DATA SHEET

SUNPLUS

SPY0029A

Linear Regulator

Preliminary

APR. 15, 2005

Version 0.6

Table of Contents

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 100mA.

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. 100mA @ 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 (±10%)
- Low Voltage Detection.
  (A. Overload detection, B. Low battery detection)
- 3 pin Types of Package or Dice Form

4. BLOCK DIAGRAM

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SPY0029A
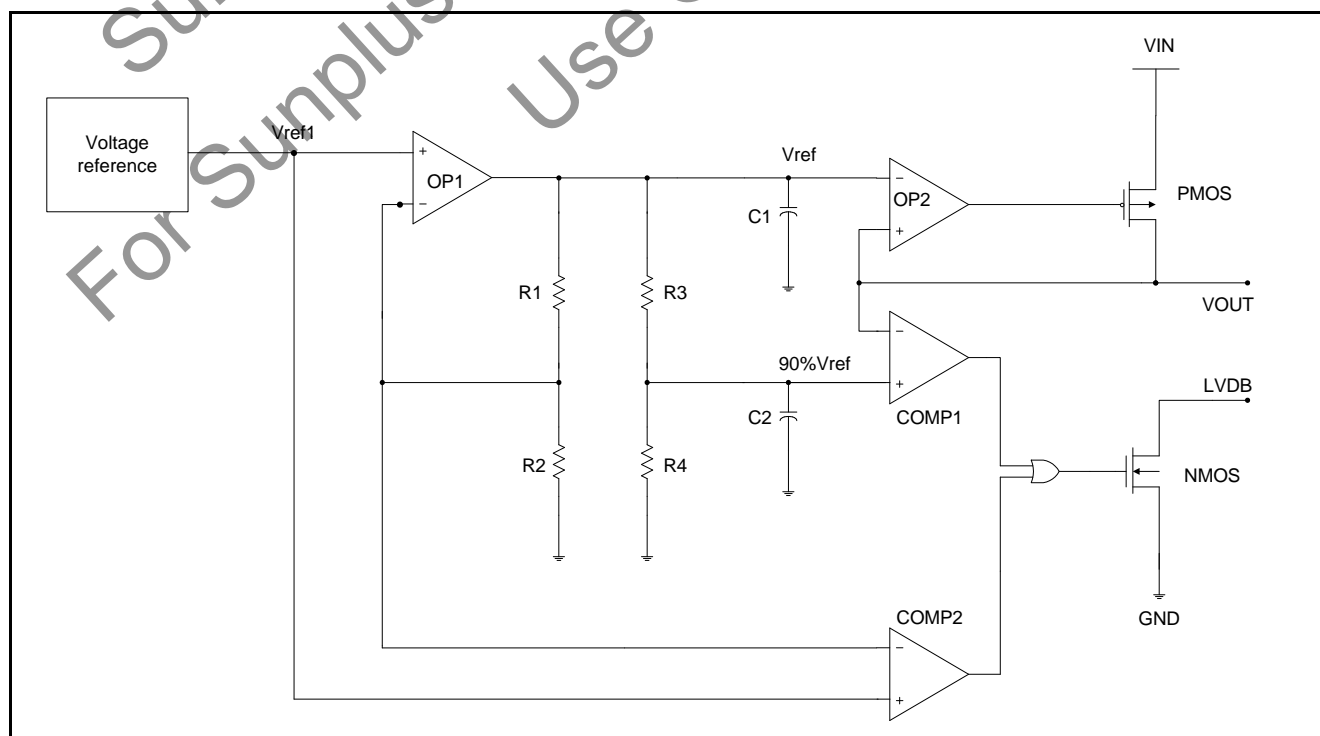
5. SIGNAL DESCRIPTIONS

5.1. 4 PIN only for chip on board (COB)

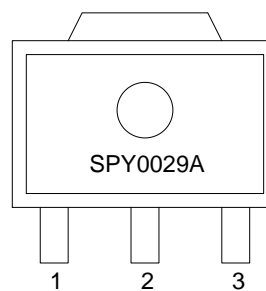| Mnemonic	PIN No.	Type	Description
LVDB	1	O	Low voltage detection, Low activity
GND	2	G	Chip Ground
VOUT	3	O	Output Regulated Voltage.
VIN	4	I	Input Voltage.

