DATA SHEET

GPY0029C
GPY0029D

Linear Regulator

Aug. 16, 2016

Version 1.1

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LINEAR REGULATOR

1. GENERAL DESCRIPTION

GPY0029C and GPY0029D are voltage regulators with ultra-low quiescent current and manufactured by CMOS process. They are able to operate through a +7.0V input range and delivers up to 300mA driving current. GPY0029C features a low voltage detection (RESET pin, active low) to assure its operation under a low voltage condition; it is an open-drain output. In GPY0029D, it has a chip enable input (active high) and during shutdown mode (EN=Low), GPY0029D only consumes less than 0.1uA.

2. APPLICATION

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

3. FEATURES

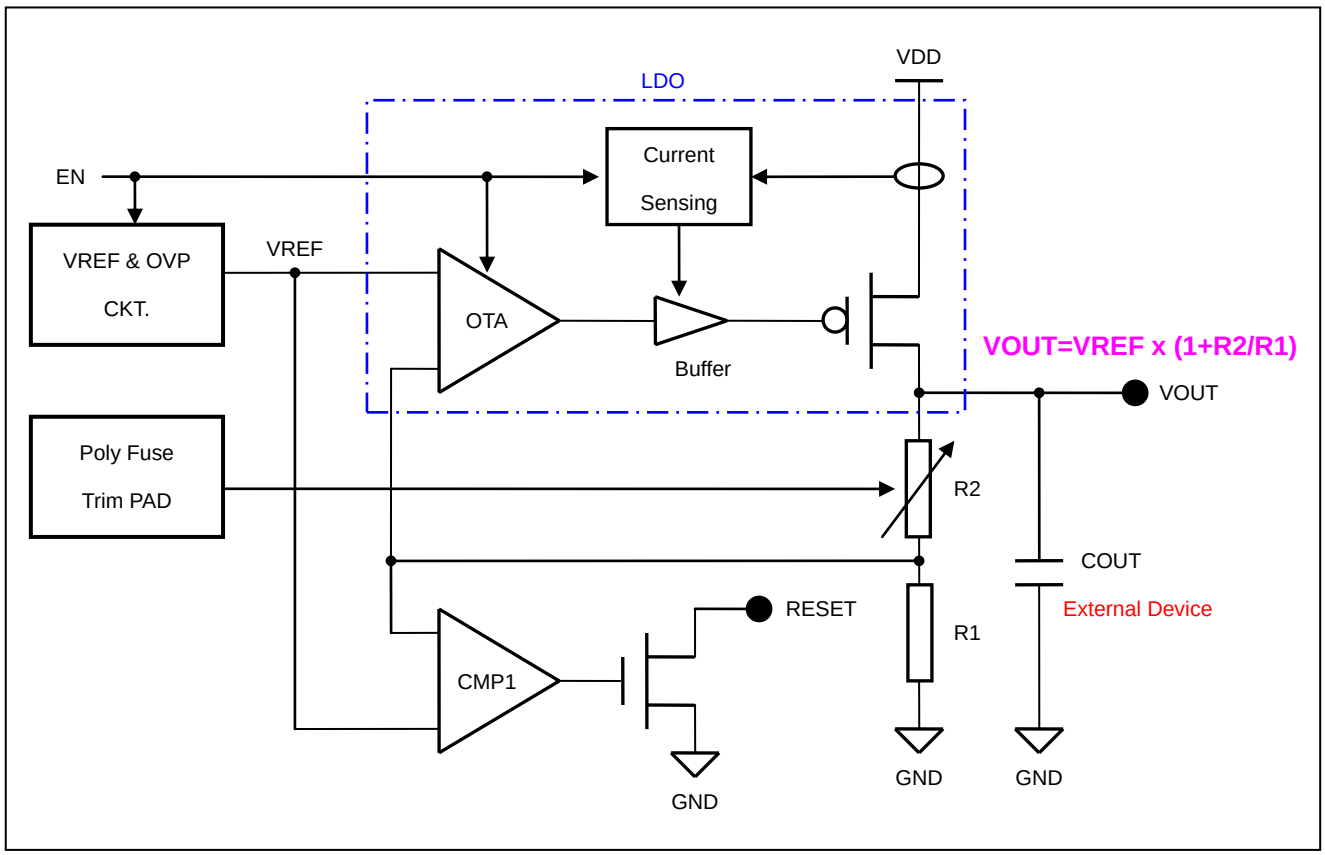
- Low Quiescent Current (Typ. 4.0μA @ V_{IN} = 5.0V)
- High Current Driving Capability

(Typ. 300mA @ V_{OUT} =1.5V / 2.8V / 3.0V / 3.3V, V_{IN} = 5.0V)(SOT-89)

(Typ. 300mA @ V_{OUT} =1.5V / 1.8V / 2.8V / 3.3V, V_{IN} = 5.0V)(SOT-25)

- Over Current Limitation (Typ. 480mA @ V_{IN} = 5.0V)
- Thermal Shutdown Protection (Typ. 150℃)
- Small Dropout Voltage (Typ. 40mV @ I_{OUT} = 1.0mA)
- Low Temperature-Drift Coefficient of Output Voltage (Typ. ±50ppm/^{0}C)
- Excellent Line Regulation (Typ. 0.15%/V)
- High Accuracy Output Voltage (±3%)
- RESET output pin for low V_{OUT} detection
- Only One Capacitor Required (Capacitance Range:1μF ~ 47μF, ESR Range: 0 ~ 2 Ω)
- SOT-89 and SOT-25 Package or Dice Form

4. BLOCK DIAGRAM



5. SIGNAL DESCRIPTIONS

5.1. 4-PIN Only for Chip On Board (GPY0029C-COB)

Mnemonic	PIN No.	PAD No.	Type	Description
RESET	1	5	O	Open Drain Reset Output, Low Reset
GND	2	4	G	Chip Ground
VOUT	3	2	O	Output Regulated Voltage
VIN	4	1	I	Input Voltage
FB	3	3	I	Regulator Feedback Input. FB pad must be bonded to VOUT pin

5.2. 3-PIN (GPY0029C-SOT-89)

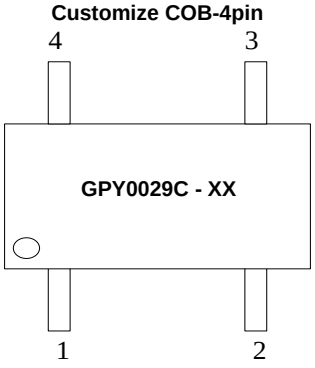
Mnemonic	PIN No.	Type	Description
GND	1	G	Chip Ground
VIN	2	I	Input Voltage
VOUT	3	O	Output Regulated Voltage

