

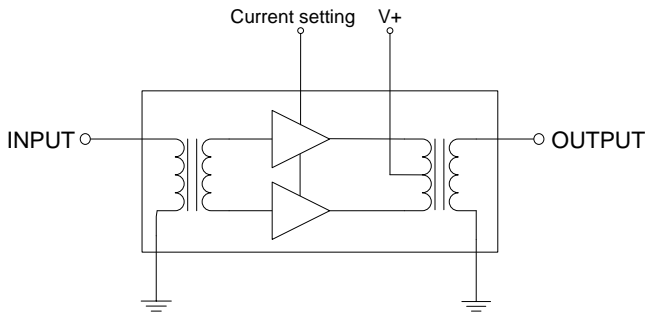
### Product Description

The QPA3250 is a Hybrid Power Doubler amplifier module. The part employs GaAs pHEMT die and GaN HEMT die and operates from 45MHz to 1218MHz. It provides extremely high output up to 76.8dBmV composite power or 67dBmV virtual level. DC current as well as supply voltage of the device can be externally adjusted for optimum distortion performance versus power consumption over a wide range of output level. QPA3250 is optimized to work under DPD (Digital Pre-Distortion) in order to save power or to improve linearity.



Package: SOT-115J

### Functional Block Diagram



### Product Features

- Extremely High Output Capability
- Excellent Linearity
- Superior Return Loss Performance
- Optimal Reliability
- Unconditionally Stable Under all Terminations
- 22.5dB Min. Gain at 1218MHz
- 550mA Max.
- Device works at V+ between 24V and 34V
- DOCSIS 3.1 Compliant
- Optimized to work under DPD (Digital Pre-Distortion)

### Applications

- 45 – 1218 MHz CATV Amplifier Systems
- Node+x and Deep Fiber Node Systems

### Ordering Information

| Part No. | Description     |
|----------|-----------------|
| QPA3250  | Box with 50 pcs |
|          |                 |

## QPA3250 Absolute Maximum Ratings

| Parameter                           | Value / Range |
|-------------------------------------|---------------|
| RF Input Voltage (single tone)      | 75 dBmV       |
| DC Supply over-voltage (5 minutes)  | +38 V         |
| Vpin4 over-voltage (5 minutes)      | +38 V         |
| Storage Temperature                 | -40 to 100 °C |
| Operating Mounting Base Temperature | -30 to 100 °C |

Operation of this device outside the parameter ranges given above may cause permanent damage.

## Electrical Specifications

| Parameter                         | Test Conditions: V+=34V, Vpin4=2.5V, T <sub>MB</sub> =35°C, Z <sub>S</sub> =Z <sub>L</sub> =75Ω | Min   | Typ     | Max  | Unit |
|-----------------------------------|---|-------|---------|------|------|
| IDC                               |   |       | 530     | 550  | mA   |
| Ipin4 (current setting pin)       |   | -1200 |         |      | μA   |
| Vpin4 Range (current setting pin) |   |       | 0...2.5 |      | V    |
| Operational Frequency Range       | –   | 45    | –       | 1218 | MHz  |
| Gain                              | f <sub>o</sub> = 45 MHz   |       | 21.8    |      | dB   |
| Gain                              | f <sub>o</sub> = 1218 MHz   | 22.5  | 23.0    | 24.0 |      |
| Gain Slope                        | 45 to 1218 MHz <sup>[1]</sup>   | 0.5   | 1.0     | 2.0  |      |
| Gain Flatness                     | 45 to 1218 MHz  |       |         | 0.8  |      |
| Input Return Loss                 | f <sub>o</sub> = 45 to 320 MHz  | 20.0  |         | –    | dB   |
|                                   | f <sub>o</sub> = 320 to 640 MHz   | 19.0  |         | –    |      |
|                                   | f <sub>o</sub> = 640 to 870 MHz   | 17.0  |         | –    |      |
|                                   | f <sub>o</sub> = 870 to 1000 MHz  | 16.0  |         | –    |      |
|                                   | f <sub>o</sub> = 1000 to 1218 MHz   | 15.0  |         | –    |      |
| Output Return Loss                | f <sub>o</sub> = 45 to 320 MHz  | 20.0  |         | –    | dB   |
|                                   | f <sub>o</sub> = 320 to 640 MHz   | 19.0  |         | –    |      |
|                                   | f <sub>o</sub> = 640 to 870 MHz   | 18.0  |         | –    |      |
|                                   | f <sub>o</sub> = 870 to 1000 MHz  | 17.0  |         | –    |      |
|                                   | f <sub>o</sub> = 1000 to 1218 MHz   | 16.0  |         | –    |      |
| Noise Figure                      | f <sub>o</sub> = 50 to 1218 MHz   | –     | 3.0     | 4.0  | dB   |
| CTB                               |   |       | -80     | -73  | dBc  |
| XMOD                              | VO = 63 dBmV at 1218MHz, 22dB extrapolated tilt,  |       | -75     | -57  | dBc  |
| CSO                               | 79 analog channels plus 111 digital channels  |       | -66     | -64  | dBc  |
| CIN                               | (-6dB offset) <sup>[2][3]</sup>   |       | 58      | 55   | dB   |