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

Customize COB-4pin
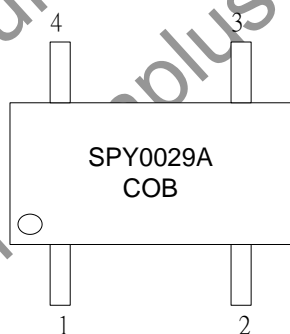
SOT-89

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	℃
Power Consumption (#)	P_{WATT}	500	mW

Note1: Stresses beyond those given in the "Absolute Maximum Ratings" table may cause operational errors or damage to the device. For normal operational conditions see Electrical Characteristic

Note2: (#) applied to SOT-89 package

Note3: For bonding-wire current density & package power dissipation issues, we do not suggest that the power consumption exceed "Absolute Maximum Ratings"; it may cause device damage or affect device reliability

6.2. DC Characteristic

(V_{OUT} (target) = 3.3V / 3.0V / 2.7V / 2.55V, Typical values are at T_{OPT} = 25ºC)
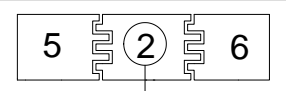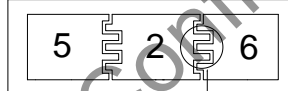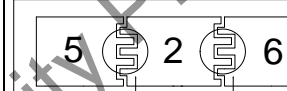
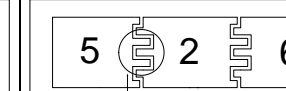| Item	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	V_{IN} = 5.0V, $10\mu A \leqq I_{OUT} \leqq 10mA$, V_{OUT} = 3.3V	$\dfrac{Vout - Vout(target)}{Vout(target)}$	-10.0	-	10.0	%
Output Current	V_{IN} = 5.0V , V_{OUT} = 3.3V	I_{OUT}	50	100	-	mA
Load Regulation	V_{IN} = 5.0V, $1mA \leqq I_{OUT} \leqq 50mA$, 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, $V_{OUT} + 0.5V \leqq V_{IN} \leqq 7.0V$, V_{OUT} = 3.3V	$\dfrac{\Delta Vout}{\Delta Vin \times Vout}$	-	0.15	-	%/V
Input Voltage	V_{OUT} = 3.3V	V_{IN}	-	-	7.0	V
Temperature Coefficient	I_{OUT} = 10mA, $0^{O}C \leqq T_{OPT} \leqq 70^{O}C$, V_{OUT} = 3.3V	$\dfrac{\Delta Vout}{\Delta T}$	-	±50	-	ppm/℃
Low Voltage Detection Threshold	(A) $1 - \dfrac{Vout}{Vout(Normal)}$, V_{OUT} = 3.3V	V_{DET}	5.0	10	15	%
	(B) $\triangle V = V_{OUT}$ (Normal) - V_{IN} , V_{OUT} = 3.3V	$\triangle V$	-	±60	-	mV
LVDB Output Voltage Low (Open Nmos Drain)	I_{SINK} = 1mA , V_{OUT} = 3.3V	VO_L	-	-	0.4	V

Note1: V_{OUT} (normal) @ V_{IN} = 5.0V, I_{OUT} = 1mA , Vout = 3.3V , T_{OPT} = 25 ^{O}C

**Note2:** Pwatt = ($V_{IN} - V_{OUT}$)* I_{OUT} ; SOT-89 package maximum power dissipation is 500mW for SPY0029

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6.3. Bonding Option (several output voltage)

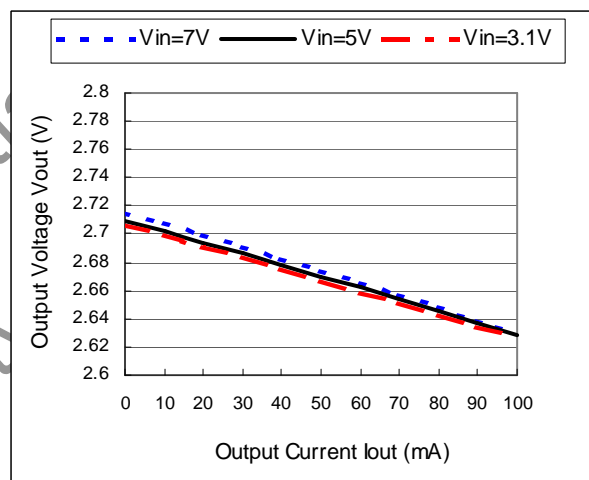| Option	Output voltage	Power source bonding PAD no.
1	3.3V	2 (note1)
2	3.0V	2 & 6 (note 2)
3	2.7V	2 & 5 & 6 (note 3)
4	2.55V	2 & 5 (note 4)

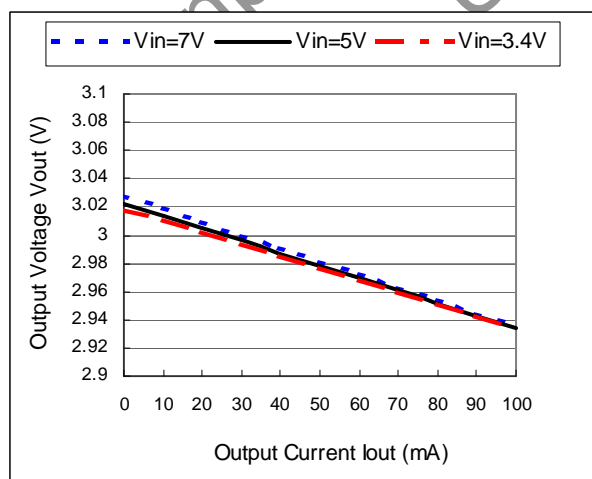| Note 1	Note 2	Note 3	Note 4
5 (2) 6	5 2 6	5 2 6	5 2 6
Bonding Point	Bonding Point	Bonding Point	Bonding Point