5.3. 5-PIN (GPY0029D-SOT-25)

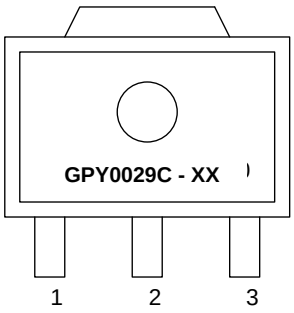
Mnemonic	PIN No.	Type	Description
VIN	1	P	Input Voltage
GND	2	G	Chip Ground
EN	3	I	Chip Enable (Active High). It should be a pull-low 100kΩ resistor to GND when the control signal is floating.
NC	4	NC	No connection.
VOUT	5	O	Output Regulated Voltage

5.4. PIN Configuration

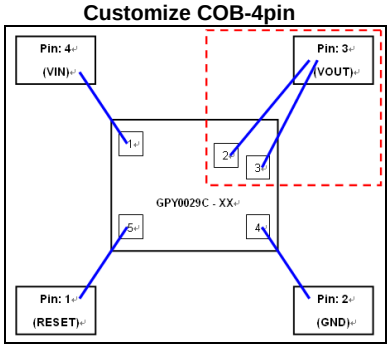
Customize COB-4pin



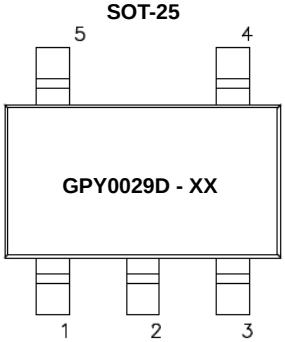
SOT-89



Customize COB-4pin



SOT-25



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 ~ 625 (COB) 570 (SOT-89) 400 (SOT-25)	mW

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

Note2: $P_{WATT} = (V_{IN} - V_{OUT}) \times I_{OUT}$

6.2. Thermal Characteristics

Characteristics	Symbol	Value	Unit
COB Package Thermal Resistance	R_{THJA}	160 ~ 200	℃/W
SOT-89 Package Thermal Resistance	R_{THJA}	175	℃/W
SOT-25 Package Thermal Resistance	R_{THJA}	250	℃/W

6.3. DC Characteristic for GPY0029C-XX

(V_{IN} = 5.0V, V_{OUT} (target) = 1.5V / 2.8V / 3.0V / 3.3V, $C_{IN} = C_{OUT}$ = 10μF, Typical values are at T_{OPT} = 25ºC)

Item	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Input Voltage		V_{IN}	2.4	-	7.0	V
Output Voltage Accuracy	I_{OUT} = 1mA	V_{OUT}	-3	-	+3	%
Output Current	$V_{IN} = V_{OUT}$ + 0.4V and $V_{IN} \geqq$ 3.7V	I_{OUT}	300	-	-	mA
Current Limit	$V_{IN} \geqq$ 3.7V	I_{LIM}	400	480	-	mA
Load Regulation	V_{IN} = 5.0V, 1mA $\leqq I_{OUT} \leqq$ 300mA	ΔV_{OUT}	-	40	60	mV
Line Regulation	I_{OUT} = 1mA, V_{OUT} + 0.5V $\leqq V_{IN} \leqq$ 7.0V	$\frac{\Delta Vout}{\Delta Vin \times Vout}$	-	0.15	-	%/V
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	I_{OUT} = 0	I_{SS}	-	4.0	7.5	μA
Temperature Coefficient	I_{OUT} = 10mA, $0^oC \leqq T_{OPT} \leqq 70^oC$, V_{OUT} = 3.3V	$\frac{\Delta Vout}{\Delta T}$	-	±50	-	ppm/℃
RESET Output Low Voltage	RESET Output Sinking 2mA	V_{OL}	-	50	100	mV
Output High Leakage Current	V_{RESET} = 5V	I_{RESET}	-	-	100	nA
Threshold to Output Voltage	Rising edge, referred to V_{OUT}	V_{RSTH}	-	V_{OUT} x 0.87	-	V
Threshold to Output Voltage	Falling edge, referred to V_{OUT}	V_{RSTL}	-	V_{OUT} x 0.80	-	V
Power-ON Reset Delay Time	See Timing Diagram	T_{DPOR}	-	0.1	-	mS
V_{OUT} Reset Delay Time	See Timing Diagram	T_{DL}	-	0.2	-	mS
Thermal Shutdown Temperature	I_{OUT} = 1mA	T_{OTP}	130	150	170	℃
Thermal Shutdown Hysteresis	I_{OUT} = 1mA	T_{HYS}	-	25	-	℃

Note1: V_{OUT} (normal) @ V_{IN} = 5.0V, I_{OUT} = 1mA, Vout = 3.0V / 3.3V, $T_{OPT} = 25\,^oC$

6.4. DC Characteristic for GPY0029D-XX

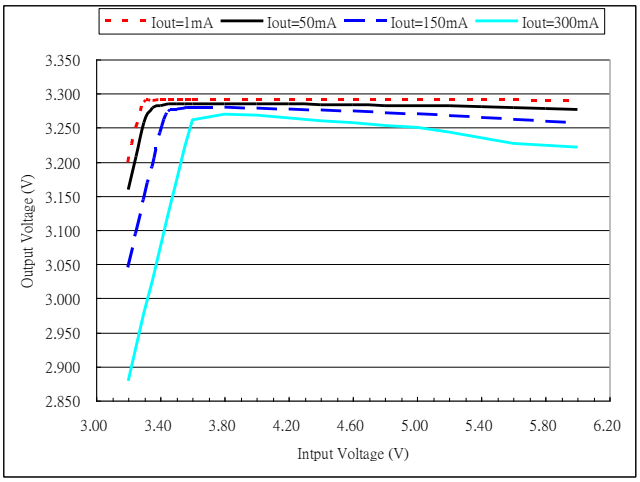
(V_{IN} = 5.0V, V_{OUT} (target) = 1.5V / 1.8V / 2.8V / 3.3V, C_{IN} = C_{OUT} = 10μF, Typical values are at T_{OPT} = 25ºC)

