

Positive Voltage Regulator with (Output ON/OFF)

■ GENERAL DESCRIPTION

The XC62H series are highly precise, low power consumption, positive voltage regulators, manufactured using CMOS and laser trimming technologies. The series consists of a high precision voltage reference, an error correction circuit, and an output driver with current limitation.

By way of the CE function, with output turned off, the series enters standby. In the stand-by mode, power consumption is greatly reduced.

SOT-25 (150mW), SOT-89-5 (500mW) and USP-6B (100mW) packages are available.

In relation to the CE function, as well as the positive logic XC62HR series, a negative logic XC62HP series (custom) is also available.

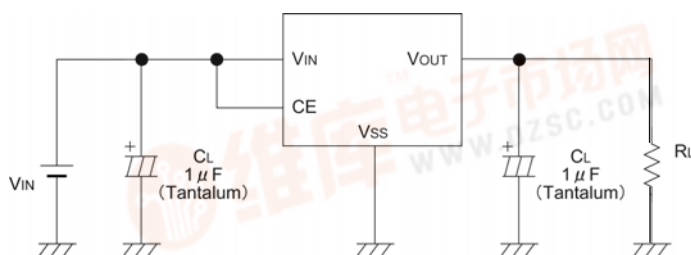
■ APPLICATIONS

- Battery powered equipment
- Voltage supplies for cellular phones
- Cameras, Video recorders
- Palmtops

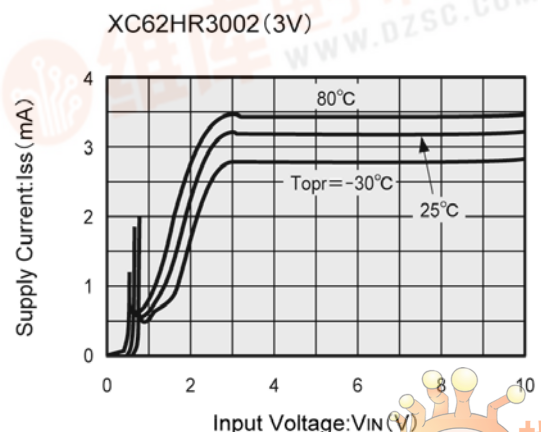
■ FEATURES

- Maximum Output Current** : 165mA (within max Pd, $V_{OUT}=3.0V$)
- Output Voltage Range** : 2.0V ~ 6.0V (0.1V increments)
(1.5V ~ 1.9V semi-custom)
- Highly Accurate** : $\pm 2\%$
($\pm 1\%$ for semi-custom products)
- Low Power Consumption** : 3 μA (TYP.) ($V_{OUT}=3V$, Output enabled)
: 0.1 μA (TYP.) (Output disabled)
- Output Voltage Temperature Characteristics** : $\pm 100ppm/^\circ C$ (TYP.)
- Line Regulation** : 0.2% / V (TYP.)
- CMOS Low Power Consumption**
- Dropout Voltage** : 0.18V @ 60mA
: 0.58V @ 160mA
- Packages** : SOT-25
SOT-89-5
USP-6B
- Environmentally Friendly**: EU RoHS Compliant, Pb Free

■ TYPICAL APPLICATION CIRCUIT



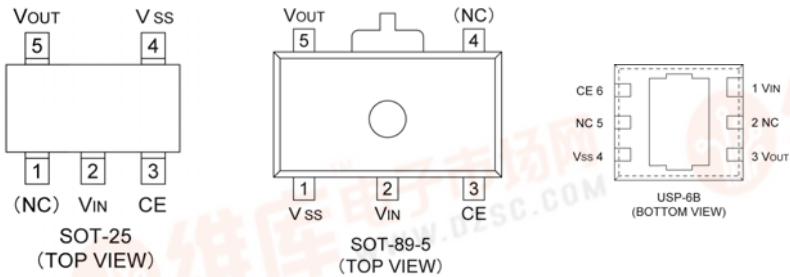
■ TYPICAL PERFORMANCE CHARACTERISTICS



XC62H Series

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PIN CONFIGURATION



*The dissipation pad for the USP-6B package should be solder-plated in recommended mount pattern and metal masking so as to enhance mounting strength and heat release. If the pad needs to be connected to other pins, it should be connected to the VIN (No.1) pin.

PIN ASSIGNMENT

| PIN NUMBER | | | PIN NAME | FUNCTION |
|------------|----------|--------|------------------|--------------------------|
| SOT-25 | SOT-89-5 | USP-6B | | |
| 1 | 4 | 2, 5 | NC | No Connection |
| 2 | 2 | 1 | V _{IN} | Supply Voltage Input |
| 3 | 3 | 6 | CE | Chip Enable |
| 4 | 1 | 4 | V _{SS} | Ground |
| 5 | 5 | 3 | V _{OUT} | Regulated Output Voltage |

FUNCTION

| SERIES | CE | VOLTAGE OUTPUT |
|--------|----|----------------|
| XC62HR | H | ON |
| | L | OFF |
| XC62HP | H | OFF |
| | L | ON |

H = High level
L = Low level

PRODUCT CLASSIFICATION

Ordering Information

XC62H①②③④⑤⑥⑦-⑧⁽¹⁾

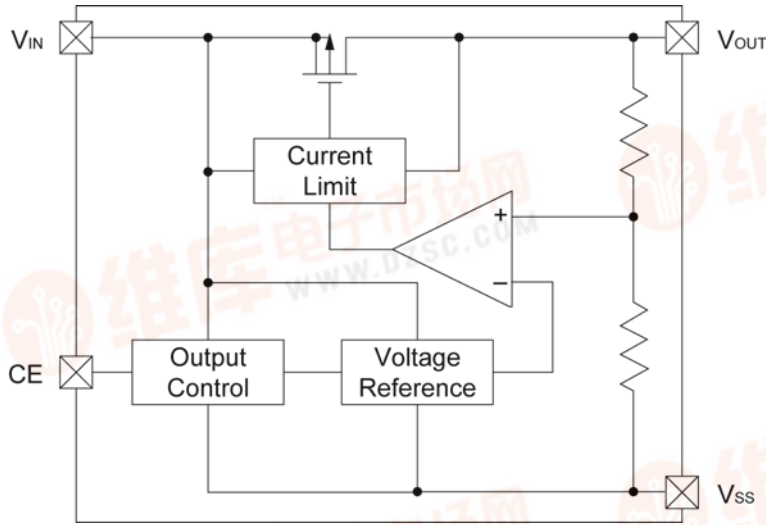
| DESIGNATOR | DESCRIPTION | SYMBOL | DESCRIPTION |
|------------|-------------------------------------|--------|---|
| ① | CE Pin Logic | R | Positive |
| | | P | Negative (Custom) |
| ②③ | Output Voltage | 20-60 | e.g. V _{OUT} 3.0V → ②=3, ③=0 V _{OUT} 5.0V → ②=5, ③=0 |
| ④ | Temperature Characteristics | 0 | ± 100ppm (TYP.) |
| ⑤ | Output Voltage Accuracy | 1 | ± 1% (semi-custom) |
| | | 2 | ± 2% |
| ⑥⑦-⑧ | Packages Taping Type ⁽²⁾ | MR | SOT-25 |
| | | MR-G | SOT-25 |
| | | PR | SOT-89-5 |
| | | PR-G | SOT-89-5 |
| | | DR | USP-6B |
| | | DR-G | USP-6B |

⁽¹⁾ The "-G" suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.

⁽²⁾ The device orientation is fixed in its embossed tape pocket. For reverse orientation, please contact your local Torex sales office or representative. (Standard orientation: ⑥R-⑧, Reverse orientation: ⑥L-⑧)

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■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Ta=25°C

| PARAMETER | SYMBOL | RATINGS | UNITS |
|-----------------------------|------------------|---|-------|
| Input Voltage | V _{IN} | 12.0 | V |
| Output Current | I _{OUT} | 500 | mA |
| Output Voltage | V _{OUT} | V _{SS} -0.3 ~ V _{IN} +1.3 | V |
| CE Input Voltage | V _{CE} | V _{SS} -0.3 ~ V _{IN} +1.3 | V |
| Power Dissipation | SOT-25 | 150 | mW |
| | SOT-89-5 | 500 | |
| | USP-6B | 100 | |
| Operating Temperature Range | Topr | -30 ~ +80 | °C |
| Storage Temperature Range | Tstg | -40 ~ +125 | °C |

■ ELECTRICAL CHARACTERISTICS

XC62HR2002 V_{OUT(T)}=2.0V (*1)

Ta=25°C

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS | CIRCUIT |
|--|--|--|-------|-------|-------|----------|---------|
| Output Voltage | V _{OUT (E)} (*2) | I _{OUT} =40mA V _{IN} =3.0V | 1,960 | 2,000 | 2,040 | V | ① |
| Maximum Output Current | I _{OUT max} | V _{IN} =3.0V, V _{OUT(E)} ≥ 1.8V | 115 | - | - | mA | ① |
| Load Regulation | ΔV _{OUT} | V _{IN} =3.0V 1mA ≤ I _{OUT} ≤ 60mA | - | 45 | 90 | mV | ① |
| Dropout Voltage (*3) | V _{dif1} | I _{OUT} =40mA | - | 180 | 360 | mV | ① |
| | V _{dif2} | I _{OUT} =100mA | - | 580 | 880 | mV | ① |
| Supply Current 1 | I _{SS1} | V _{IN} =V _{CE} =3.0V | - | 2.9 | 7.9 | μA | ② |
| Supply Current 2 | I _{SS2} | V _{IN} =3.0V, V _{CE} =V _{SS} | - | - | 0.1 | μA | ② |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot \Delta V_{OUT}}$ | I _{OUT} =40mA 3.0V ≤ V _{IN} ≤ 10.0V | - | 0.2 | 0.3 | % / V | ① |
| Input Voltage | ΔV _{IN} | | - | - | 10.0 | V | - |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot \Delta V_{OUT}}$ | I _{OUT} =40mA -30°C ≤ Topr ≤ 80°C | - | ±100 | - | ppm / °C | ① |
| CE "High" Voltage | V _{CEH} | | 1.5 | - | - | V | ① |
| CE "Low" Voltage | V _{CEL} | | - | - | 0.25 | V | ① |
| CE "High" Current | I _{CEH} | V _{CE} =V _{IN} | - | - | 0.1 | μA | ② |
| CE "Low" Current | I _{CEL} | V _{CE} =V _{SS} | -0.2 | -0.05 | 0 | μA | ② |

NOTE:

*1: V_{OUT(T)}=Specified output voltage .