6.4. Typical Operating Characteristics
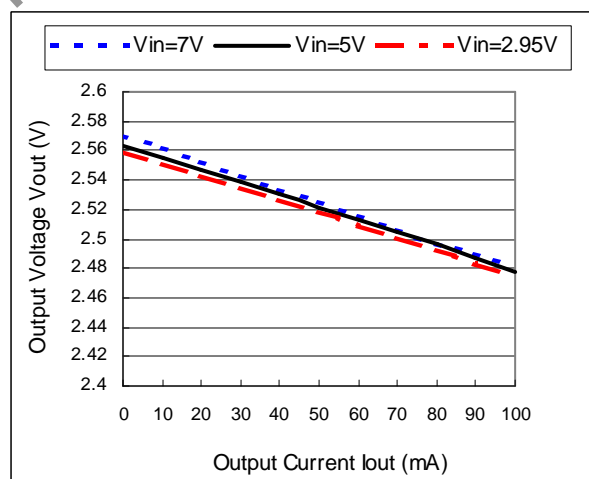
6.4.1. Output voltage vs. output current (Vout = 3.3V)
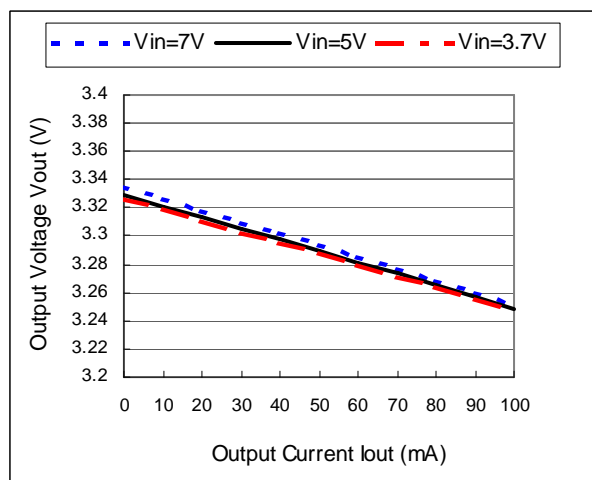
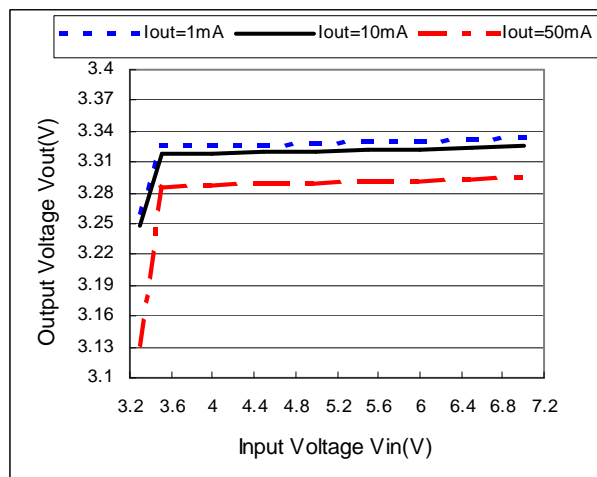
6.4.3. Output voltage vs. output current (Vout = 2.7V)