Item	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Input Voltage		V_{IN}	2.4	-	7.0	V
Output Voltage Accuracy	I_{OUT} = 1mA	V_{OUT}	-3	-	+3	%
Output Current	V_{IN} = V_{OUT} + 0.4V and V_{IN} ≧ 3.7V	I_{OUT}	300	-	-	mA
Current Limit	V_{IN} ≧ 3.7V	I_{LIM}	400	480	-	mA
Load Regulation	V_{IN} = 5.0V, 1mA ≦ I_{OUT} ≦ 300mA	Δ V_{OUT}	-	40	60	mV
Line Regulation	I_{OUT} = 1mA, V_{OUT} + 0.5V ≦ V_{IN} ≦ 7.0V	$\frac{\Delta Vout}{\Delta Vin \times Vout}$	-	0.15	-	%/V
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_{EN} = 5.0V. Enable and I_{OUT} = 0	I_{SS}	-	4.0	7.5	μA
	V_{EN} = 3.0V. Enable and I_{OUT} = 0		-	7.5	15	
	V_{EN} = 1.2V. Enable and I_{OUT} = 0		-	15	30	
Shutdown Current	V_{EN} = 0V. Shutdown.	$_{SHDN}$	-	0.1	1	μA
Temperature Coefficient	I_{OUT} = 10mA, 0^{O}C ≦ T_{OPT} ≦ 70^{O}C , V_{OUT} = 3.3V	$\frac{\Delta Vout}{\Delta T}$	-	±50	-	ppm/℃
EN Input Bias Current	V_{EN} = V_{IN} = 5.0V	I_{EN}	-	-	100	nA
EN Input Low Voltage	V_{IN} = 2.4V ~ 5.0V. Shutdown.	V_{IL}	-	-	0.4	V
EN Input High Voltage	V_{IN} = 2.4V ~ 5.0V. Enable.	V_{IH}	1.2	-	-	V
Thermal Shutdown Temperature	I_{OUT} = 1mA	T_{OTP}	130	150	170	℃
Thermal Shutdown Hysteresis	I_{OUT} = 1mA	T_{HYS}	-	25	-	℃

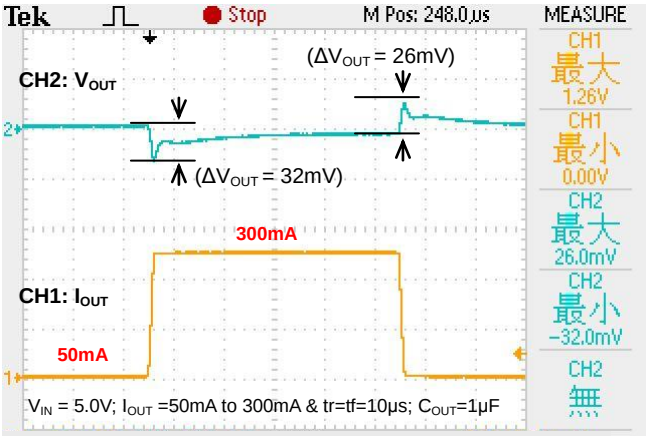
Note1: V_{OUT} (normal) @ V_{IN} = 5.0V, I_{OUT} = 1mA, Vout = 3.0V / 3.3V, T_{OPT} = 25℃.

6.5. Typical Operating Characteristics

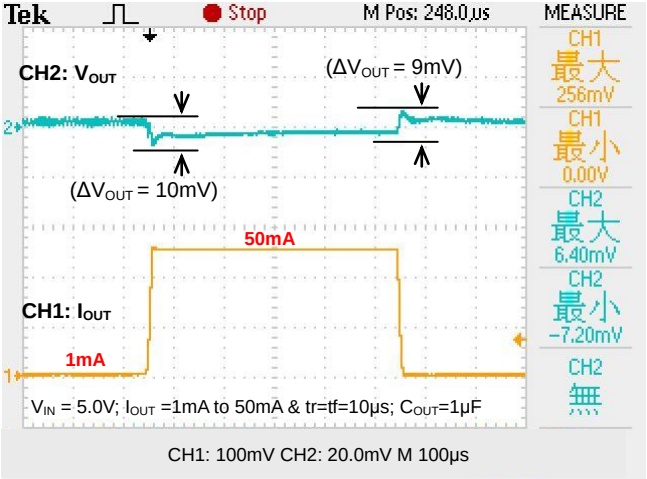
6.5.1. Output voltage vs. input voltage (V_{OUT} = 3.3V)



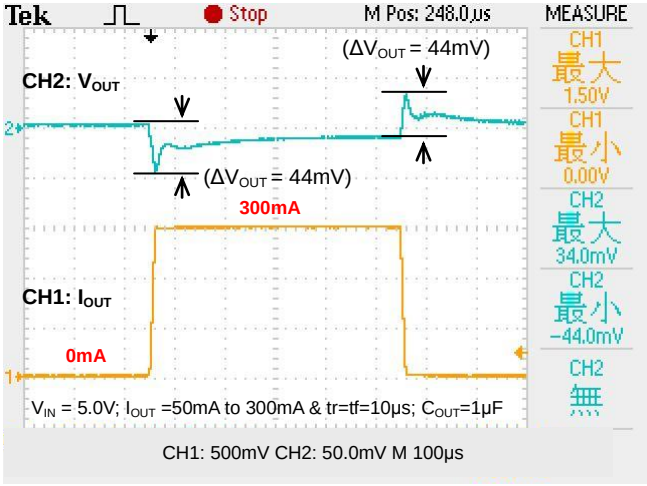
6.5.2. Load transient response; I_{OUT} = 50mA to 300mA



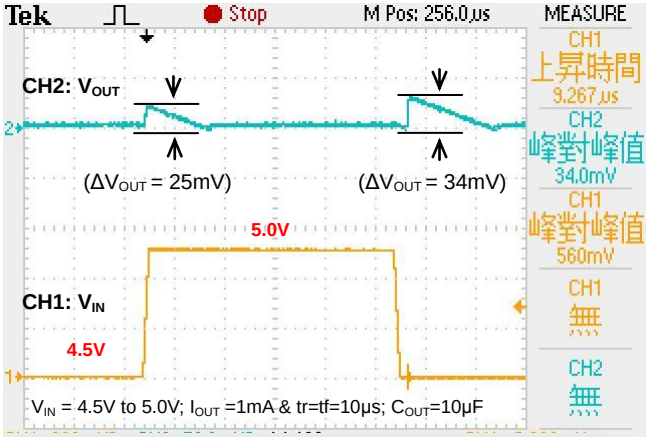
6.5.3. Load transient response; I_{OUT} = 1mA to 50mA