*2: V_{OUT(E)}=Effective output voltage (i.e. the output voltage when "V_{OUT(T)}+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{OUT} value).

*3: V_{dif}= {V_{IN1} (*5)-V_{OUT1} (*4)}

*4: V_{OUT1}= A voltage equal to 98% of the output voltage whenever an amply stabilized I_{OUT} {V_{OUT(T)}+1.0V} is input.

*5: V_{IN1}= The input voltage when V_{OUT1} appears as input voltage is gradually decreased.

■ ELECTRICAL CHARACTERISTICS (Continued)

XC62HR3002 $V_{OUT(T)}=3.0V$ ⁽¹⁾

$T_a=25^{\circ}C$

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS | CIRCUIT |
|---|--|--|-------|-----------|-------|-------------------|---------|
| Output Voltage | $V_{OUT(E)}$ ⁽²⁾ | $I_{OUT}=40mA$ $V_{IN}=4.0V$ | 2,940 | 3,000 | 3,060 | V | ① |
| Maximum Output Current | $I_{OUT\ max}$ | $V_{IN}=4.0V, V_{OUT(E)} \geq 2.7V$ | 165 | - | - | mA | ① |
| Load Regulation | ΔV_{OUT} | $V_{IN}=4.0V$ $1mA \leq I_{OUT} \leq 80mA$ | - | 45 | 90 | mV | ① |
| Dropout Voltage ⁽³⁾ | Vdif1 | $I_{OUT}=60mA$ | - | 180 | 360 | mV | ① |
| | Vdif2 | $I_{OUT}=160mA$ | - | 580 | 880 | mV | ① |
| Supply Current 1 | ISS1 | $V_{IN}=V_{CE}=4.0V$ | - | 3.0 | 8.0 | μA | ② |
| Supply Current 2 | ISS2 | $V_{IN}=4.0V, V_{CE}=V_{SS}$ | - | - | 0.1 | μA | ② |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot \Delta V_{OUT}}$ | $I_{OUT}=40mA$ $4.0V \leq V_{IN} \leq 10.0V$ | - | 0.2 | 0.3 | % / V | ① |
| Input Voltage | ΔV_{IN} | | - | - | 10.0 | V | - |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot \Delta V_{OUT}}$ | $I_{OUT}=40mA$ $-30^{\circ}C \leq T_{opr} \leq 80^{\circ}C$ | - | ± 100 | - | ppm / $^{\circ}C$ | ① |
| CE "High" Voltage | V_{CEH} | | 1.5 | - | - | V | ① |
| CE "Low" Voltage | V_{CEL} | | - | - | 0.25 | V | ① |
| CE "High" Current | I_{CEH} | $V_{CE}=V_{IN}$ | - | - | 0.1 | μA | ② |
| CE "Low" Current | I_{CEL} | $V_{CE}=V_{SS}$ | -0.2 | -0.05 | 0 | μA | ② |

XC62HR4002 $V_{OUT(T)}=4.0V$ ⁽¹⁾

$T_a=25^{\circ}C$

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS | CIRCUIT |
|---|--|--|-------|-----------|-------|-------------------|---------|
| Output Voltage | $V_{OUT(E)}$ ⁽²⁾ | $I_{OUT}=40mA$ $V_{IN}=5.0V$ | 3,920 | 4,000 | 4,080 | V | ① |
| Maximum Output Current | $I_{OUT\ max}$ | $V_{IN}=5.0V, V_{OUT(E)} \geq 3.6V$ | 200 | - | - | mA | ① |
| Load Regulation | ΔV_{OUT} | $V_{IN}=5.0V$ $1mA \leq I_{OUT} \leq 100mA$ | - | 45 | 90 | mV | ① |
| Dropout Voltage ⁽³⁾ | Vdif1 | $I_{OUT}=80mA$ | - | 170 | 340 | mV | ① |
| | Vdif2 | $I_{OUT}=180mA$ | - | 560 | 840 | mV | ① |
| Supply Current 1 | ISS1 | $V_{IN}=V_{CE}=5.0V$ | - | 3.1 | 8.1 | μA | ② |
| Supply Current 2 | ISS2 | $V_{IN}=5.0V, V_{CE}=V_{SS}$ | - | - | 0.1 | μA | ② |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot \Delta V_{OUT}}$ | $I_{OUT}=40mA$ $5.0V \leq V_{IN} \leq 10.0V$ | - | 0.2 | 0.3 | % / V | ① |
| Input Voltage | ΔV_{IN} | | - | - | 10.0 | V | - |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot \Delta V_{OUT}}$ | $I_{OUT}=40mA$ $-30^{\circ}C \leq T_{opr} \leq 80^{\circ}C$ | - | ± 100 | - | ppm / $^{\circ}C$ | ① |
| CE "High" Voltage | V_{CEH} | | 1.5 | - | - | V | ① |
| CE "Low" Voltage | V_{CEL} | | - | - | 0.25 | V | ① |
| CE "High" Current | I_{CEH} | $V_{CE}=V_{IN}$ | - | - | 0.1 | μA | ② |
| CE "Low" Current | I_{CEL} | $V_{CE}=V_{SS}$ | -0.2 | -0.05 | 0 | μA | ② |

NOTE:

- *1: $V_{OUT(T)}$ =Specified output voltage .
- *2: $V_{OUT(E)}$ =Effective output voltage (i.e. the output voltage when " $V_{OUT(T)}+1.0V$ " is provided at the V_{IN} pin while maintaining a certain I_{OUT} value).
- *3: $V_{dif} = \{V_{IN1}^{(5)} - V_{OUT1}^{(4)}\}$
- *4: V_{OUT1} = A voltage equal to 98% of the output voltage whenever an amply stabilized I_{OUT} $\{V_{OUT(T)}+1.0V\}$ is input.
- *5: V_{IN1} = The input voltage when V_{OUT1} appears as input voltage is gradually decreased.

■ ELECTRICAL CHARACTERISTICS (Continued)

XC62HR5002 $V_{OUT(T)}=5.0V$ ^{(*)1}

$T_a=25^\circ C$

| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS | CIRCUIT |
|--|--|--|-------|-----------|-------|------------------|---------|
| Output Voltage | $V_{OUT(E)}$ ^{(*)2} | $I_{OUT}=40mA$ $V_{IN}=6.0V$ | 4,900 | 5,000 | 5,100 | V | ① |
| Maximum Output Current | $I_{OUT\ max}$ | $V_{IN}=6.0V, V_{OUT(E)} \geq 4.5V$ | 220 | - | - | mA | ① |
| Load Regulation | ΔV_{OUT} | $V_{IN}=6.0V$ $1mA \leq I_{OUT} \leq 100mA$ | - | 40 | 80 | mV | ① |
| Dropout Voltage ^{(*)3} | V_{dif1} | $I_{OUT}=100mA$ | - | 165 | 320 | mV | ① |
| | V_{dif2} | $I_{OUT}=200mA$ | - | 540 | 820 | mV | ① |
| Supply Current1 | I_{SS1} | $V_{IN}=V_{CE}=6.0V$ | - | 3.1 | 8.1 | μA | ② |
| Supply Current2 | I_{SS2} | $V_{IN}=6.0V, V_{CE}=V_{SS}$ | - | - | 0.1 | μA | ② |
| Line Regulation | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot \Delta V_{OUT}}$ | $I_{OUT}=40mA$ $6.0V \leq V_{IN} \leq 10.0V$ | - | 0.2 | 0.3 | % / V | ① |
| Input Voltage | ΔV_{IN} | | - | - | 10.0 | V | - |
| Output Voltage Temperature Characteristics | $\frac{\Delta V_{OUT}}{\Delta T_{opr} \cdot \Delta V_{OUT}}$ | $I_{OUT}=40mA$ $-30^\circ C \leq T_{opr} \leq 80^\circ C$ | - | ± 100 | - | ppm / $^\circ C$ | ① |
| CE "High" Voltage | V_{CEH} | | 1.5 | - | - | V | ① |
| CE "Low" Voltage | V_{CEL} | | - | - | 0.25 | V | ① |
| CE "High" Current | I_{CEH} | $V_{CE}=V_{IN}$ | - | - | 0.1 | μA | ② |
| CE "Low" Current | I_{CEL} | $V_{CE}=V_{SS}$ | -0.2 | -0.05 | 0 | μA | ② |

NOTE:

*1: $V_{OUT(T)}$ =Specified output voltage .

*2: $V_{OUT(E)}$ =Effective output voltage (i.e. the output voltage when " $V_{OUT(T)}+1.0V$ " is provided at the V_{IN} pin while maintaining a certain I_{OUT} value).

3: $V_{dif} = \{V_{IN1}^{()5} - V_{OUT1}^{(*)4}\}$

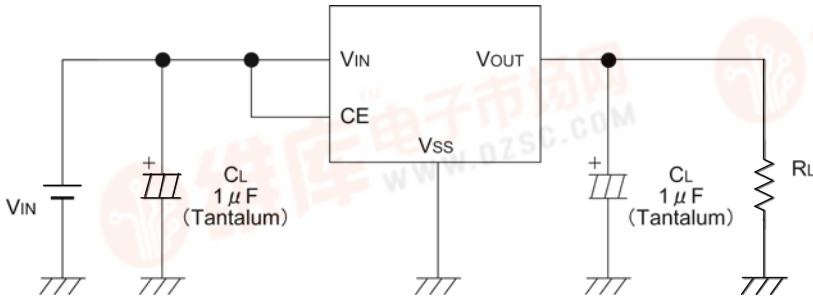
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*5: V_{IN1} = The input voltage when V_{OUT1} appears as input voltage is gradually decreased.