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

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

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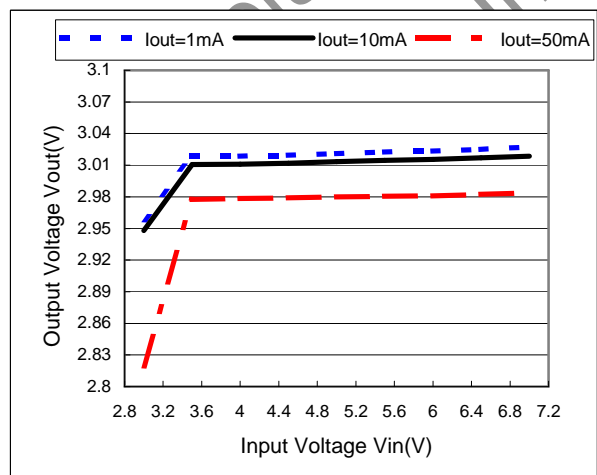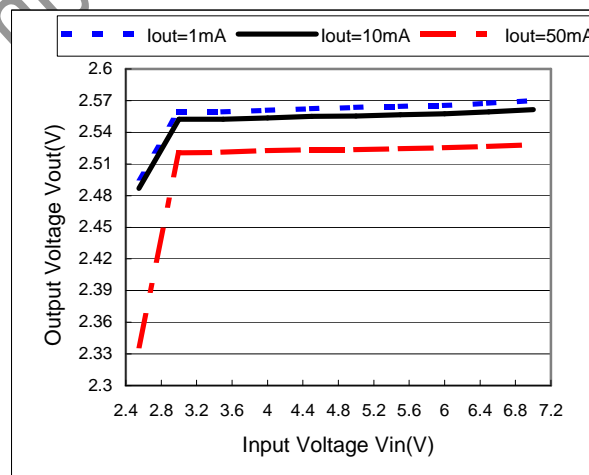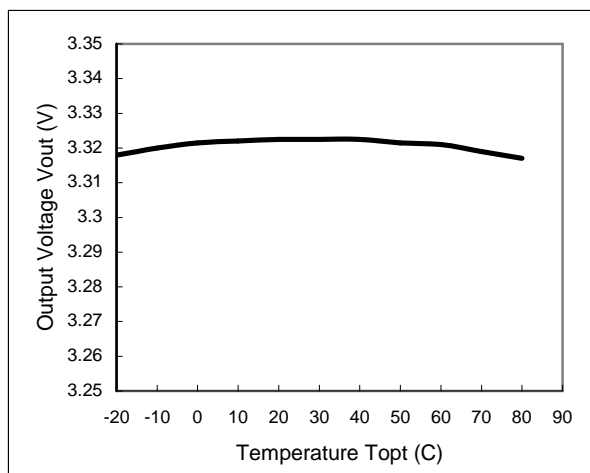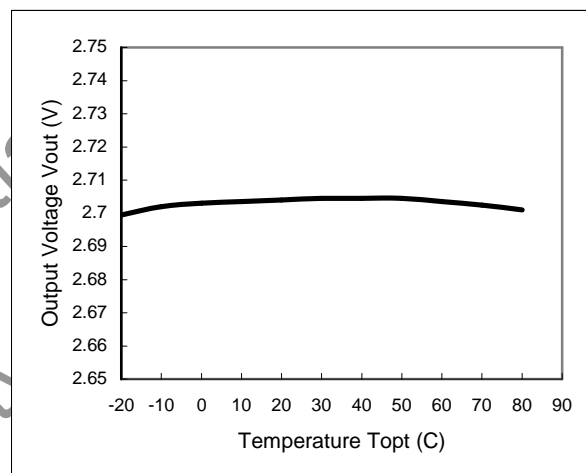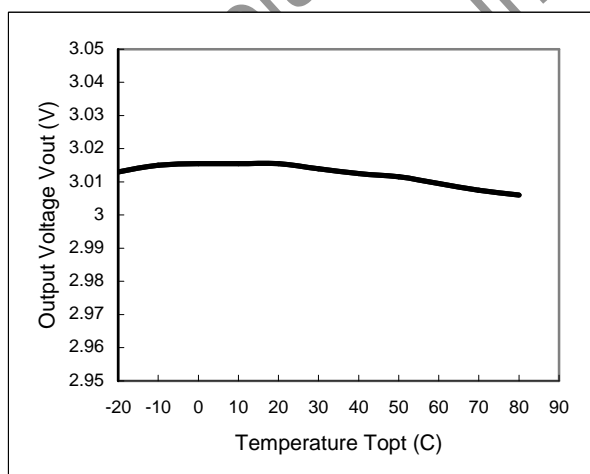

6.4.7. Output voltage vs. input voltage (Vout = 2.7V)
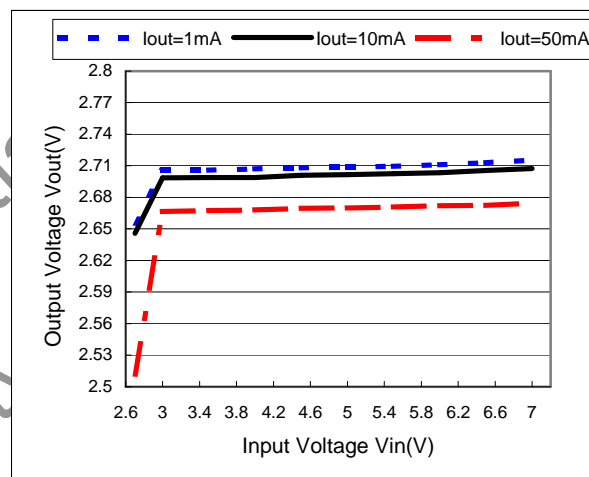
6.4.6. Output voltage vs. input voltage (Vout = 3.0V)