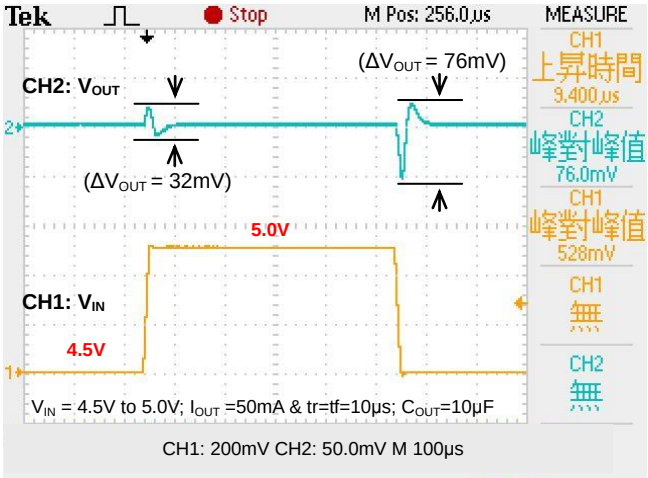
6.5.4. Load transient response; I_{OUT} = 0mA to 300mA



6.5.5. Line transient response; I_{OUT} = 1mA

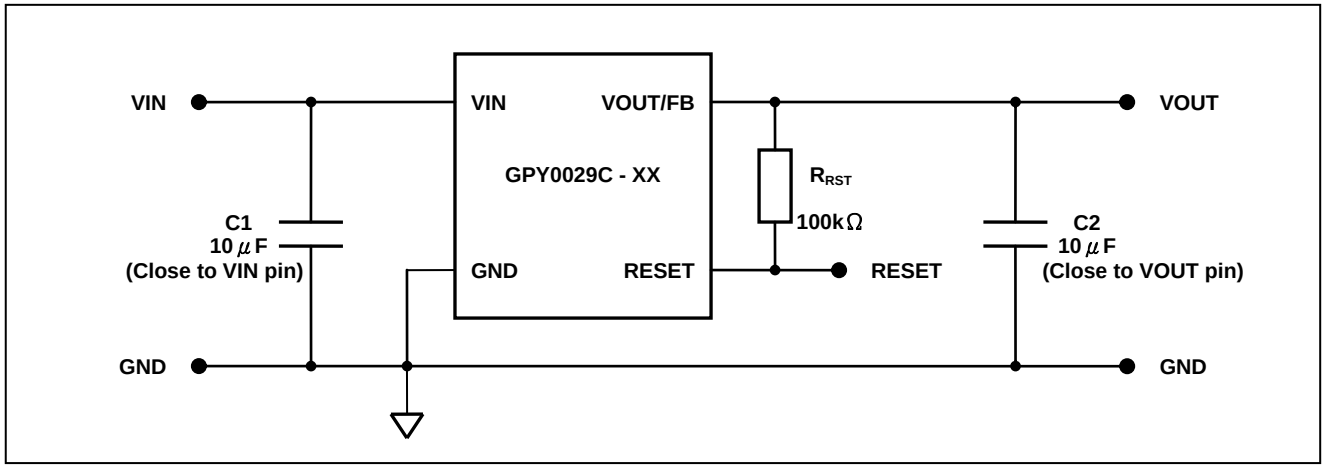


6.5.6. Line transient response; I_{OUT} = 50mA



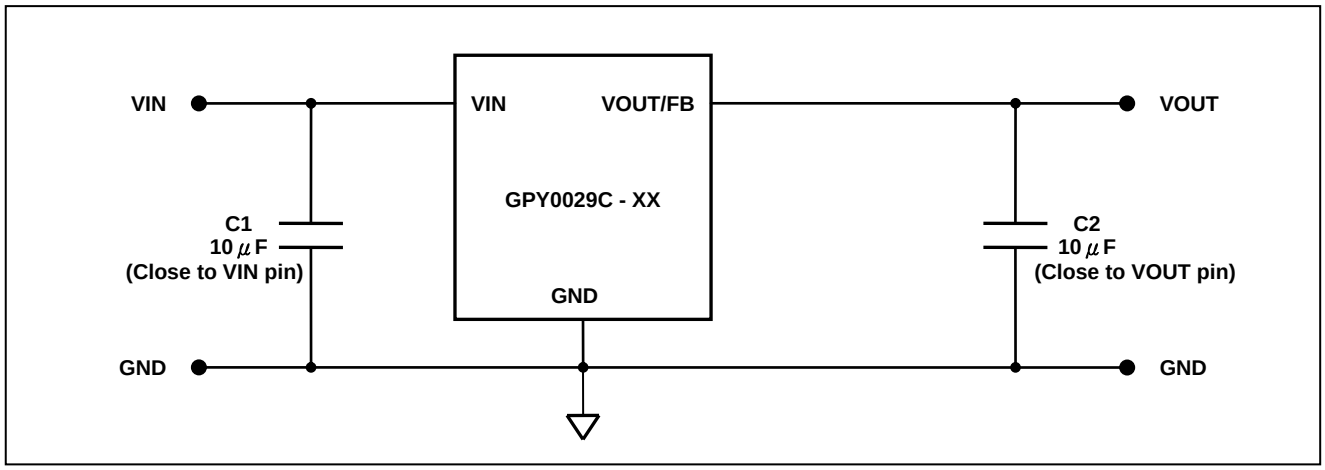
6.6. Application Circuit

6.6.1. 4-PIN COB (with Reset Function)



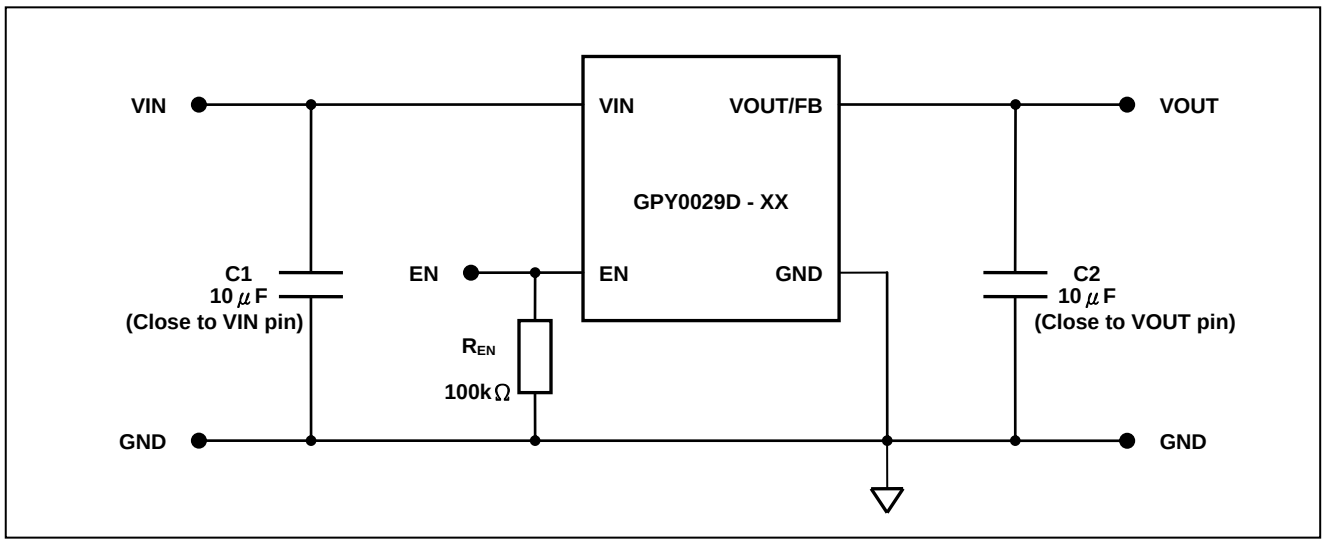
Note1: FB pad must be bonded to VOUT pin in COB.

