

PRELIMINARY

CCD VERTICAL DRIVER

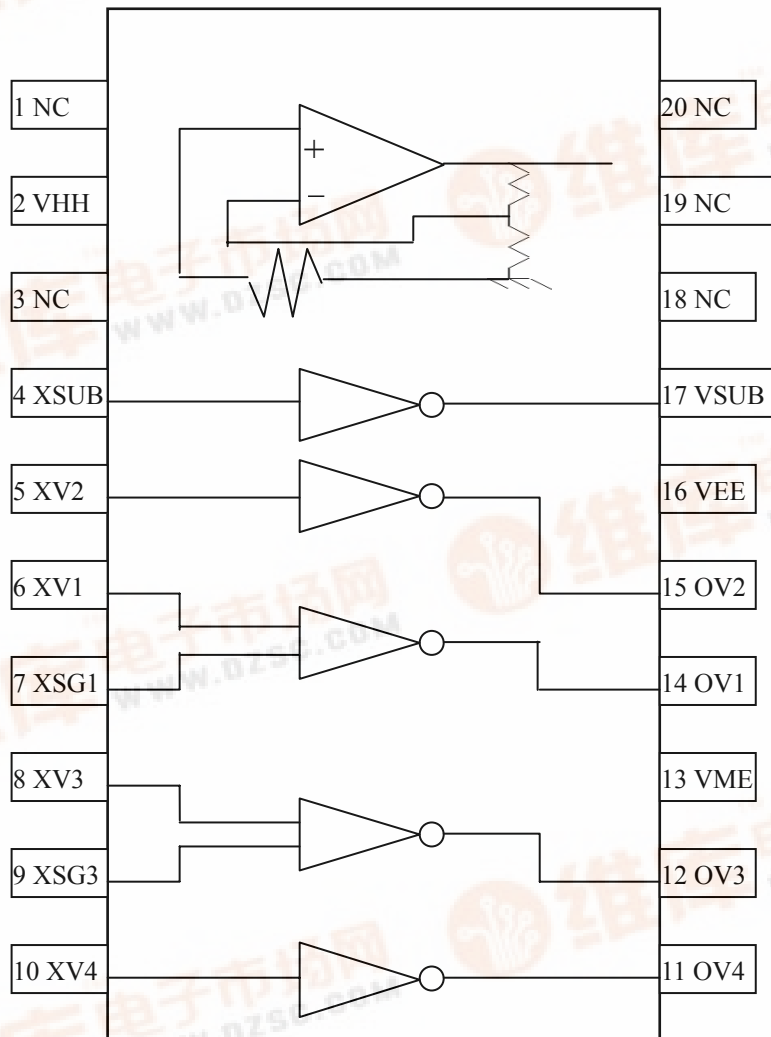
■ **FEATURES**

- 3 levels of output voltage, 15V, 0V and -8.5V
- 3.3V / 5V input voltage

■ **DESCRIPTION**

The AA87223AP is a vertical driver for CCD image sensors, with 3 levels of output voltage processed in a standard CMOS.

■ **PIN ASSIGNMENT & BLOCK DIAGRAM**



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■ **PIN DESCRIPTION**

| Symbol | Pin No. | Type | Name & Function |
|---------------|---------|------|--|
| POWER | | | |
| VHH | 2 | - | +15V power supply pin |
| VME | 13 | - | Ground pin |
| VEE | 16 | - | -8.5V power supply pin |
| INPUT SIGNAL | | | |
| XSUB | 4 | I | Input signal pin --control VSUB |
| XV1 | 5 | I | Input signal pin --control OV1 |
| XV2 | 6 | I | Input signal pin --control OV2 |
| XV3 | 8 | I | Input signal pin --control OV3 |
| XV4 | 10 | I | Input signal pin --control OV4 |
| XSG1 | 7 | I | Input signal pin --control OV1 |
| XSG3 | 9 | I | Input signal pin --control OV3 |
| OUTPUT SIGNAL | | | |
| VSUB | 17 | O | Output signal pin --2 level, VEE & VHH |
| OV1 | 14 | O | Output signal pin--3 level, VEE, VHH & VME |
| OV2 | 15 | O | Output signal pin --2 level, VEE & VME |
| OV3 | 12 | O | Output signal pin--3 level, VEE, VHH & VME |
| OV4 | 11 | O | Output signal pin --2 level, VEE & VME |