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

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

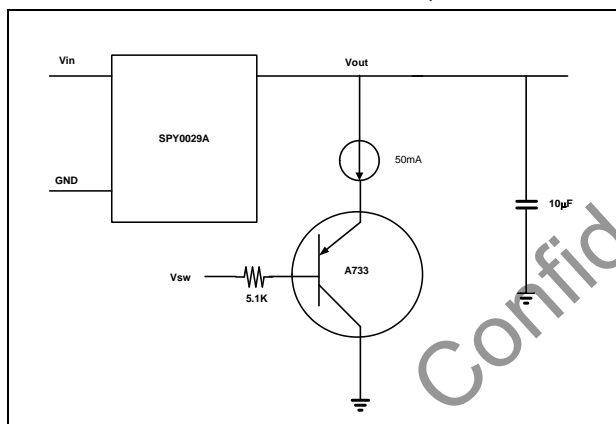**6.4.11. Output voltage vs. temperature (Vout = 2.7V)**

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

6.4.12. Output voltage vs. Temperature (Vout = 2.55V)
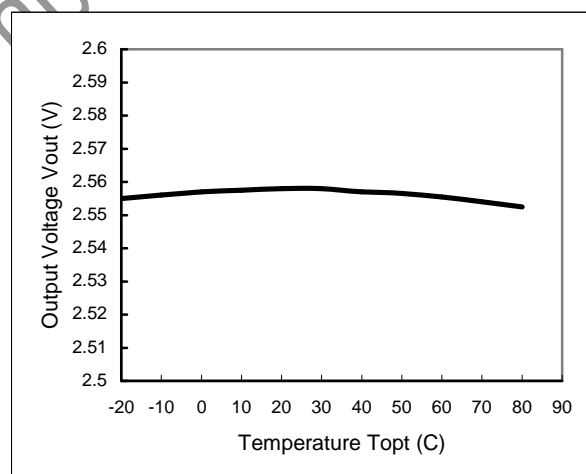
6.4.13. Load –transient response test module

(V_IN = 5V, I_OUT = 0 to 50mA, C_LOAD = 10µF)

6.4.16. Load –transient response; Vout = 2.7V
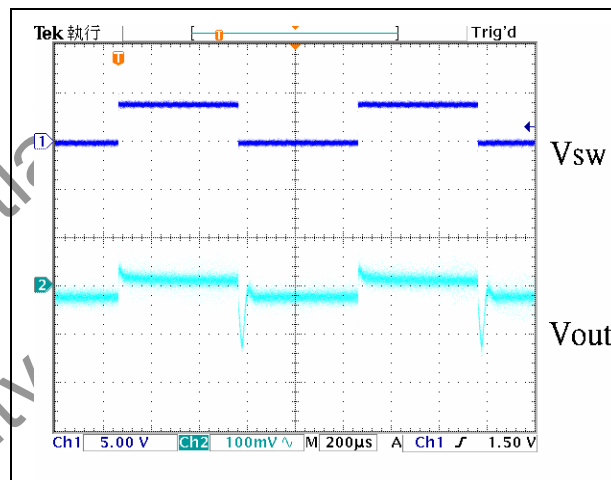
6.4.14. Load –transient response; Vout = 3.3V