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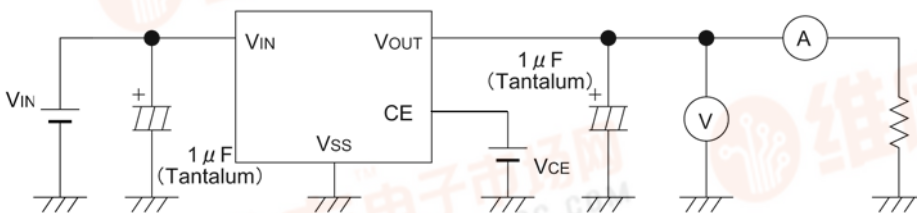
■ TYPICAL APPLICATION CIRCUIT

● Standard Circuit

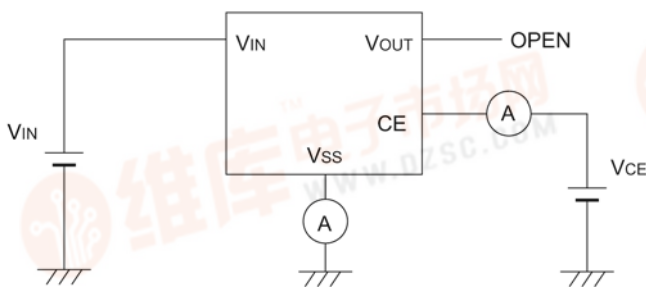


■ TEST CIRCUITS

Circuit 1

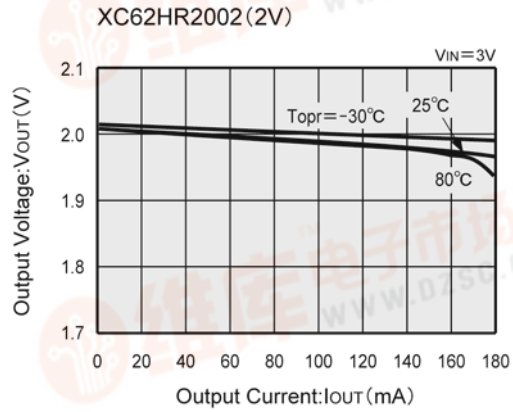
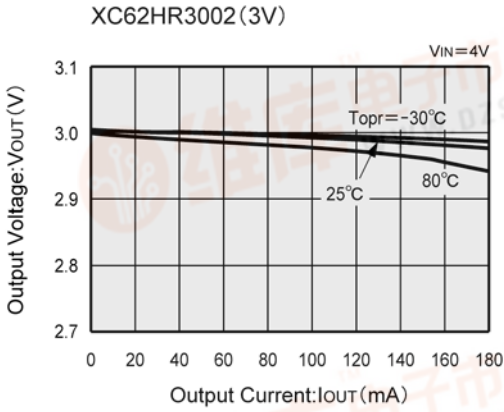
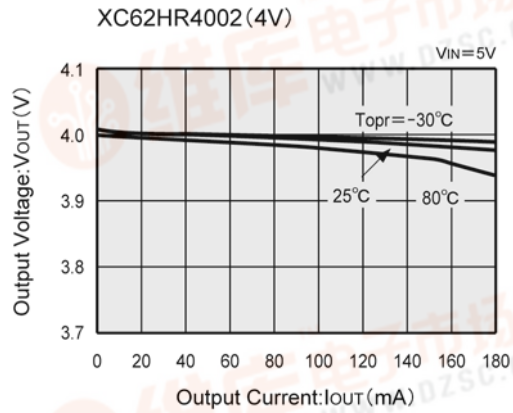
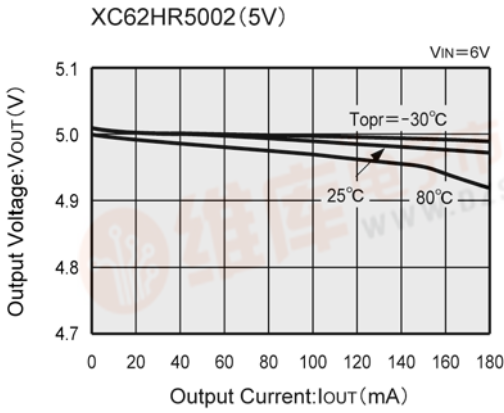


Circuit 2

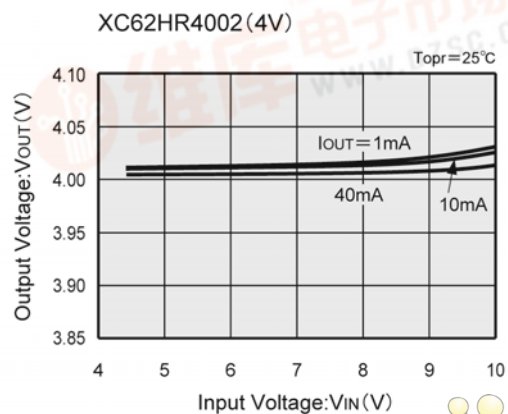
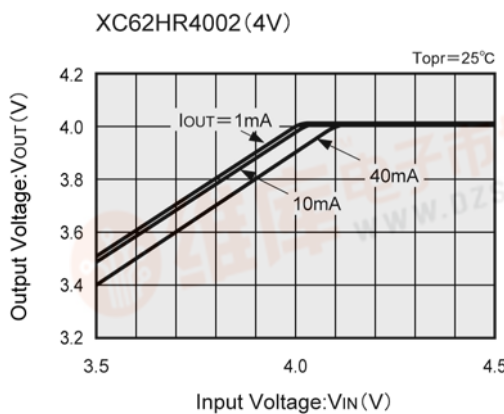
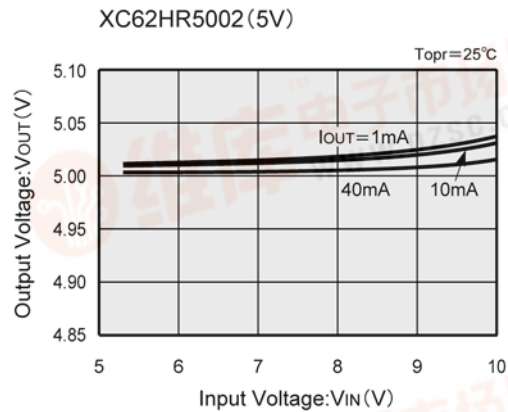
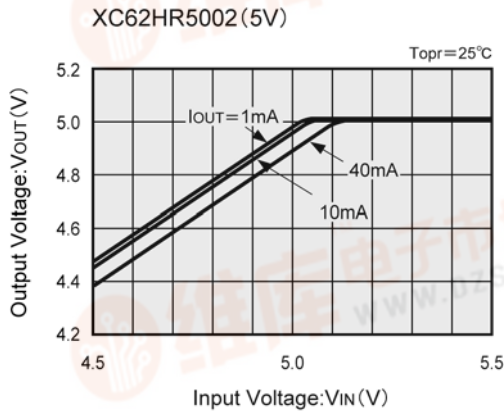


TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Output Current



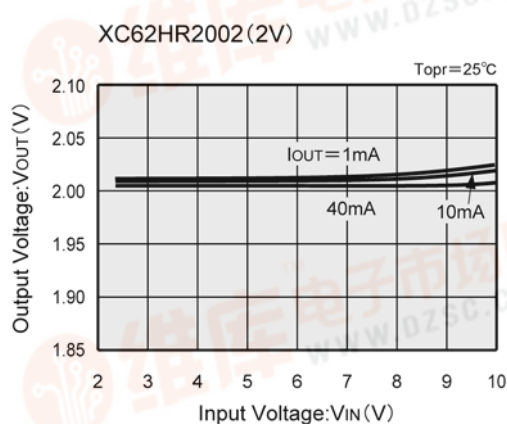
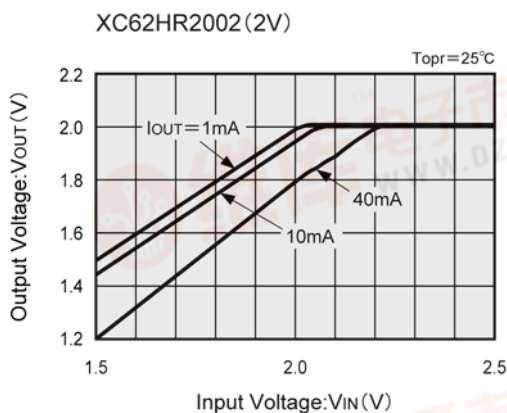
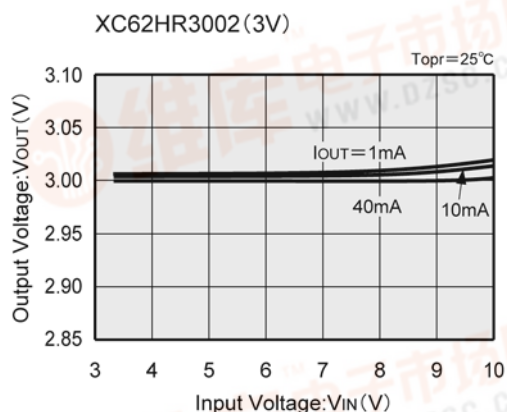
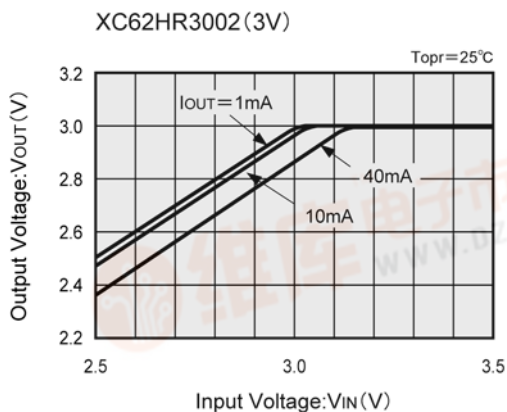
(2) Output Voltage vs. Input Voltage