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■ **ABSOLUTE MAXIMUM RATINGS** (See NOTE)

| Parameter | Symbol | Rating | | | UNIT |
|----------------------------------|----------------|---------|-----|---------|------|
| | | MIN | TYP | MAX | |
| Supply Voltage | VEE | -10 | | 0 | V |
| | VHH | -0.3 | | VEE+30 | V |
| Input Voltage | VI | -0.3 | | VHH+0.3 | V |
| Output Voltage | OV1, OV3, VSUB | VEE-0.3 | | VHH+0.3 | V |
| | OV2, OV4 | VEE-0.3 | | VME+0.3 | V |
| Voltage-Amplifier Output Current | Idcut | -5 | | 5 | mA |
| Operating Ambient Temperature | Ta | -25 | | 85 | |
| Storage Temperature | Ts | -45 | | 125 | |

NOTE: Stress above those listed under “Absolute Maximum Rating” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for the extended periods of time may affect device reliability.

■ **LOGIC TRUTH TABLE**

| INPUT | | | | OUTPUT | | |
|--------|---------|--------|------|--------|--------|------|
| XV1, 3 | XSG1, 3 | XV2, 4 | XSUB | OV1, 3 | OV2, 4 | VSUB |
| L | L | X | X | VHH | X | X |
| H | L | X | X | Z | X | X |
| L | H | X | X | VME | X | X |
| H | H | X | X | VEE | X | X |
| X | X | L | X | X | VME | X |
| X | X | H | X | X | VEE | X |
| X | X | X | L | X | X | VHH |
| X | X | X | H | X | X | VEE |

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■ **DC CHARACTERISTICS** (V_{HH}=15, V_{ME}=GND, V_{EE}=-8.5V; T_a = 25)