6.4.17. Load –transient response; Vout = 2.55V

6.4.15. Load –transient response; Vout = 3.0V
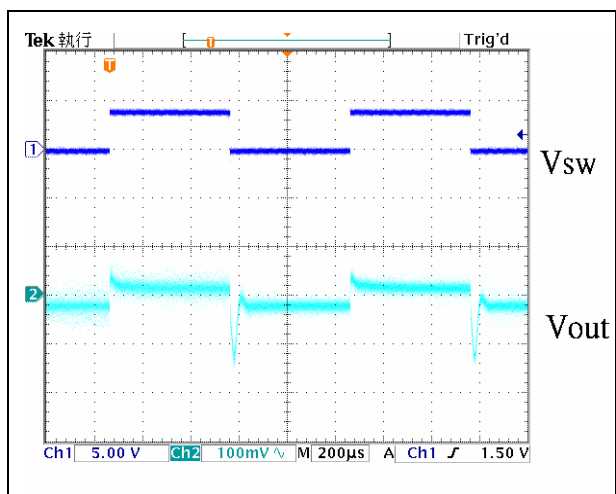
6. APPLICATION CIRCUIT

6.1. 4 PIN (with Low Voltage Detected Function)
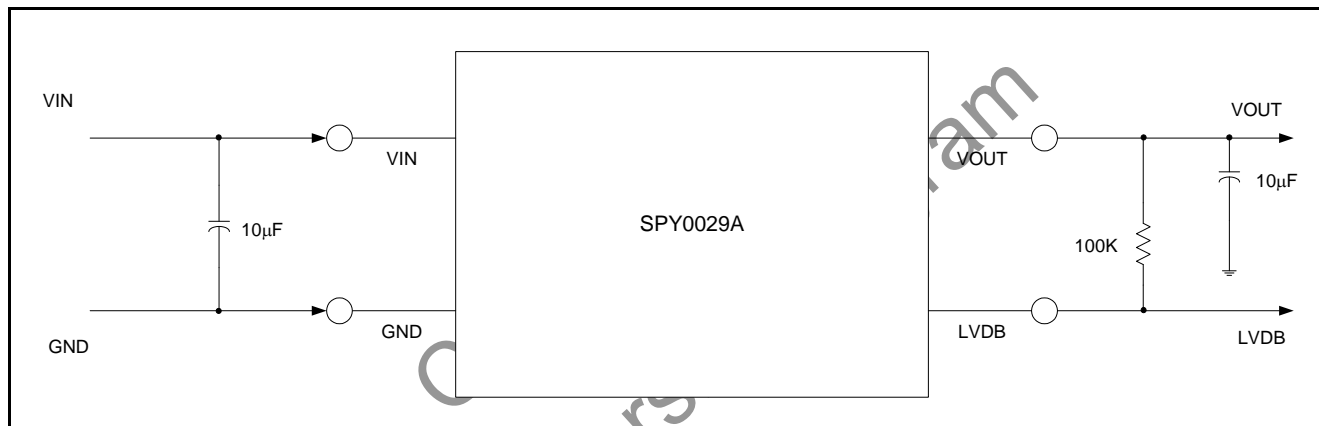
6.2. 3 PIN (no Low Voltage Detected Function)

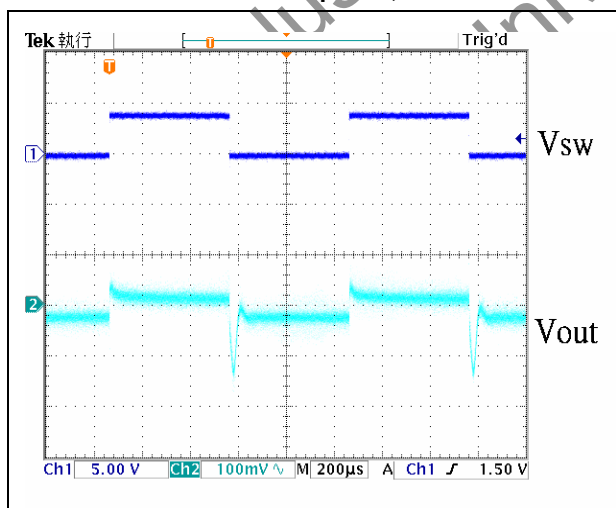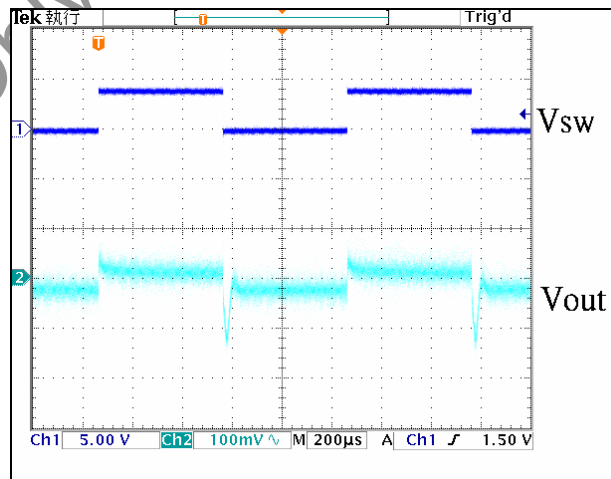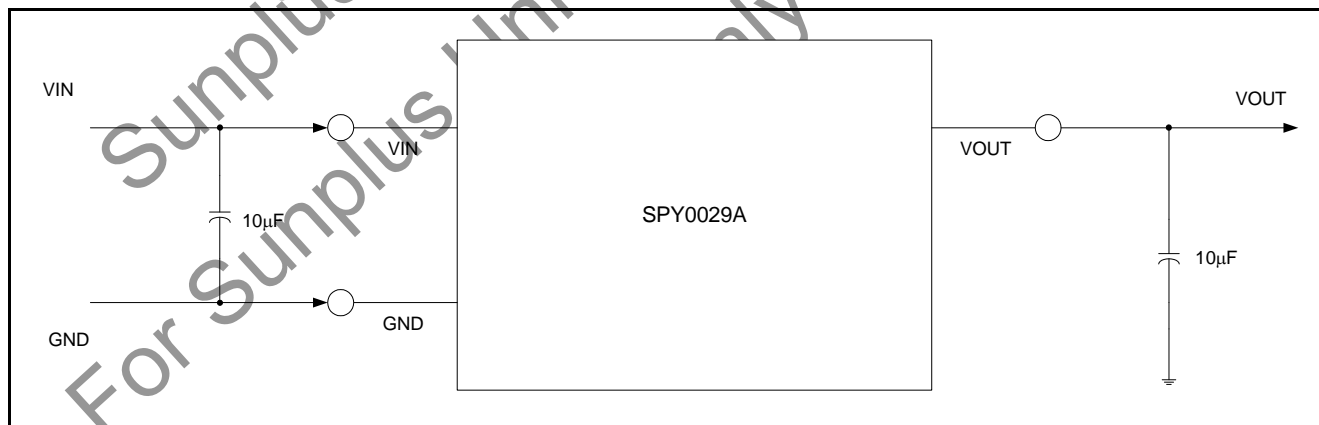## 7. PACKAGE/PAD LOCATIONS