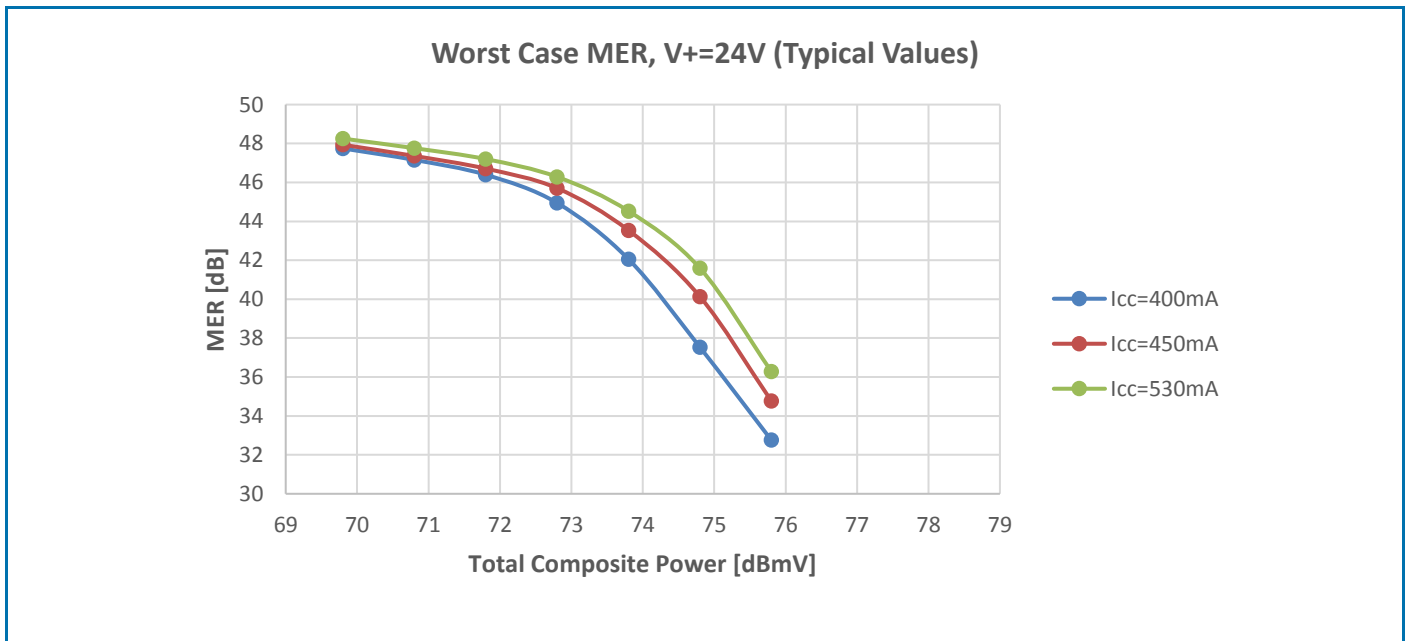
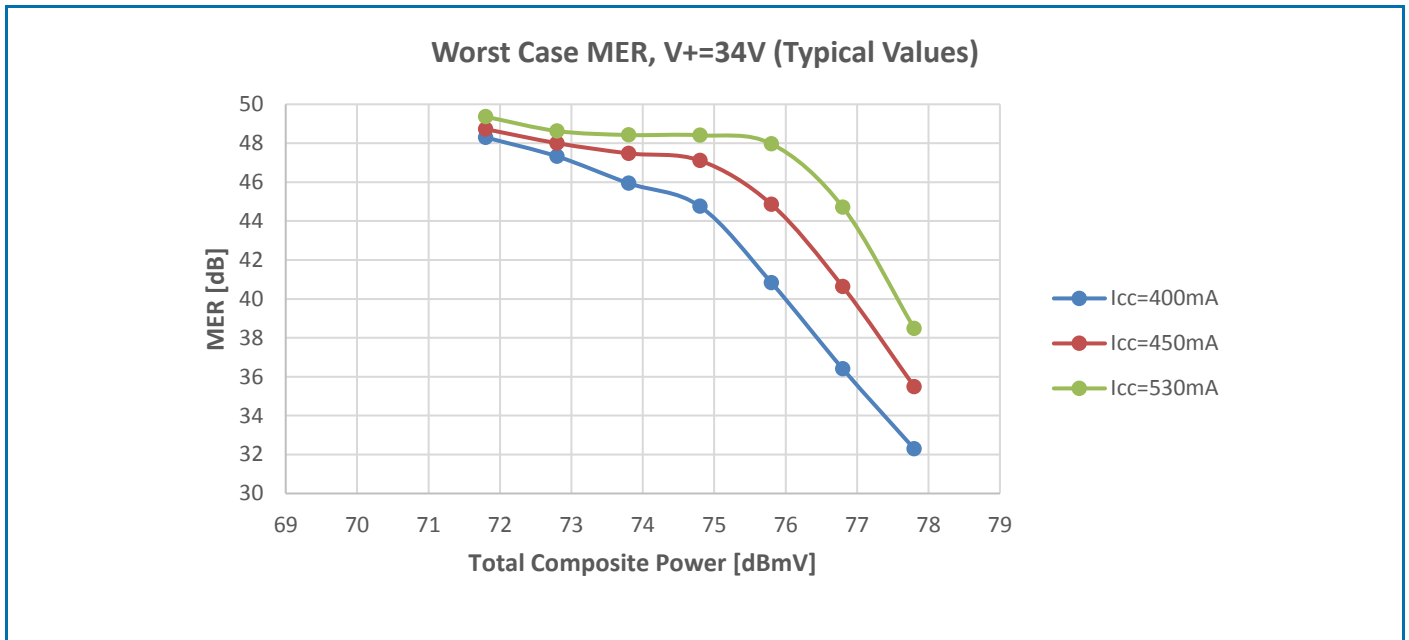
Notes:

- The slope is defined as the difference between the gain at the start frequency and the gain at the stop frequency.
- 79 analog channels, NTSC frequency raster: 55.25MHz to 547.25MHz, +41 dBmV to +50.4 dBmV tilted output level, plus 111 digital channels, -6dB offset relative to the equivalent analog carrier.
- Composite Second Order (CSO) - The CSO parameter (both sum and difference products) is defined by ANSI/SCTE 6. Composite Triple Beat (CTB) - The CTB parameter is defined by ANSI/SCTE 6. Cross Modulation (XMOD) - Cross modulation (XMOD) is measured at baseband (selective voltmeter method), referenced to 100% modulation of the carrier being tested. Carrier to Intermodulation Noise (CIN) - The CIN parameter is defined by ANSI/SCTE 17 (Test procedure for carrier to noise).

## Change of MER vs. Power Supply Voltage and Device Current

The QPA3250 can be operated at a power supply voltage  $V+$  between 24V and 34V to provide maximum required linearity performance at minimum power consumption. Maximum output capability can be adjusted between 73.8dBmV composite power (= 58dBmV actual level at  $f_{max}$  equivalent to 64dBmV virtual level) at  $V+ = 24V$  and 76.8dBmV composite power (= 61dBmV actual level at  $f_{max}$  equivalent to 67dBmV virtual level) at  $V+ = 34V$  under a pure digital loading (185 channels QAM256) with 21dB tilt and full current ( $I_{cc}=530mA$ ).

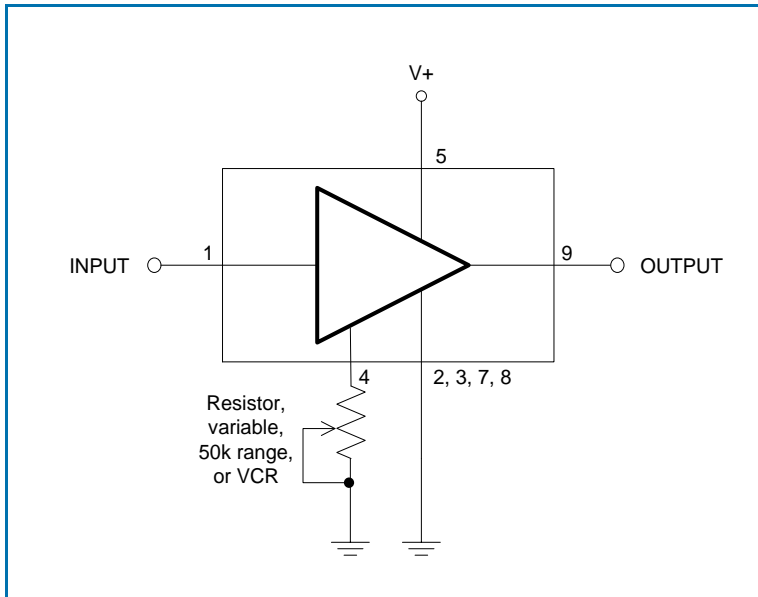
Test Condition: TMB = +35°C; ZS = ZL = 75Ω, 21dB tilt, 185 digital channels, 108-1218MHz (QAM256 ITU-T J.83 Annex B)



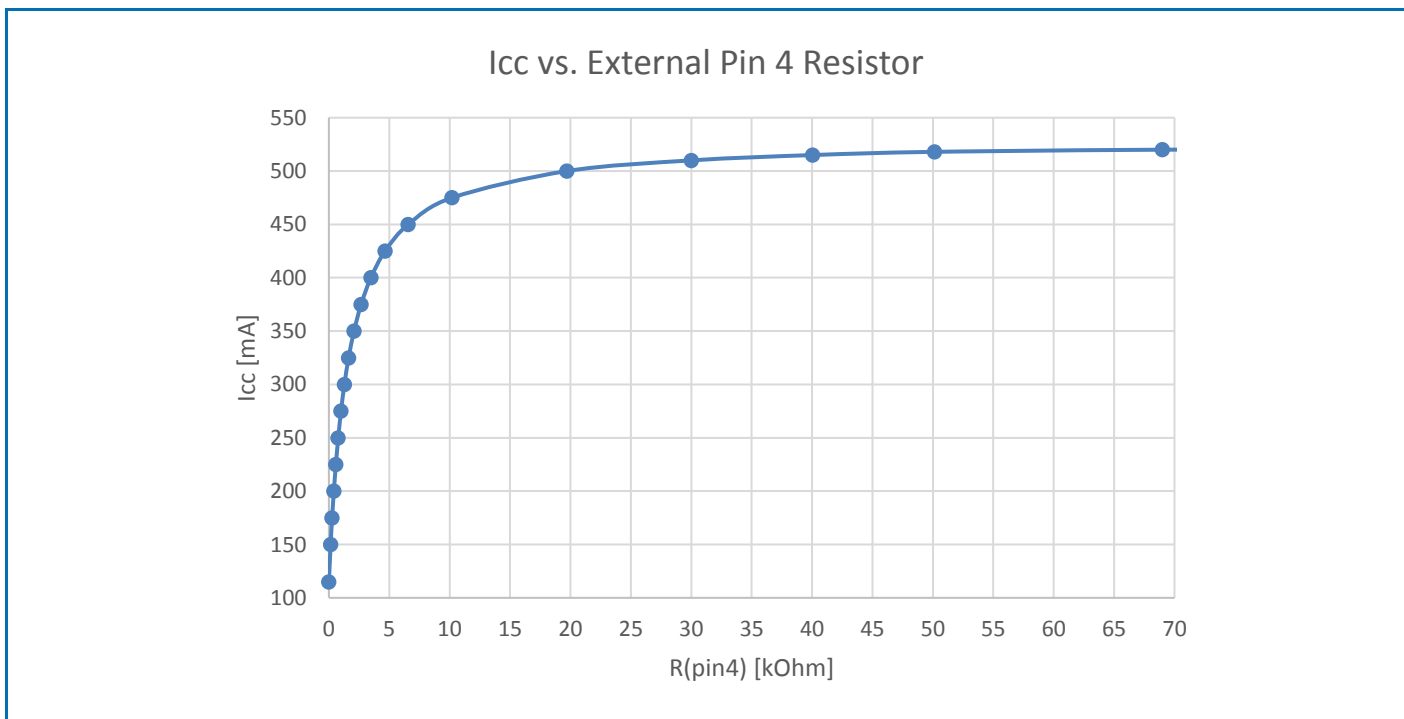
## Change of Device Current vs. External Resistor Value