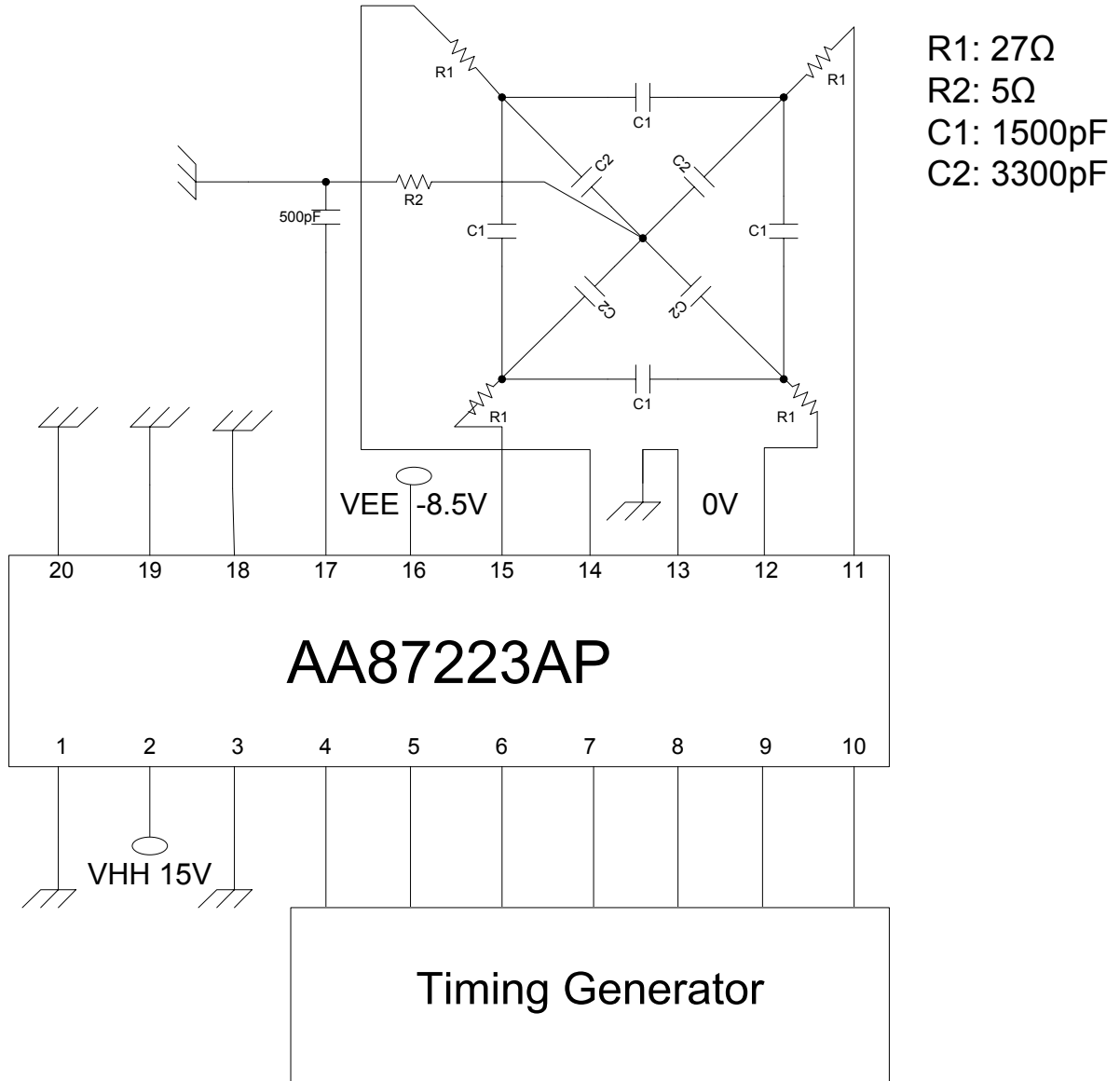
| Parameter | Symbol | Value | | | Unit | Condition |
|----------------|------------------|-------|------|------|------|----------------------------|
| | | Min | Typ | Max | | |
| Power Supply | V _{HH} | 14.5 | 15 | 15.5 | V | |
| | V _{EE} | -9.5 | -8.5 | -7.5 | V | |
| Supply Current | I _{HH} | | 2.4 | 6 | mA | (*1) |
| | I _{EE} | -8 | -4.2 | | mA | |
| Input Voltage | V _{IH} | 2.3 | | | V | |
| | V _{IL} | | | 1.3 | | |
| Input Current | I _I | -1 | 0 | 1 | uA | V _{IN} =0~5V (*2) |
| Output Current | I _{OL} | 24 | 30 | | mA | OV1~4=-8.0V |
| | I _{OM1} | | -18 | -25 | mA | OV1~4=-0.5V |
| | I _{OM2} | | 18 | 25 | mA | OV1,3=0.5V |
| | I _{OH} | | -15 | -25 | mA | OV1,3=14.5V |
| | I _{OSL} | | 21 | 30 | mA | V _{SUB} =-8.0V |
| | I _{OSH} | | -10 | -15 | mA | V _{SUB} =14.5V |

(*1) Refer the measurement circuit. Shutter speed: 1/40us

(*2) XV1~4, XSG1, 3, XSUB pins

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■ **MEASUREMENT CIRCUIT**



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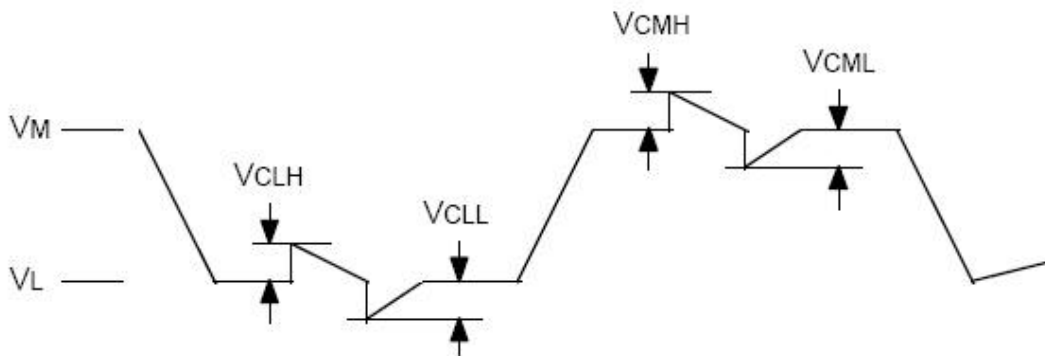
■ **AC CHARACTERISTICS** (V_{HH}=15, V_{ME}=GND, V_{EE}=-8.5V; T_a = 25)