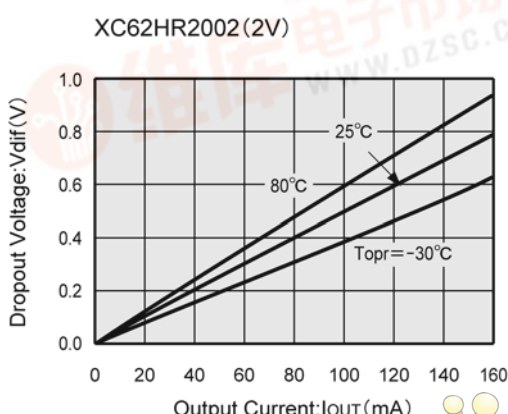
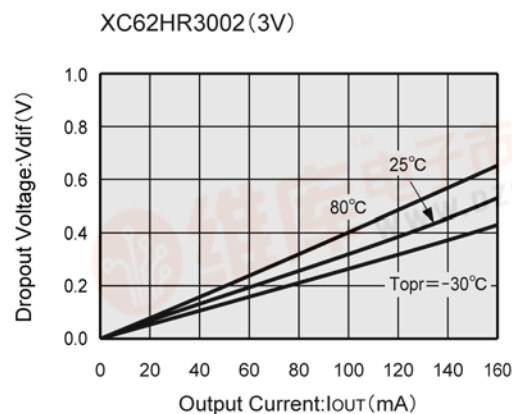
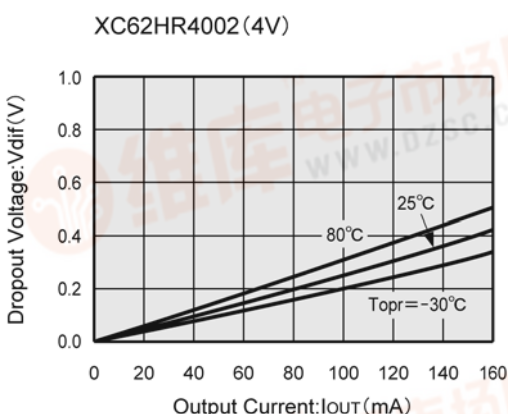
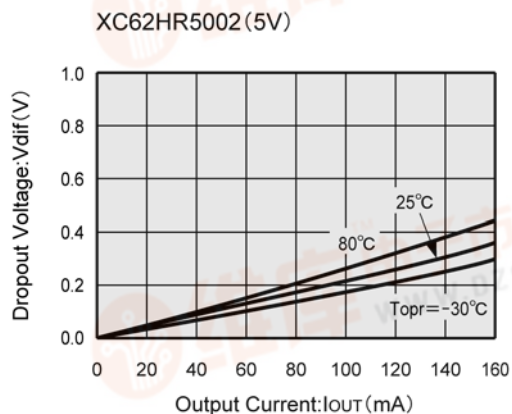
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■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(2) Output Voltage vs. Input Voltage (Continued)

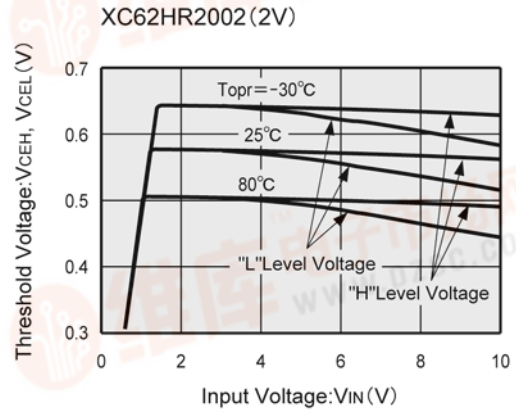
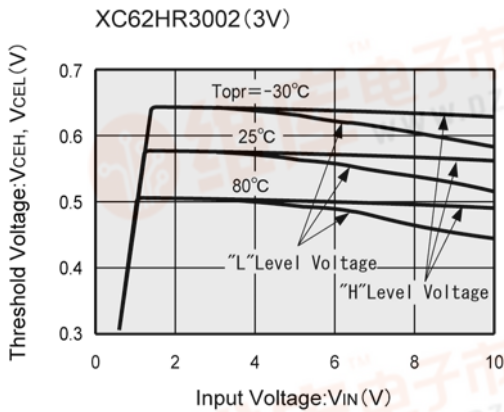
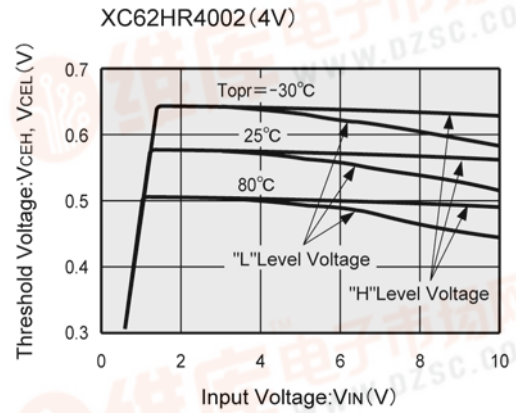
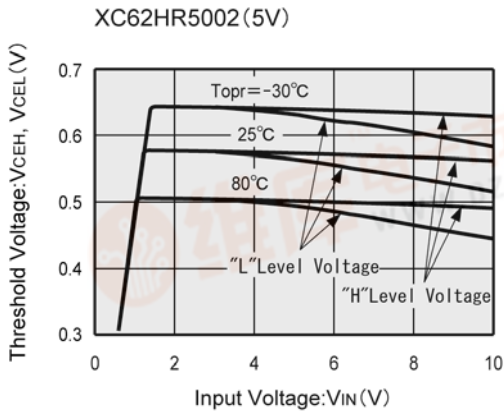


(3) Dropout Voltage vs. Output Current

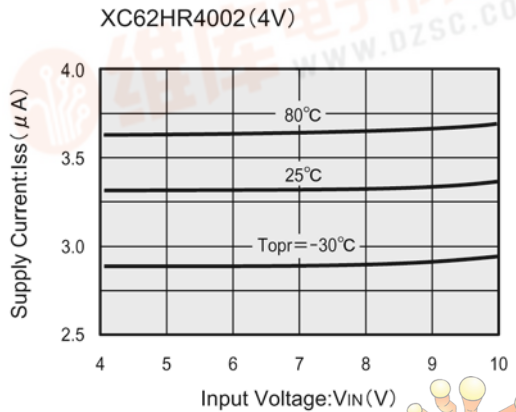
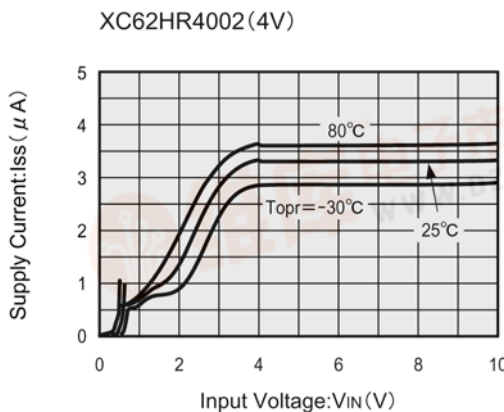
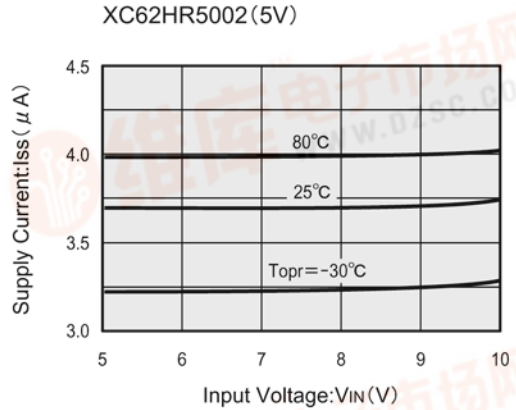
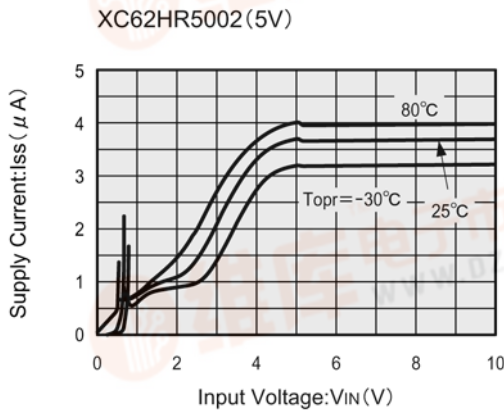


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(4) CE Pin Threshold Voltage vs. Input Voltage



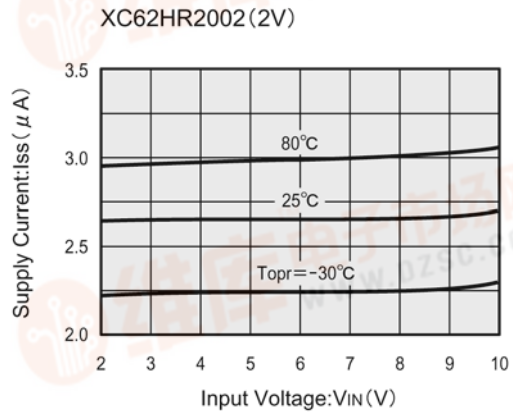
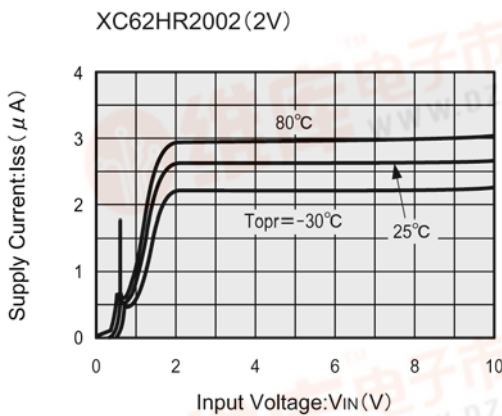
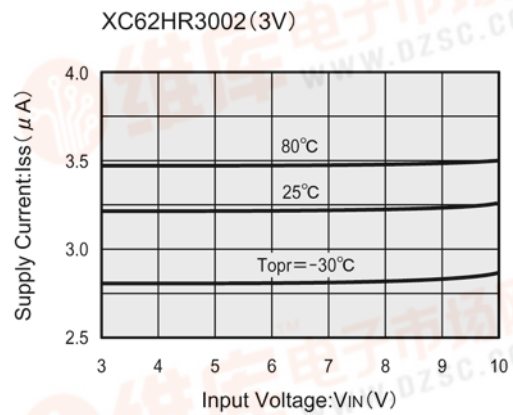
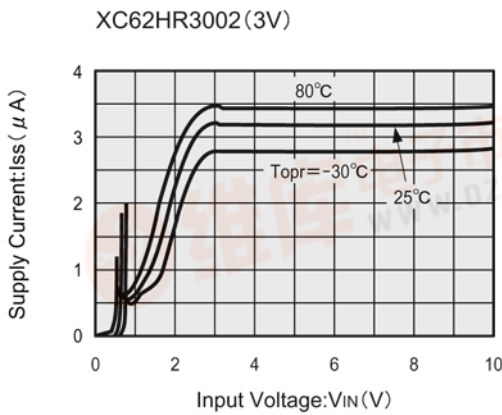
(5) Supply Current vs. Input Voltage



