonding option	5
		5. Add typical operating characteristic figures from page 6 to page 9 (6.4.1 ~ 6.4.17)	6