| Parameter | Symbol | Value | | | Unit | Condition |
|----------------------|--|-------|-----|-----|------|---------------------------------------|
| | | Min | Typ | Max | | |
| Delay Time | T _{PLM} | 100 | 140 | 190 | nS | No Load (*1) |
| | T _{PMH} | 100 | 140 | 190 | nS | |
| | T _{PLH} | 110 | 150 | 210 | nS | |
| | T _{PML} | 190 | 250 | 310 | nS | |
| | T _{PHM} | 190 | 250 | 310 | nS | |
| | T _{PHL} | 150 | 220 | 270 | nS | |
| Transition Time | T _{TLM} | 170 | 250 | 330 | nS | V _{EE} →V _{ME} (*1) |
| | T _{TMH} | 190 | 240 | 310 | nS | V _{ME} →V _{HH} (*1) |
| | T _{TLH} | 100 | 150 | 210 | nS | V _{EE} →V _{HH} (*1) |
| | T _{TML} | 100 | 200 | 310 | nS | V _{ME} →V _{EE} (*1) |
| | T _{THM} | 60 | 110 | 170 | nS | V _{HH} →V _{ME} (*1) |
| | T _{THL} | 90 | 140 | 210 | nS | V _{HH} →V _{EE} (*1) |
| Output Noise Voltage | V _{CLH} , V _{CLL} V _{CMH} , V _{CML} | | | 0.5 | V | (*2) |