6.6.2. 3-PIN COB or SOT-89 Package (no Reset Function)

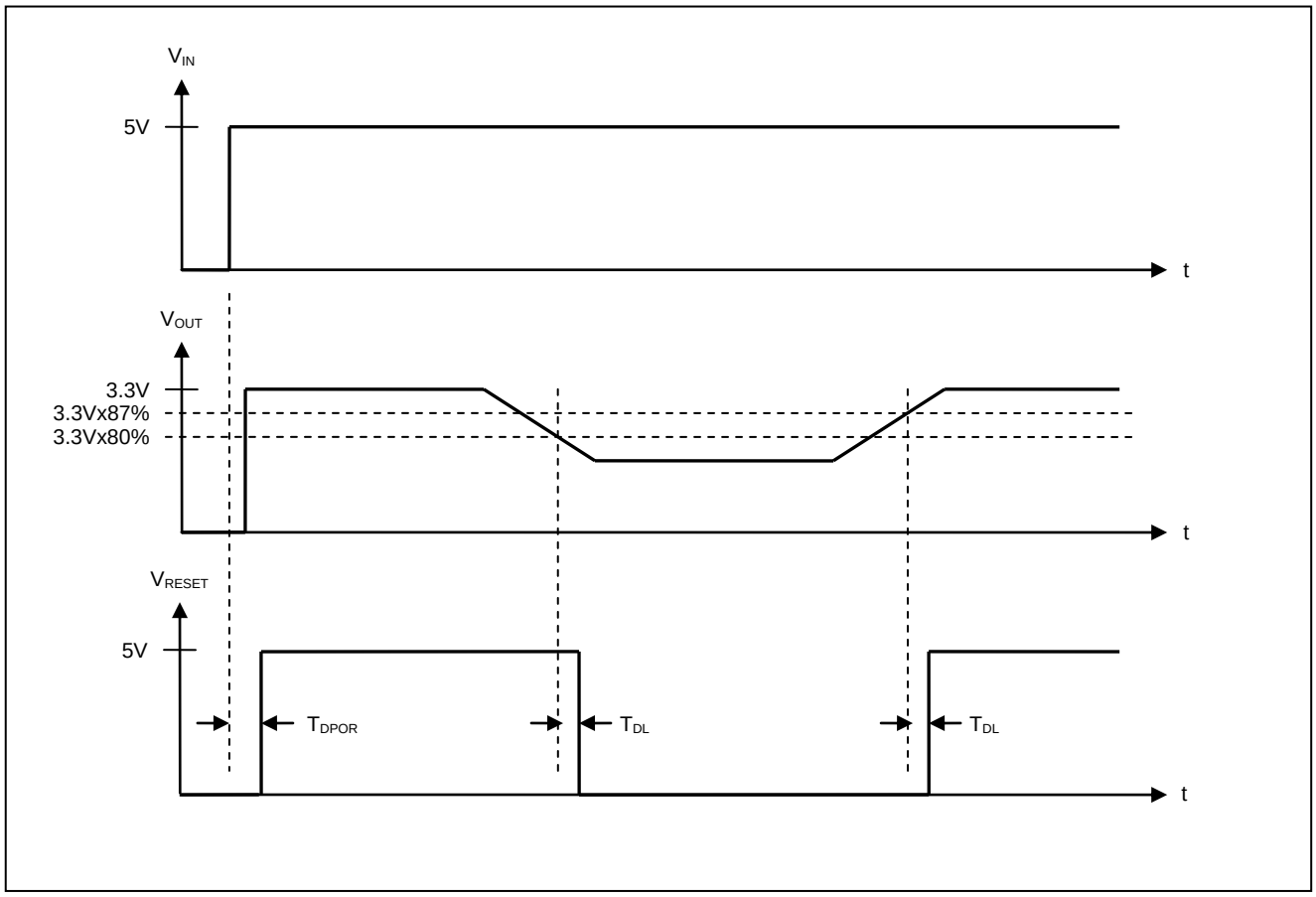


Note1: FB pad must be bonded to VOUT pin in COB or package.

6.6.3. 5-PIN SOT-25 Package (with Enable Function)