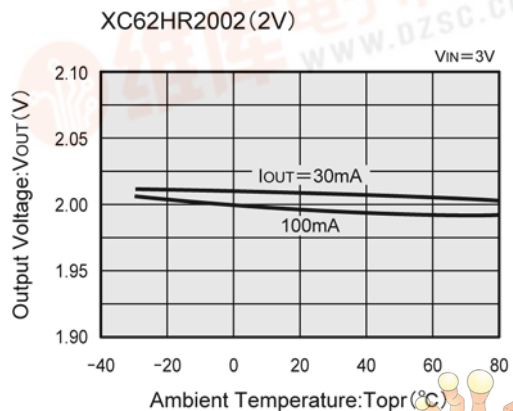
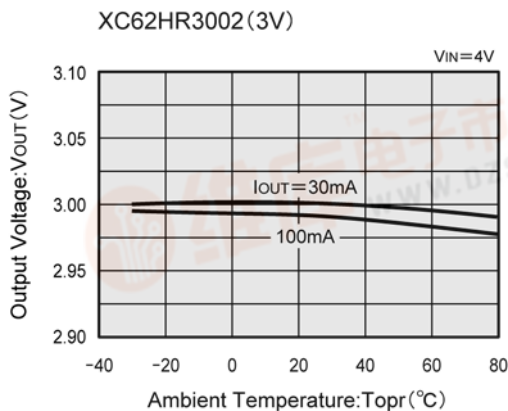
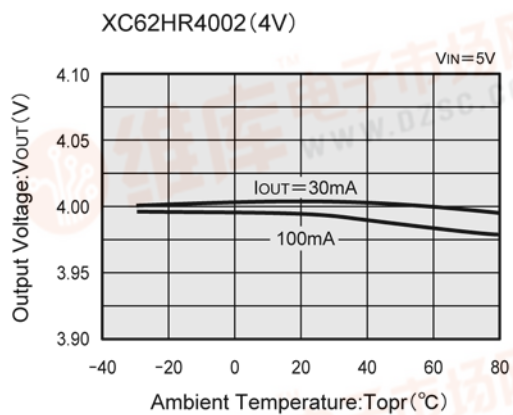
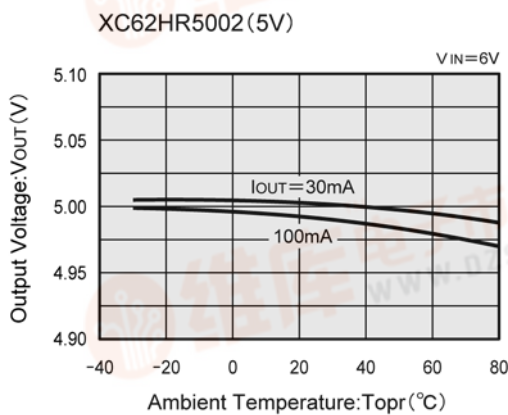
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■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(5) Supply Current vs. Input Voltage (Continued)

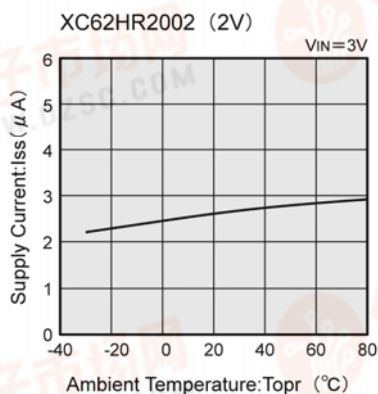
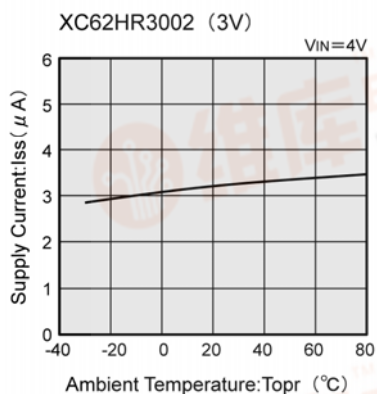
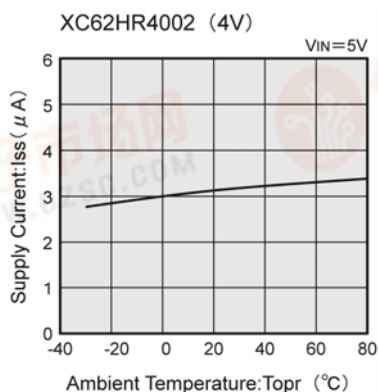
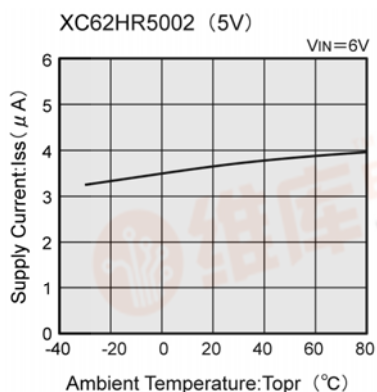


(6) Output Voltage vs. Ambient Temperature

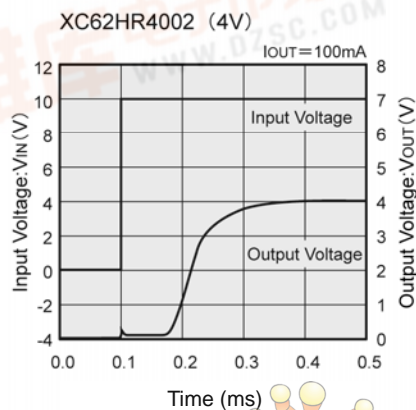
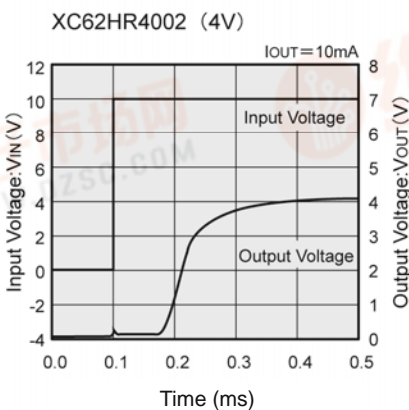
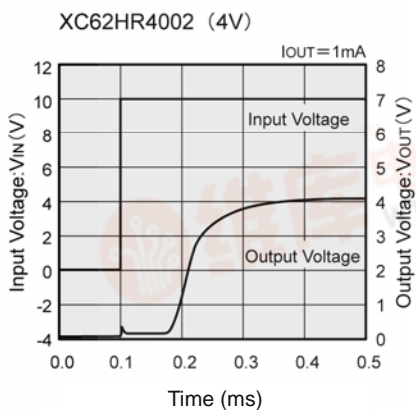
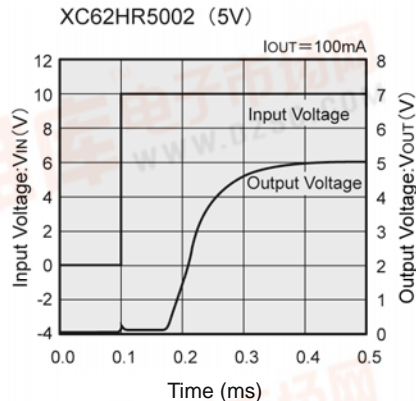
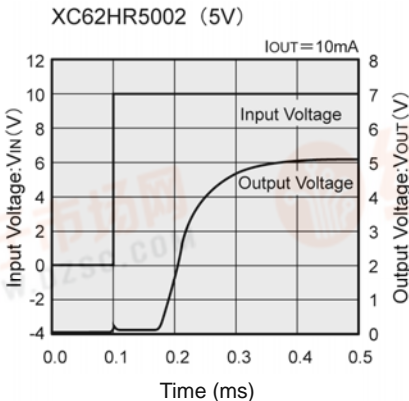
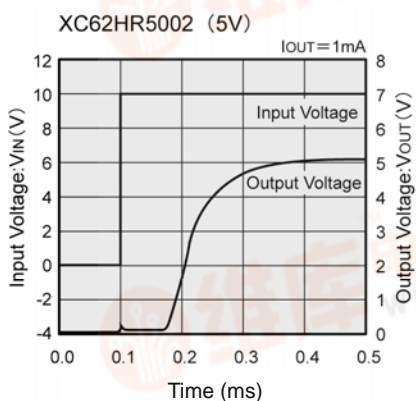


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(7) Supply Current vs. Ambient Temperature