(*1) Refer Timing Diagram

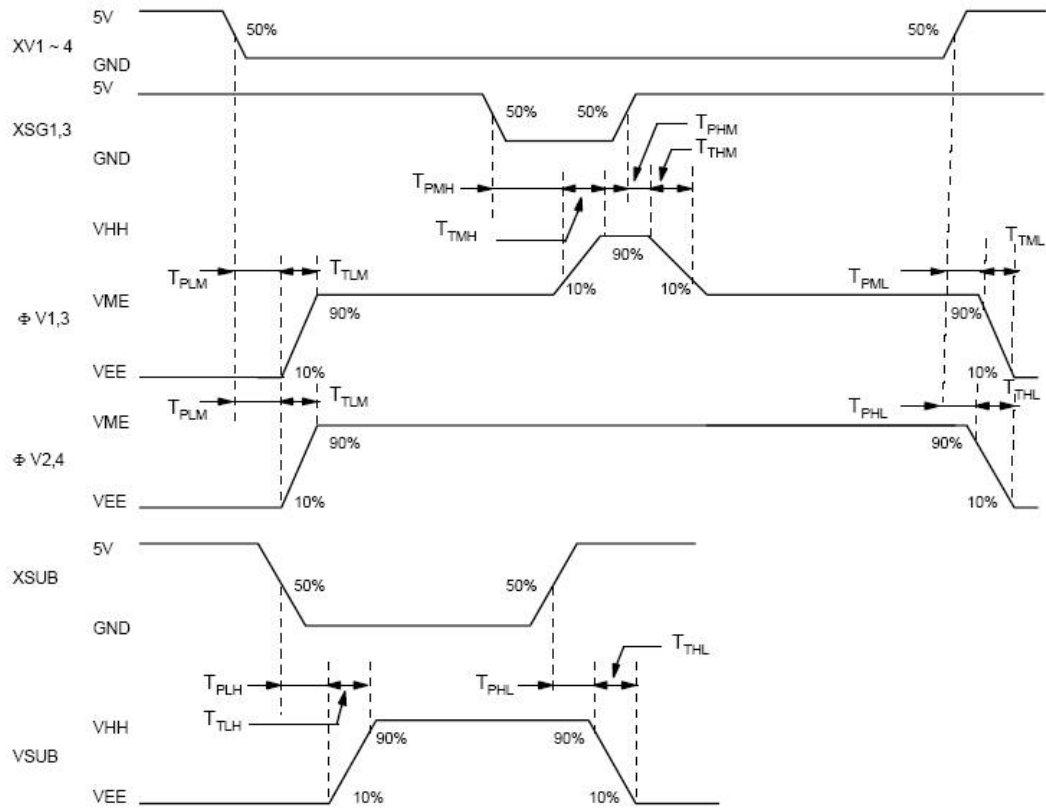
(*2) Refer Noise Diagram

■ **NOISE DIAGRAM**



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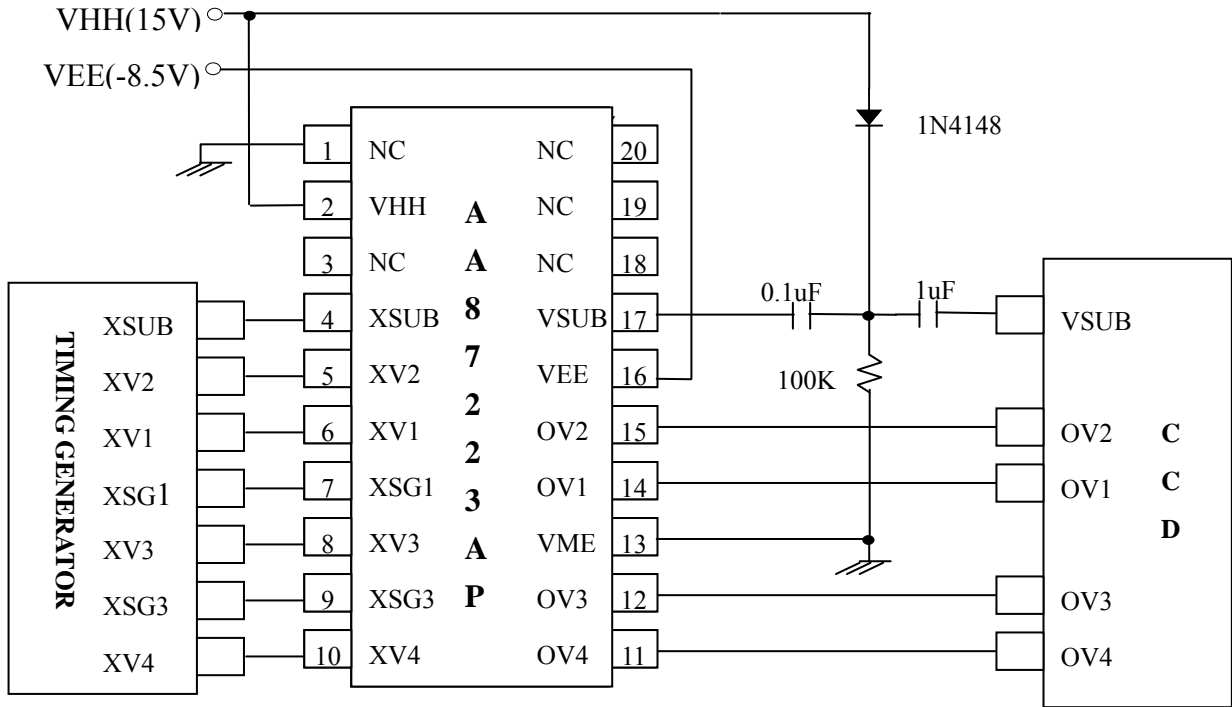
■ **TIMING DIAGRAM**