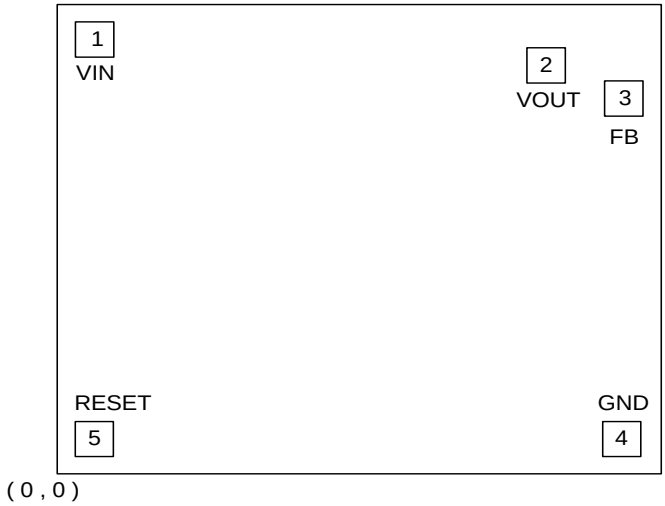


6.7. Reset Timing Diagram



7. PACKAGE/PAD LOCATIONS

7.1. PAD Assignment and Locations



This IC substrate should be connected to VSS

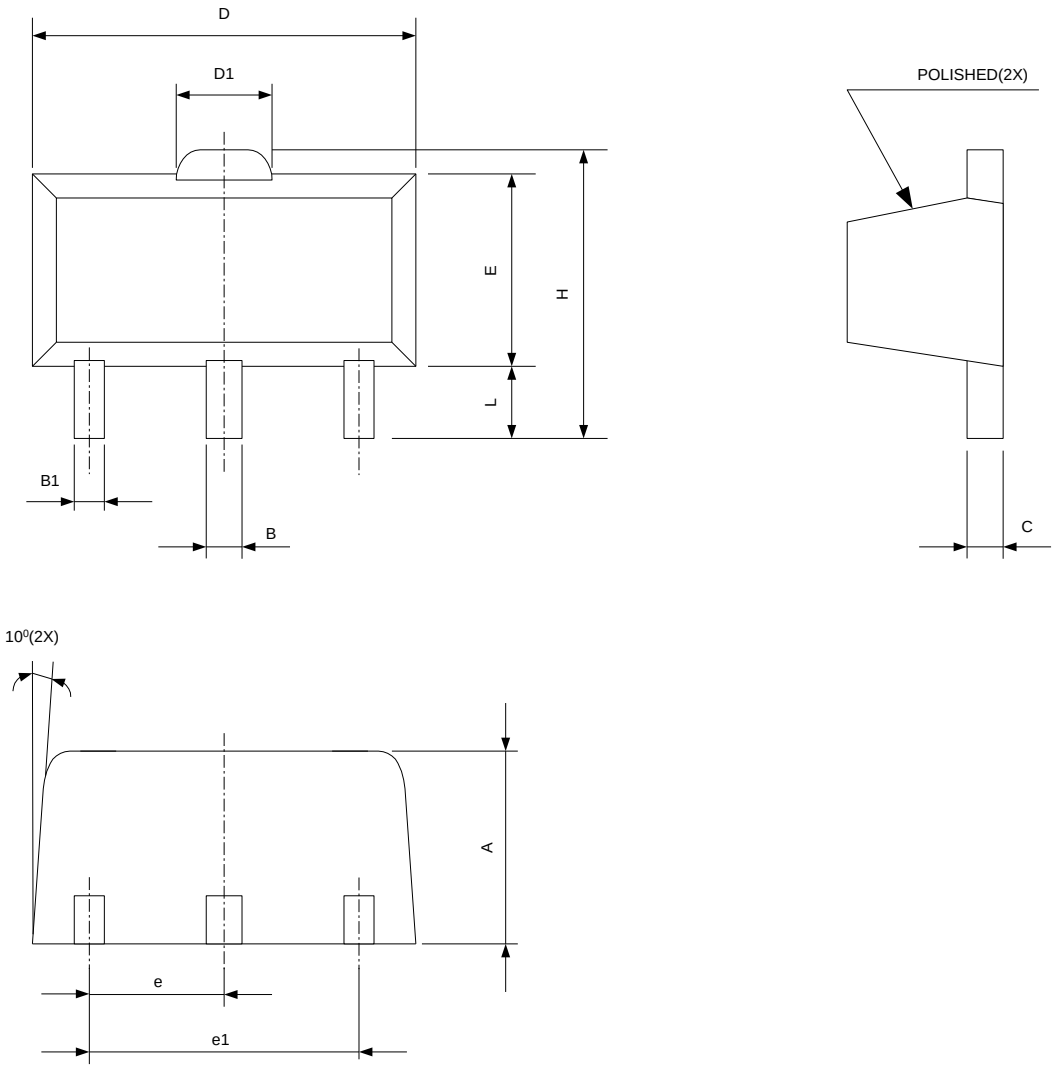
Note1: To ensure IC functions properly, please bond all of VDD and VSS pins.
Note2: FB pad must be bonded to VOUT pin in COB or SOT89 package.

7.2. Ordering Information

Product Number	Output Voltage (V)	Package Type	Package Marking
GPY0029C - 15 - C	1.5	Chip form (V_{OUT} = 1.5V ±3%)	N/A
GPY0029C - 28 - C	2.8	Chip form (V_{OUT} = 2.8V ±3%)	N/A
GPY0029C - 30 - C	3.0	Chip form (V_{OUT} = 3.0V ±3%)	N/A
GPY0029C - C	3.3	Chip form (V_{OUT} = 3.3V ±3%)	N/A
GPY0029C - 15 - HE011	1.5	Package form – SOT-89 (V_{OUT} = 1.5V ±3%)	Y29C15
GPY0029C - 28 - HE011	2.8	Package form – SOT-89 (V_{OUT} = 2.8V ±3%)	Y29C28
GPY0029C - 30 - HE011	3.0	Package form – SOT-89 (V_{OUT} = 3.0V ±3%)	Y29C30
GPY0029C - HE011	3.3	Package form – SOT-89 (V_{OUT} = 3.3V ±3%)	Y29C
GPY0029C - 15 - EE011	1.5	Package form (Tape & reel) – SOT-89 (V_{OUT} = 1.5V ±3%)	Y29C15
GPY0029C - 28 - EE011	2.8	Package form (Tape & reel) – SOT-89 (V_{OUT} = 2.8V ±3%)	Y29C28
GPY0029C - 30 - EE011	3.0	Package form (Tape & reel) – SOT-89 (V_{OUT} = 3.0V ±3%)	Y29C30
GPY0029C - EE011	3.3	Package form (Tape & reel) – SOT-89 (V_{OUT} = 3.3V ±3%)	Y29C
GPY0029D - 15 - HE021	1.5	Package form – SOT-25 (V_{OUT} = 1.5V ±3%)	Y29D15
GPY0029D - 18 - HE021	1.8	Package form – SOT-25 (V_{OUT} = 1.8V ±3%)	Y29D18
GPY0029D - 28 - HE021	2.8	Package form – SOT-25 (V_{OUT} = 2.8V ±3%)	Y29D28
GPY0029D - HE021	3.3	Package form – SOT-25 (V_{OUT} = 3.3V ±3%)	Y29D
GPY0029D - 15 - EE021	1.5	Package form (Tape & reel) – SOT-25 (V_{OUT} = 1.5V ±3%)	Y29D15
GPY0029D - 18 - EE021	1.8	Package form (Tape & reel) – SOT-25 (V_{OUT} = 1.8V ±3%)	Y29D18
GPY0029D - 28 - EE021	2.8	Package form (Tape & reel) – SOT-25 (V_{OUT} = 2.8V ±3%)	Y29D28
GPY0029D - EE021	3.3	Package form (Tape & reel) – SOT-25 (V_{OUT} = 3.3V ±3%)	Y29D