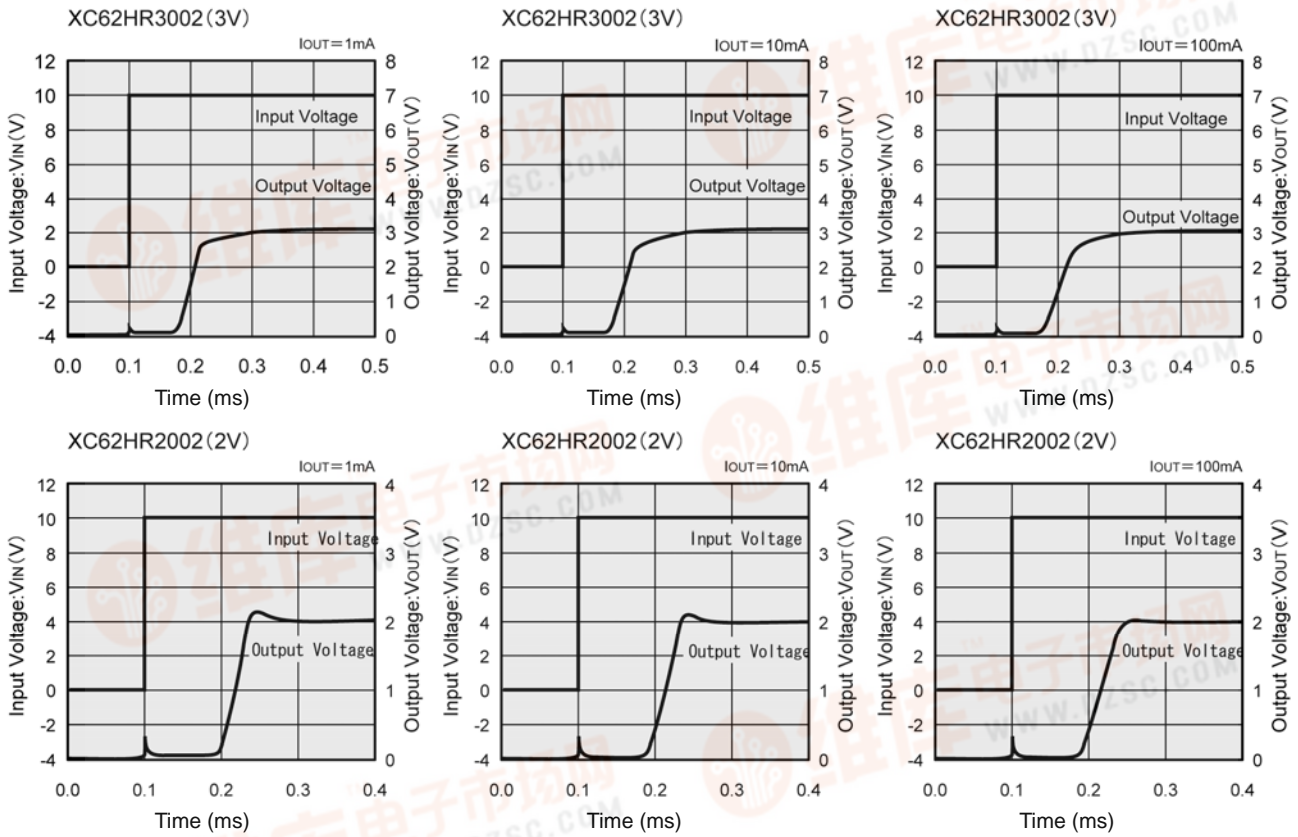
(8) Input Transient Response 1



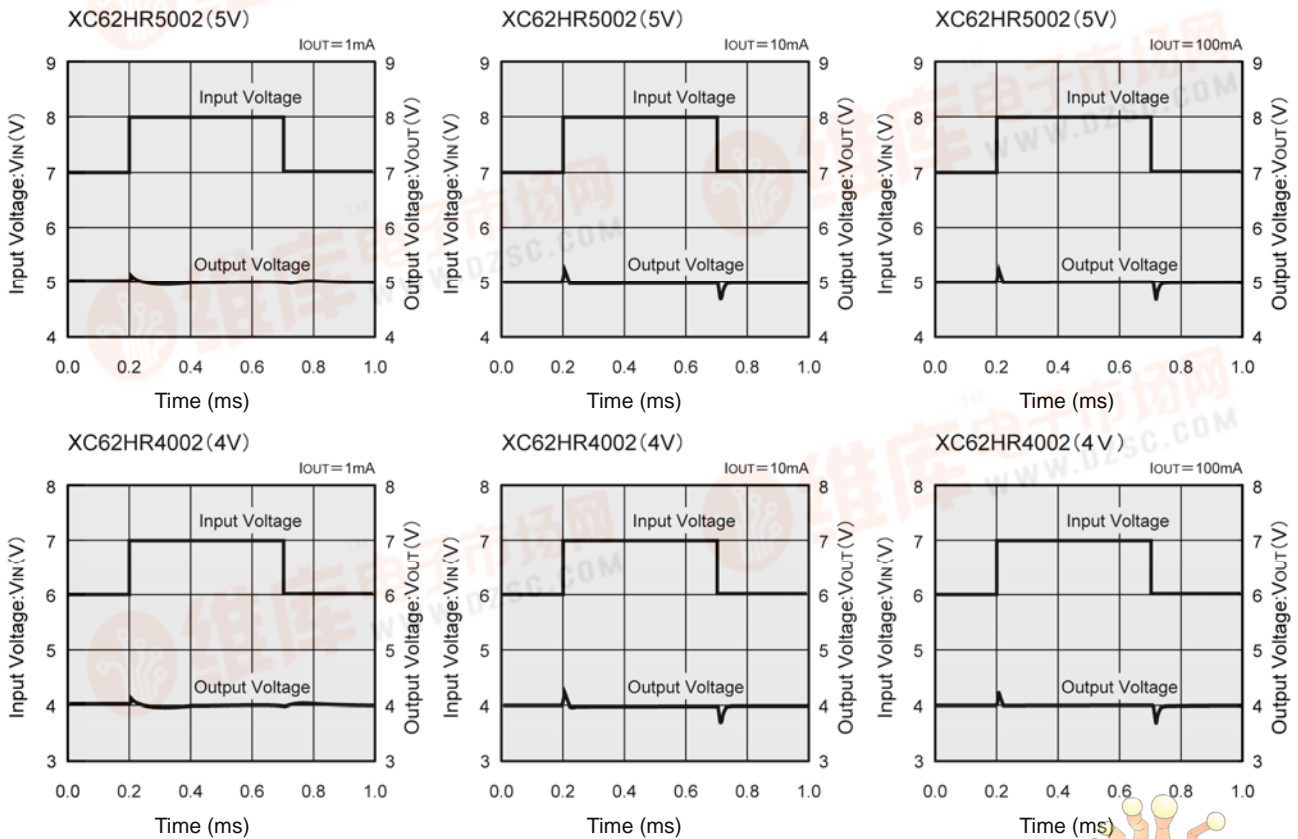
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■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(8) Input Transient Response 1 (Continued)