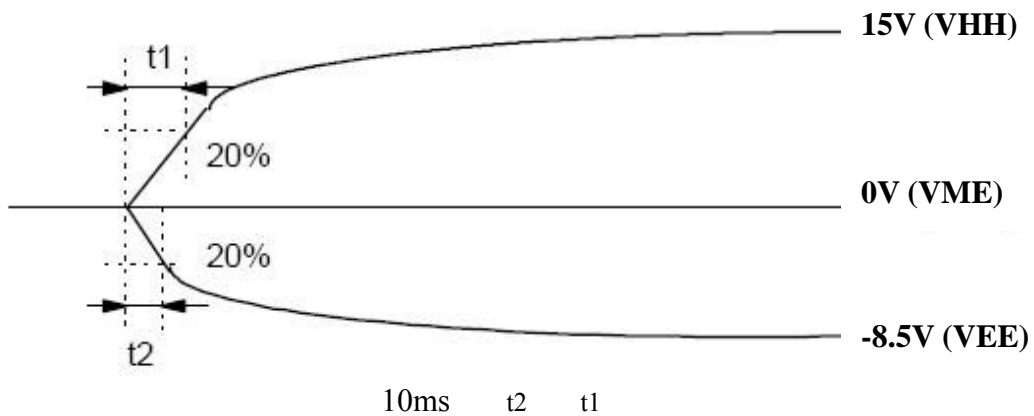
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■ **APPLICATION CIRCUIT**



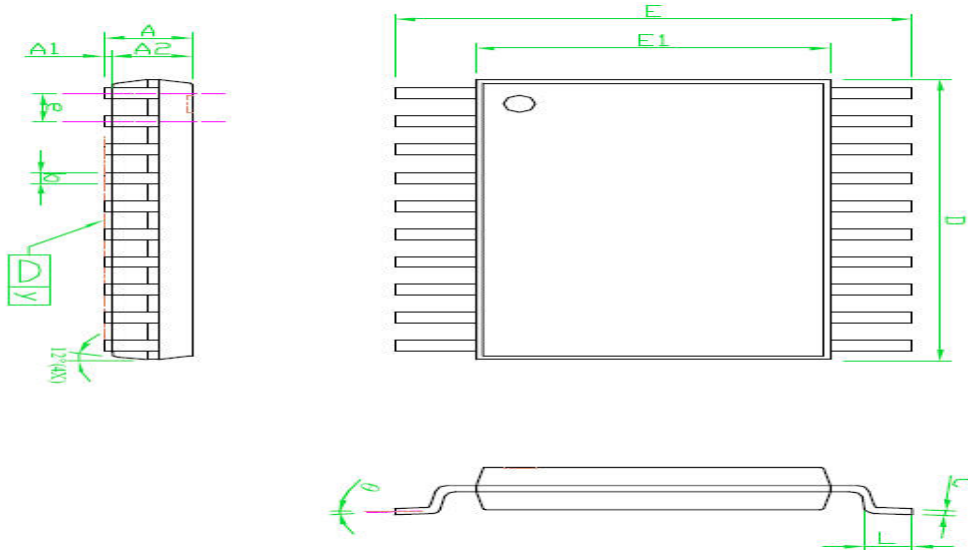
In case of $DCOUT = VHH - 1.0V$, Warning: When voltage is biased, you must keep this flow. If you don't, negative voltage is applied to CCD image sensor's SUB.



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■ **TSSOP 20L PACKAGE DIMENSION**



NOTE:

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS
2. TOLERANCE $\pm 0.1\text{mm}$ UNLESS OTHERWISE SPECIFIED
3. COPLANARITY: 0.1mm
4. CONTROLLOMG DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. FOLLOWED FROM JEDEC MO-153

| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|----------|---------------------------|------|------|----------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | - | - | 1.20 | - | - | 0.048 |
| A1 | 0.05 | - | 0.15 | 0.002 | - | 0.006 |
| A2 | 0.80 | 1.00 | 1.05 | 0.031 | 0.039 | 0.041 |
| b | 0.19 | - | 0.30 | 0.007 | - | 0.012 |
| C | 0.09 | - | 0.20 | 0.004 | - | 0.008 |
| D | 6.40 | 6.50 | 6.60 | 0.252 | 0.256 | 0.260 |
| E | 6.20 | 6.40 | 6.60 | 0.244 | 0.252 | 0.260 |
| E1 | 4.30 | 4.40 | 4.50 | 0.169 | 0.173 | 0.177 |
| e | - | 0.65 | - | - | 0.026 | - |
| L | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |
| y | - | - | 0.10 | - | - | 0.004 |
| θ | 0° | - | 8° | 0° | - | 8° |