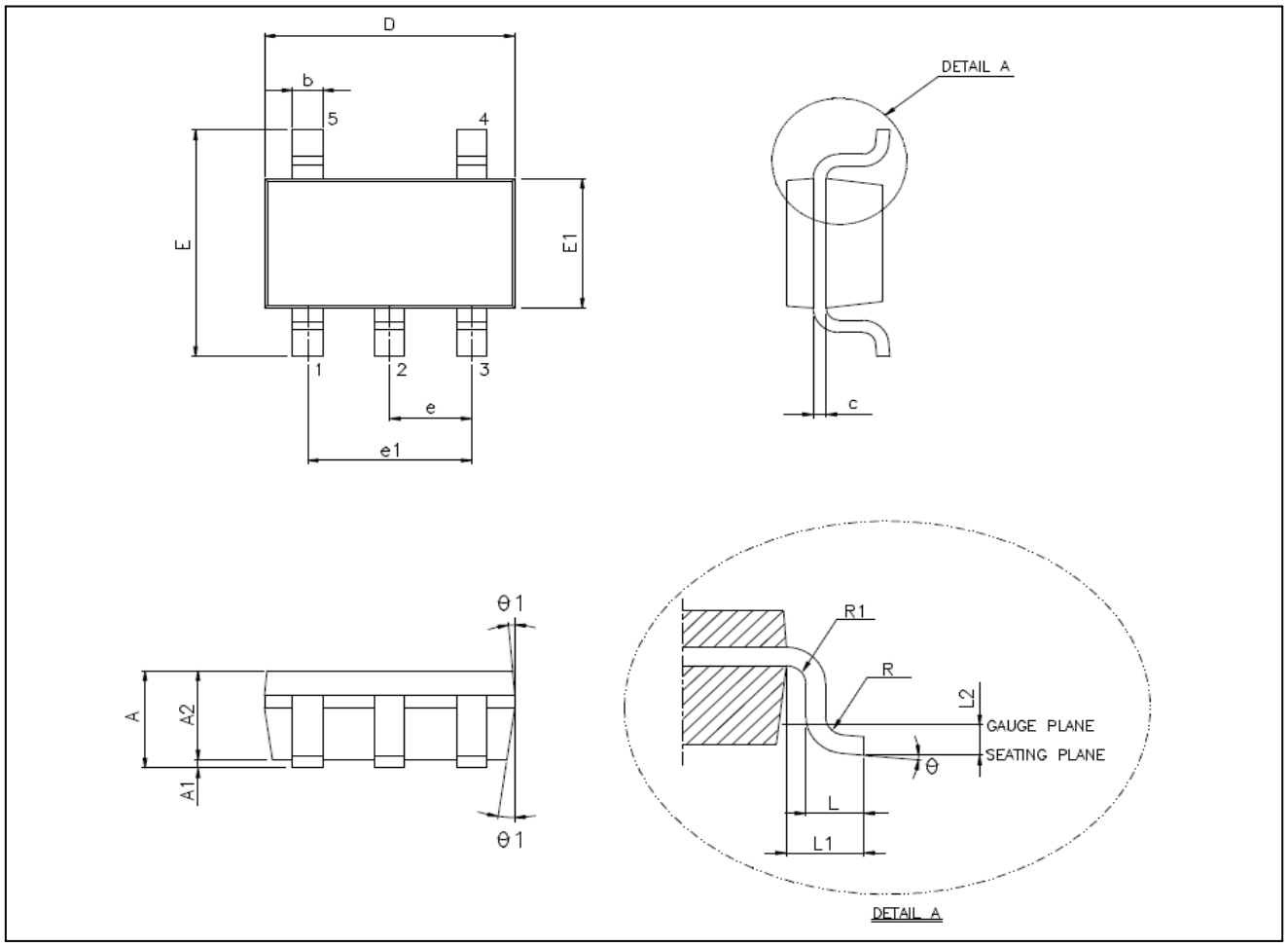
7.3. Package Information

7.3.1. 3-PIN SOT-89 package size



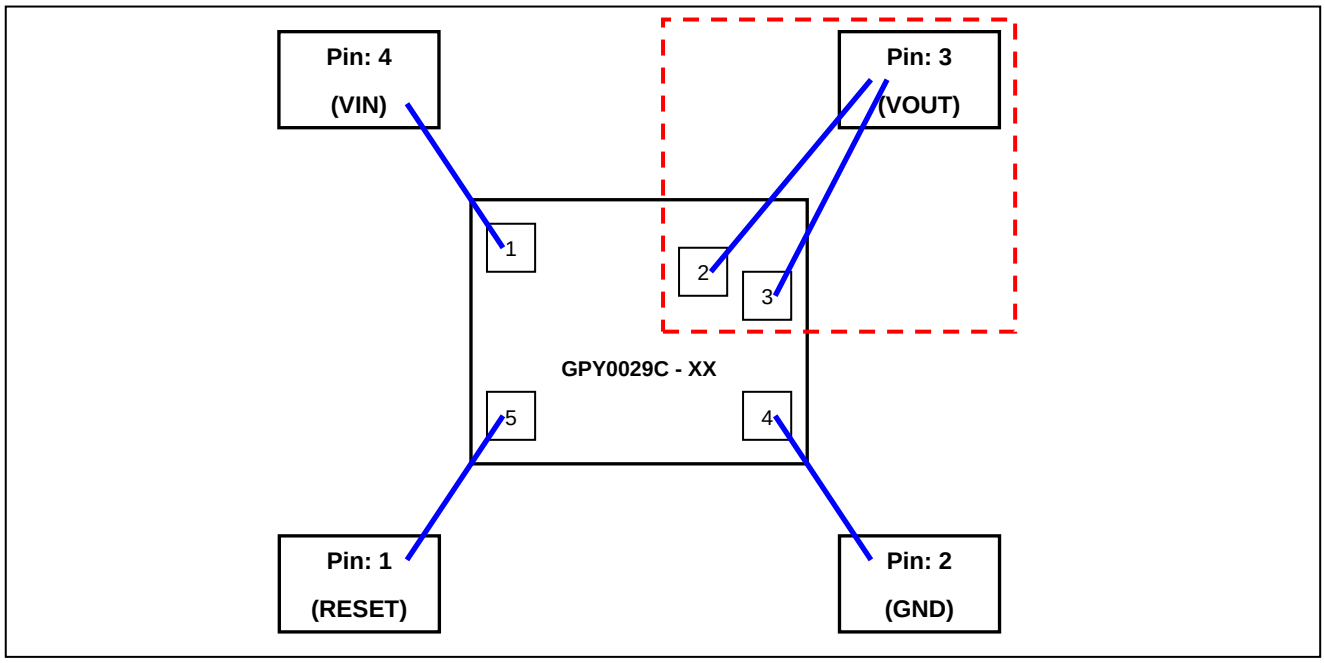
Symbol	Min.	Max.	Unit
A	1.40	1.60	Millimeter
B	0.44	0.56	Millimeter
B1	0.36	0.48	Millimeter
C	0.35	0.44	Millimeter
D	4.40	4.60	Millimeter
D1	1.35	1.83	Millimeter
E	2.29	2.60	Millimeter
H	3.94	4.25	Millimeter
e	1.50 BSC		Millimeter
e1	3.00 BSC		Millimeter
L	0.89	1.2	Millimeter