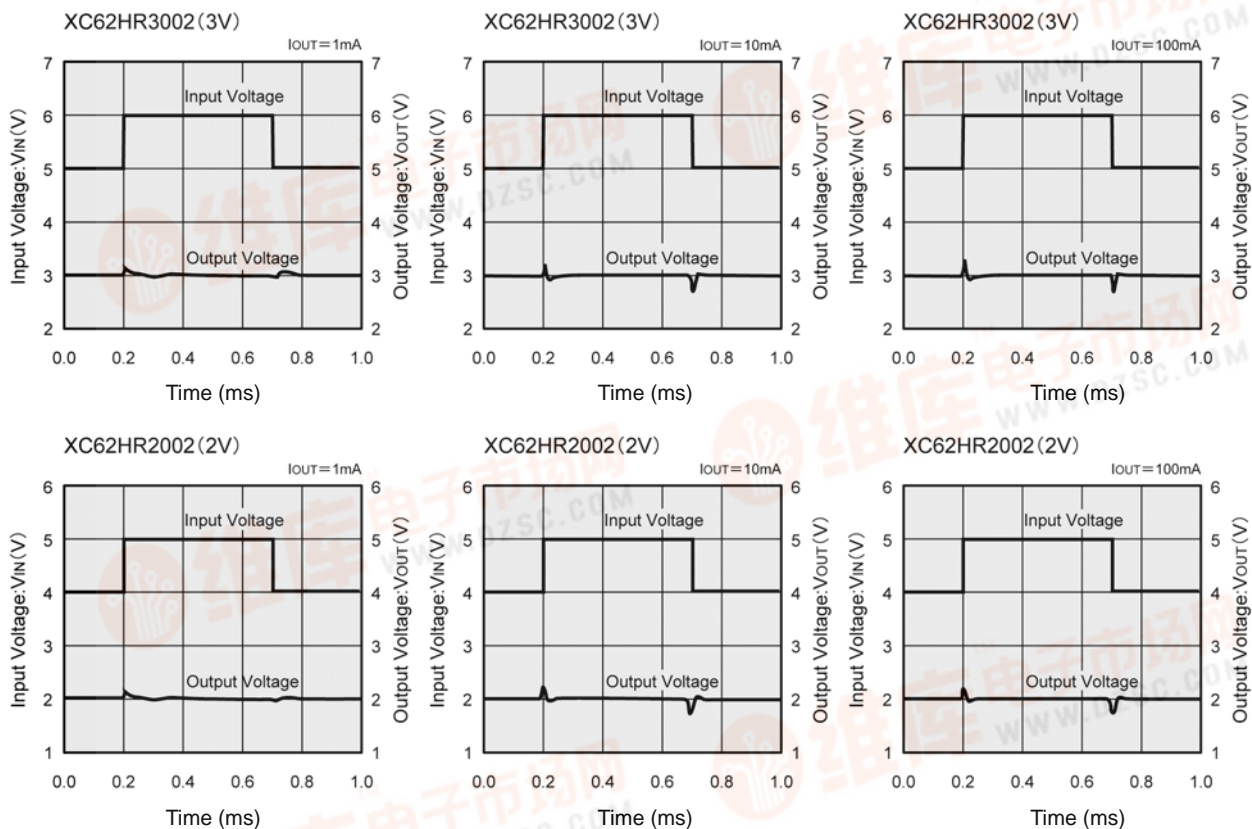


(9) Input Transient Response 2

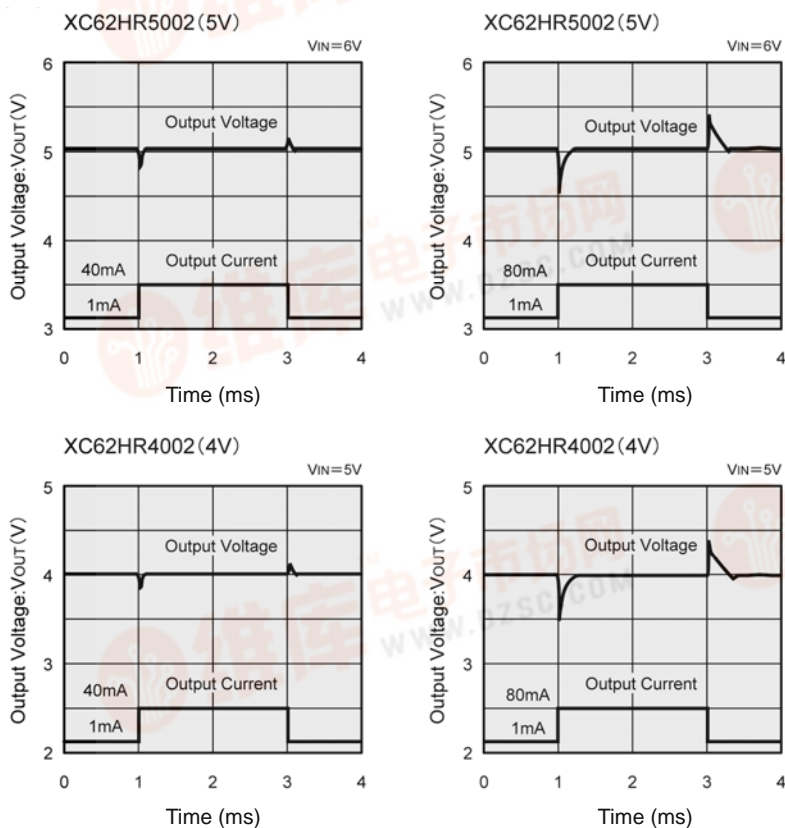


■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(9) Input Transient Response 2 (Continued)

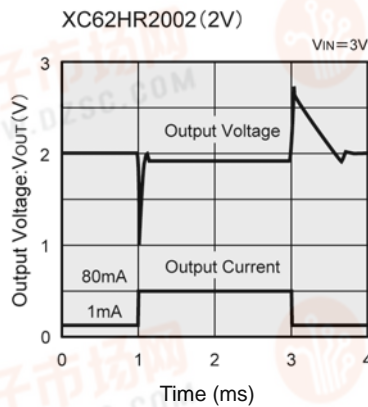
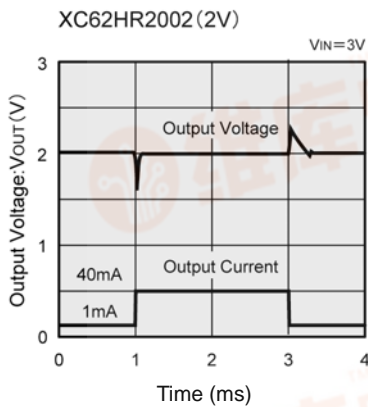
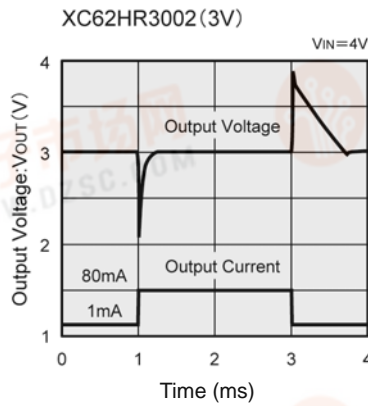
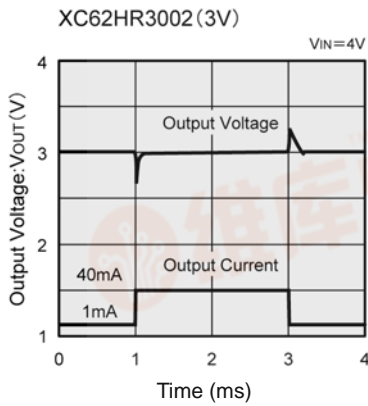


(10) Load Transient Response

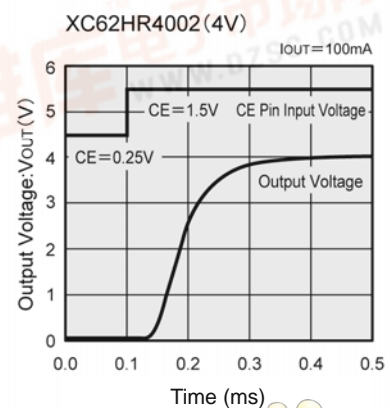
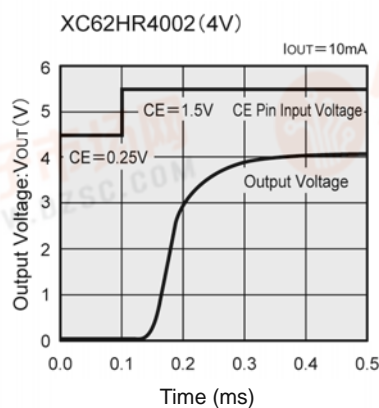
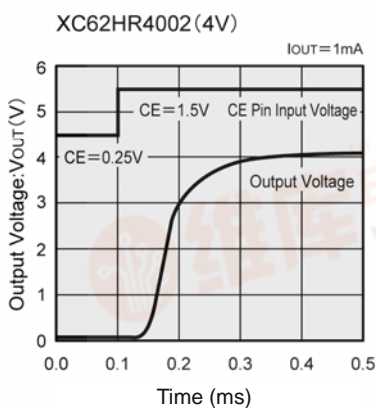
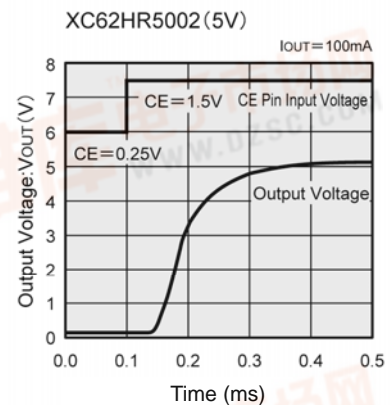
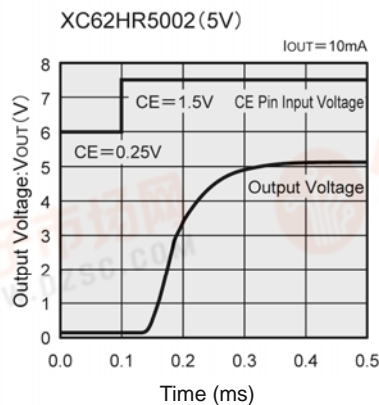
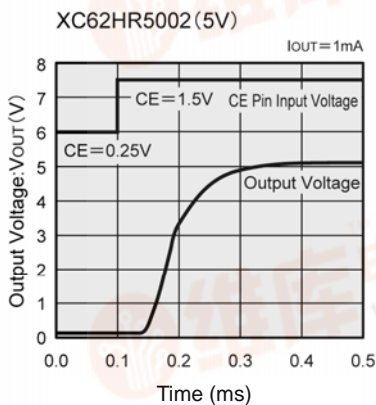


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(10) Load Transient Response (Continued)