7.1. PAD Assignment and Locations

Please contact Sunplus sales representatives for more information.

7.2. Ordering Information

Product Number	Package Type
SPY0029A-C	Chip form
SPY0029A-RE011	Package form - SOT89 (Vout = 3.3V)
SPY0029A-RE012	Package form - SOT89 (Vout = 3.0V)
SPY0029A-RE013	Package form - SOT89 (Vout = 2.7V)
SPY0029A-RE014	Package form - SOT89 (Vout = 2.55V)

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7.3. Package Information

7.3.1. 3 PIN SOT89 package size
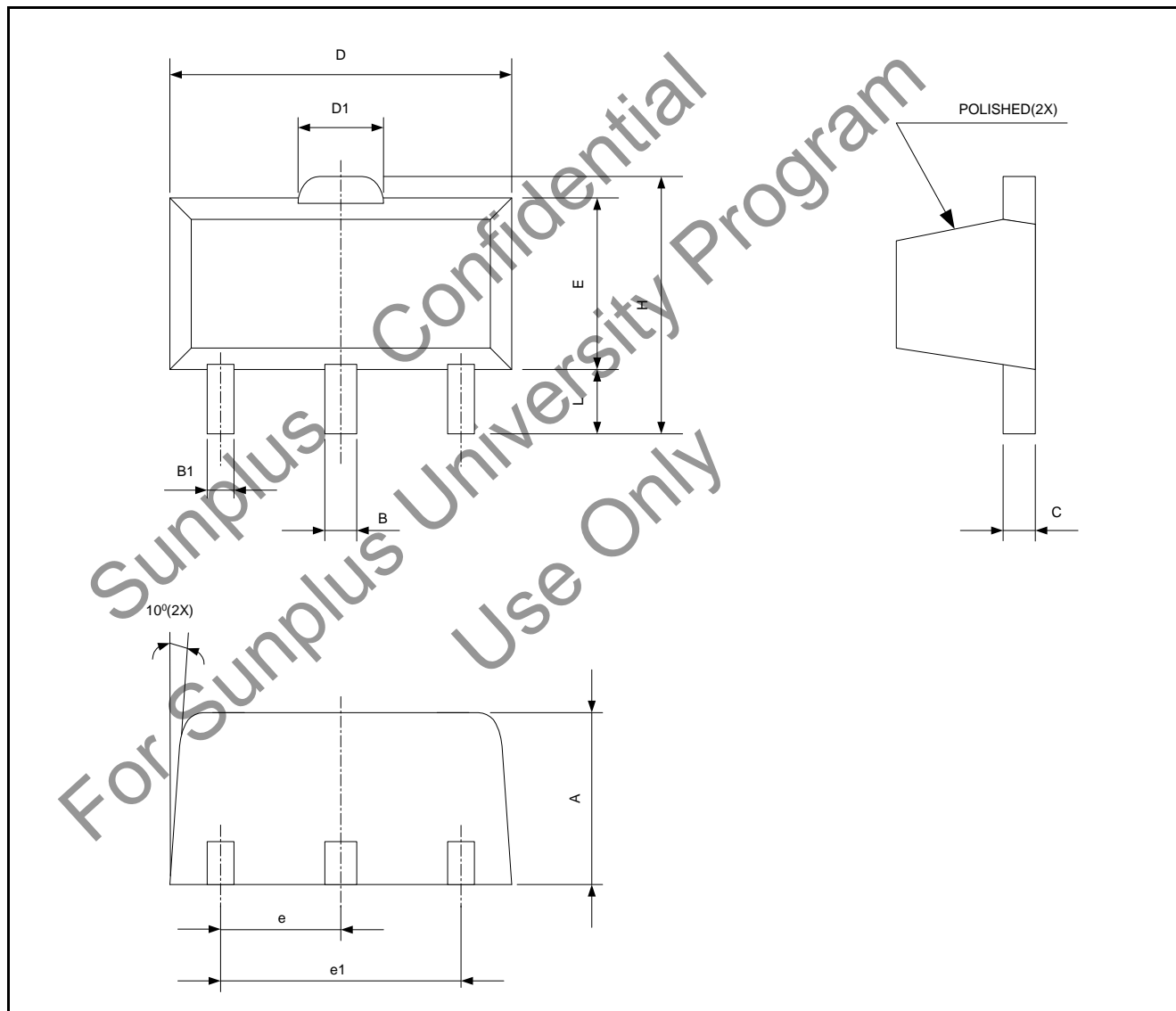
Symbol	Min.	Max.	Unit
A	1.40	1.60	Millimeter
B	0.44	0.56	Millimeter
B1	0.36	0.48	Millimeter
C	0.35	0.44	Millimeter
D	4.40	4.60	Millimeter
D1	1.35	1.83	Millimeter
E	2.29	2.60	Millimeter
H	3.94	4.25	Millimeter
e	1.50 BSC		Millimeter
e1	3.00 BSC		Millimeter
L	0.89	1.2	Millimeter