7.3.2. 5-PIN SOT-25 package size



Symbol	Min.	Max.	Unit
A		1.45	Millimeter
A1	0.00	0.15	Millimeter
A2	0.90	1.30	Millimeter
b	0.30	0.50	Millimeter
c	0.08	0.22	Millimeter
D	2.90 BSC		Millimeter
E	2.80 BSC		Millimeter
E1	1.60 BSC		Millimeter
e	0.95 BSC		Millimeter
e1	1.90 BSC		Millimeter
L	0.30	0.60	Millimeter
L1	0.60 REF.		Millimeter
L2	0.25 BSC		Millimeter
R	0.10	-	Millimeter
R1	0.10	0.25	Millimeter
θ	0°	8°	
θ1	5°	15°	

7.3.3. 4-PIN Chip On Board (COB) bonding diagram



7.4. Storage Condition and Period for Package

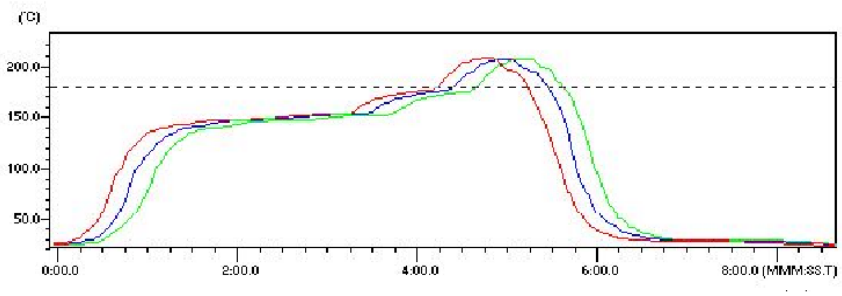
Package	Moisture sensitivity level	Max. Reflow temperature	Floor life storage condition	Dry pack
SOT	LEVEL 3	220 +5/-0℃	N/A	No

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 our lead-frame-based products choose 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.

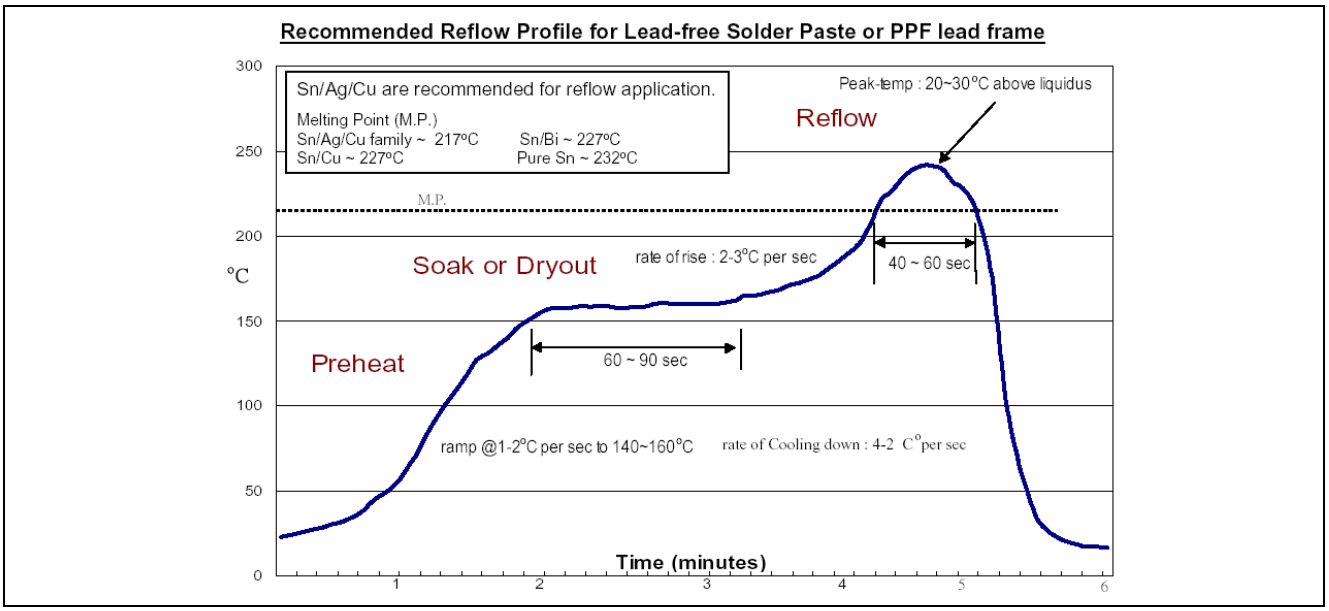
Recommended Reflow Profile for 63/37 Solder Paste or Cu lead frame



This profile is designed for use with Sn63 or Sn62 and can serve as a general guideline in establishing a reflow profile.

Reflow Profile:

- Heating-up @1~3°C per sec to 140°C
- Preheat @ 140-150°C for 120 ~ 160 sec
- Ramp @ 2~3 °C per sec to peak temperature (220 ~ 225 °C), Temperature over 183°C for 45~ 75 sec
- Cooling down to room temperature @4~2°C per sec to avoid undesired intermatalic compound layer.


Recommended Reflow Profile for Lead-free Solder Paste or PPF lead frame
Sn/Ag/Cu are recommended for reflow application.
Melting Point (M.P.)
Sn/Ag/Cu family ~ 217°C
Sn/Cu ~ 227°C
Sn/Bi ~ 227°C
Pure Sn ~ 232°C
Peak-temp : 20~30°C above liquidus
Reflow
M.P.
Soak or Dryout
rate of rise : 2-3°C per sec
40 ~ 60 sec
Preheat
60 ~ 90 sec
ramp @1-2°C per sec to 140~160°C
rate of Cooling down : 4-2 C°per sec
°C
300
250
200
150
100
50
0
Time (minutes)
1
2
3
4
5
6

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9. REVISION HISTORY

Date	Revision #	Description	Page
Aug. 16, 2016	1.1	Modify pin define table of 5-PIN (GPY0029D-SOT-25) in section 5.3.	4
Jun. 30, 2016	1.0	Modify DC Characteristic for GPY0029D-XX in section 6.4. Modify Ordering Information in section 7.2.	6 10
Mar. 19, 2015	0.2	Modify FEATURES in section 3. Modify DC Characteristic for GPY0029C-XX in section 6.3. Modify DC Characteristic for GPY0029D-XX in section 6.4. Modify Ordering Information in section 7.2.	3 5 6 10
Jan. 14, 2015	0.1	Original	16