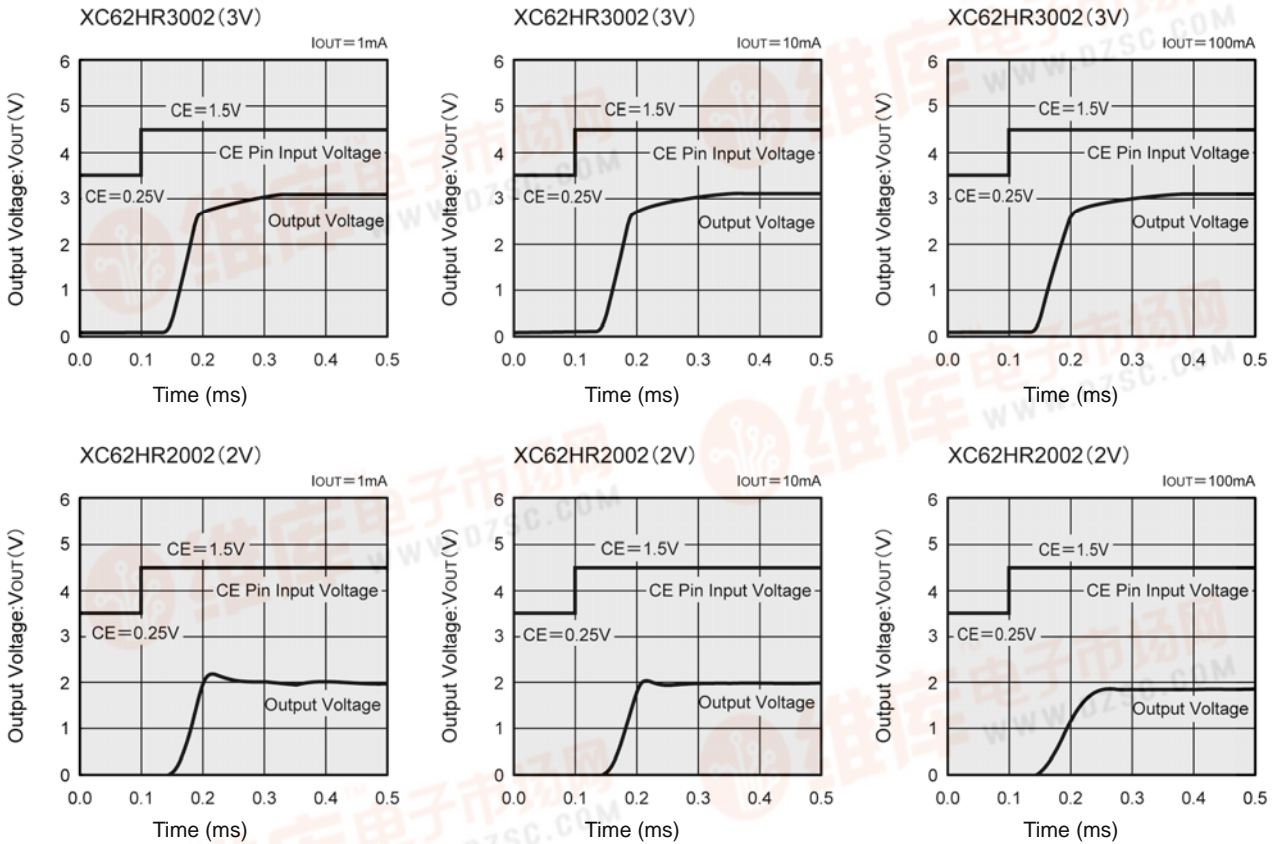


(11) CE Pin Transient Response

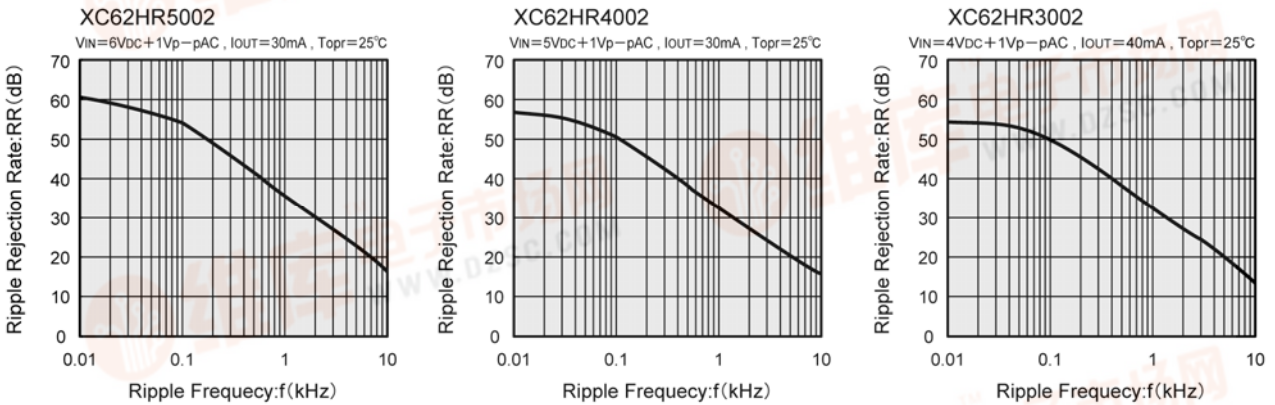


■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(11) CE Pin Transient Response (Continued)



(12) Ripple Rejection Rate

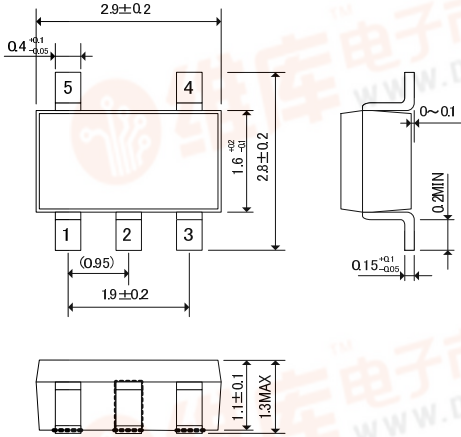


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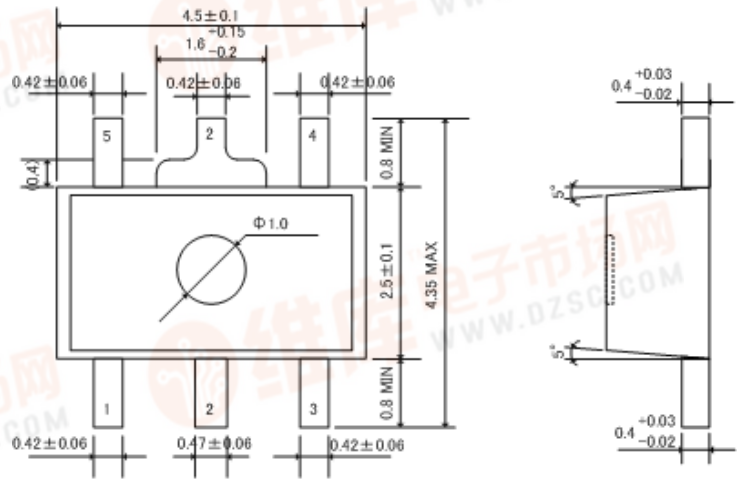
PACKAGING INFORMATION

● SOT-25

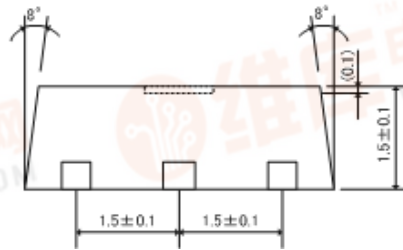
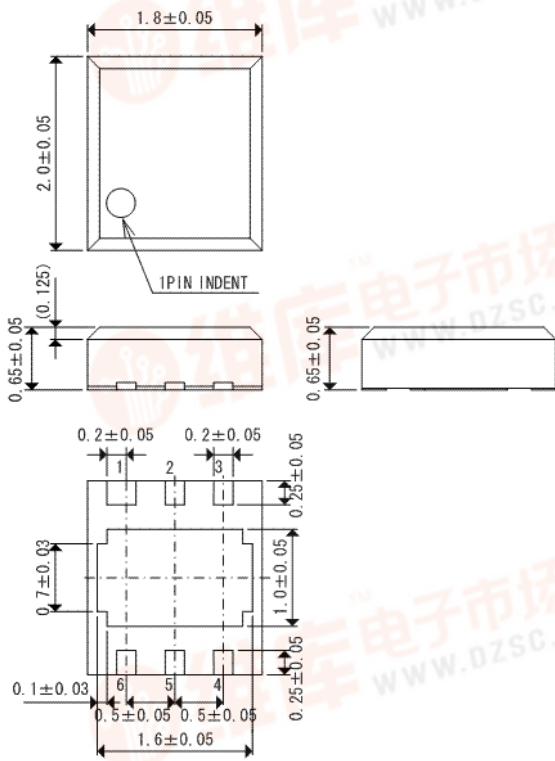
(unit : mm)



● SOT-89-5

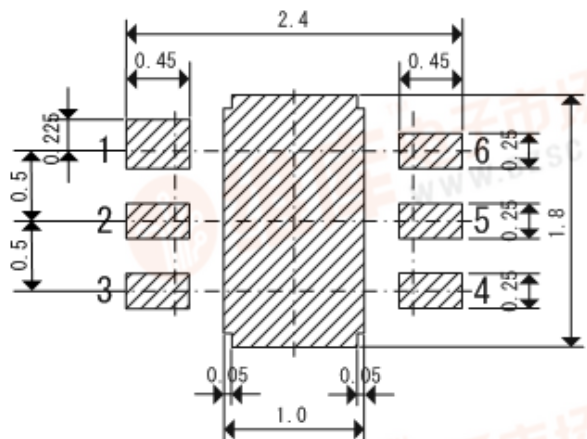


● USP-6B

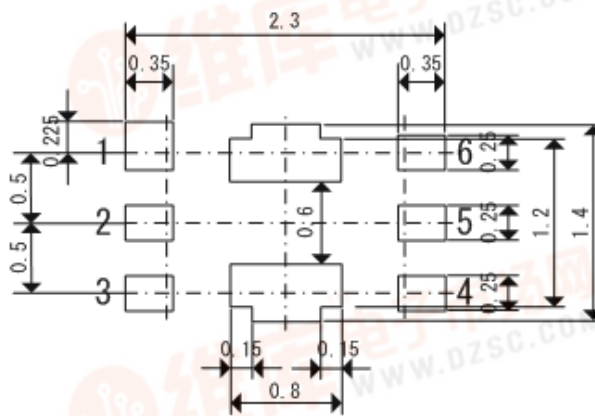


PACKAGING INFORMATION (Continued)

● USP-6B Reference Pattern Layout

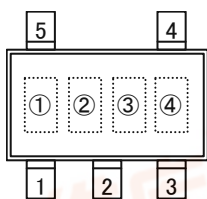


● USP-6B Reference metal mask design

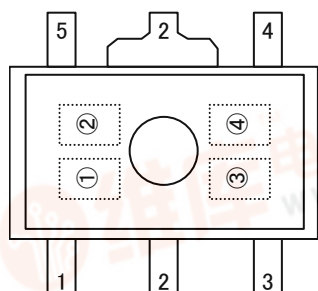


MARKING RULE

● SOT-25, SOT-89-5



SOT-25
(TOP VIEW)



SOT-89-5
(TOP VIEW)

① represents integer of the output voltage

| MARK | VOLTAGE (V) | MARK | VOLTAGE (V) |
|------|-------------|------|-------------|
| 0 | 0.x | 0 | 0.x |
| 1 | 1.x | 1 | 1.x |
| 2 | 2.x | 2 | 2.x |
| 3 | 3.x | 3 | 3.x |
| 4 | 4.x | 4 | 4.x |
| 5 | 5.x | 5 | 5.x |
| 6 | 6.x | 6 | 6.x |
| 7 | 7.x | 7 | 7.x |
| 8 | 8.x | 8 | 8.x |
| 9 | 9.x | 9 | 9.x |

② represents decimal number of the output voltage

| MARK | VOLTAGE (V) | MARK | VOLTAGE (V) |
|------|-------------|------|-------------|
| 0 | x.0 | 0 | x.0 |
| 1 | x.1 | 1 | x.1 |
| 2 | x.2 | 2 | x.2 |
| 3 | x.3 | 3 | x.3 |
| 4 | x.4 | 4 | x.4 |
| 5 | x.5 | 5 | x.5 |
| 6 | x.6 | 6 | x.6 |
| 7 | x.7 | 7 | x.7 |
| 8 | x.8 | 8 | x.8 |
| 9 | x.9 | 9 | x.9 |

③ based on internal standards

④ represents assembly lot number.

0 to 9, A to Z repeated (G, I, J, O, Q, W excluded)

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