7.4. Storage Condition and Period for Package

Package	Moisture sensitivity level	Max. Reflow temperature	Floor life storage condition	Dry pack
SOT	LEVEL 3	220 +5/-0℃	N/A	No

Note1: Please refer to IPC/JEDEC standard J-STD-020A and EIA JEDEC stand JFSD22-A112
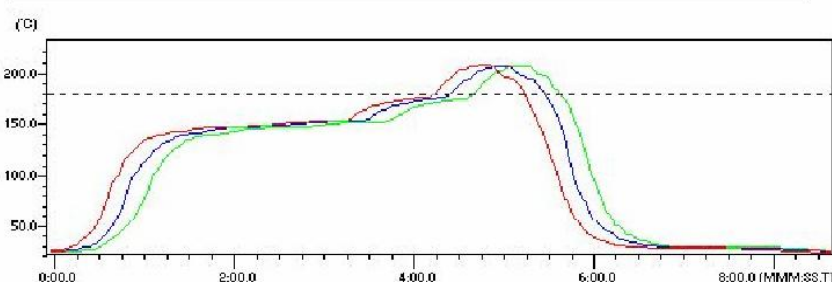**Note2:** or refer to the "CAUTION Note" on dry pack bag.

7.5. Recommended SMT Temperature Profile

This "Recommended" temperature profile is a rough guideline for SMT process reference. Most of SUNPLUS leadframe base product choice Matte Tin and Sn/Bi for plating recipe. For PPF(Pre-Plated Frame) product with 63/37 solder paste, we recommend 240℃~245℃ for peak temperature.
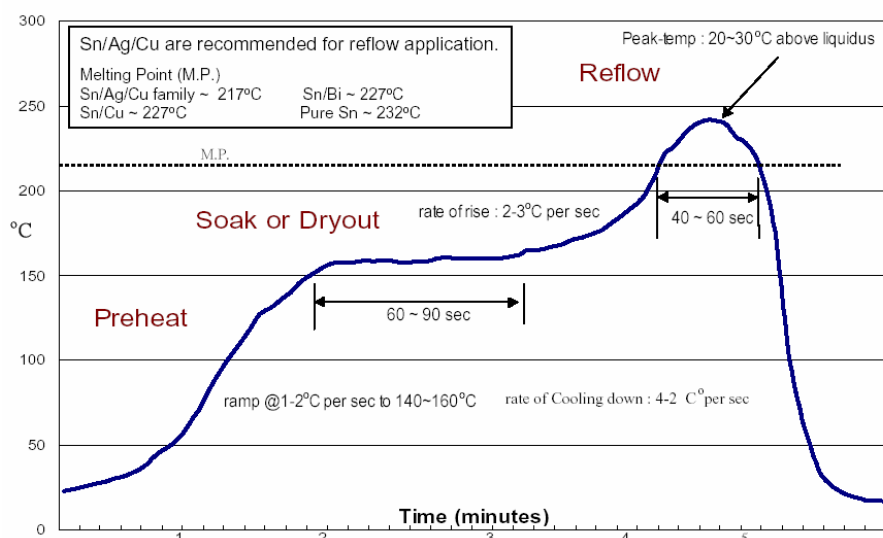
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9. REVISION HISTORY

Date	Revision #	Description	Page
APR. 15, 2005	0.6	1. Update absolute maximum ratings	5
		2. Add section 7.4 Storage Condition and Period for Package	14
		3. Add section 7.5 Recommended SMT Temperature Profile	14
DEC. 20, 2004	0.5	1.Update Ordering Information	4
FEB. 25, 2004	0.4	1.Remote 4pin package type TO-92 , add into 4pin COB type	4
		2.Update Ordering Information	5
		3.Update output voltage accuracy=+/-10%	6
		4.Update output current=100mA (Typ)	6
		5. Remove "*8.1 PAD Assignment and Locations*"	12
JAN.28, 2003	0.3	Update Ordering Information SPY0029A-RE011, SPY0029A-RE013 and SPY0029A-RE014	11
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
JUL. 10, 2002	0.1	Original	12