The QPA3250 can be operated over a wide range of current to provide maximum required performance with minimum current consumption. A single external resistor connected between pin 4 and GND allows variation of current between 530mA and 115mA (typ.). Within the recommended range of current between 530mA and 400mA gain (S21) change is less than 0.2dB and noise figure change is less than 0.1dB. If pin 4 is not connected the device operates at maximum current, see table below.

Connecting a resistor to pin 4:



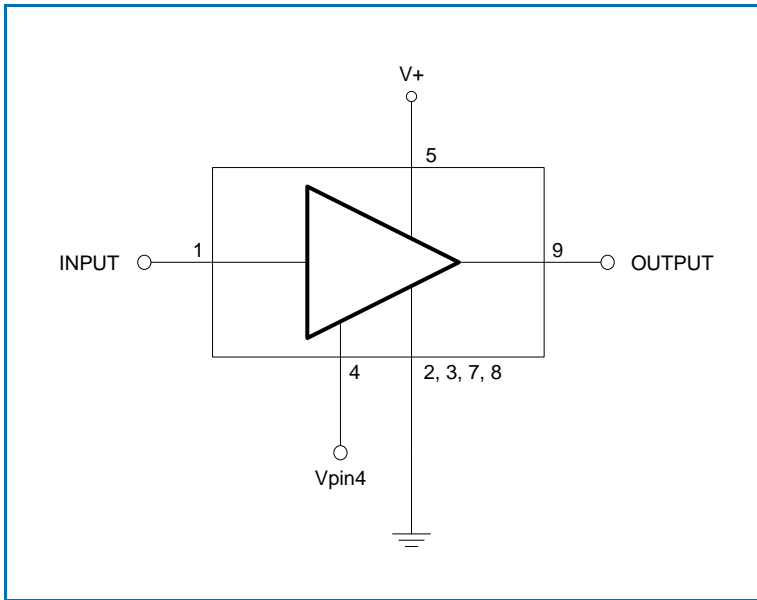
| Device current [mA], typical                                       | External resistor [ $\Omega$ ] |
|--|--------------------------------|
| 530  | Open                           |
| 520  | 69k                            |
| 500  | 19k7                           |
| 475  | 10k2                           |
| 425  | 4k7                            |
| 400  | 3k5                            |
| 350  | 2k1                            |
| 250  | 0k8                            |
| 115  | 0 (short)                      |
| $V_+ = 34V$ ;<br>$T_{MB} = 35^\circ C$ ;<br>$Z_S = Z_L = 75\Omega$ |                                |



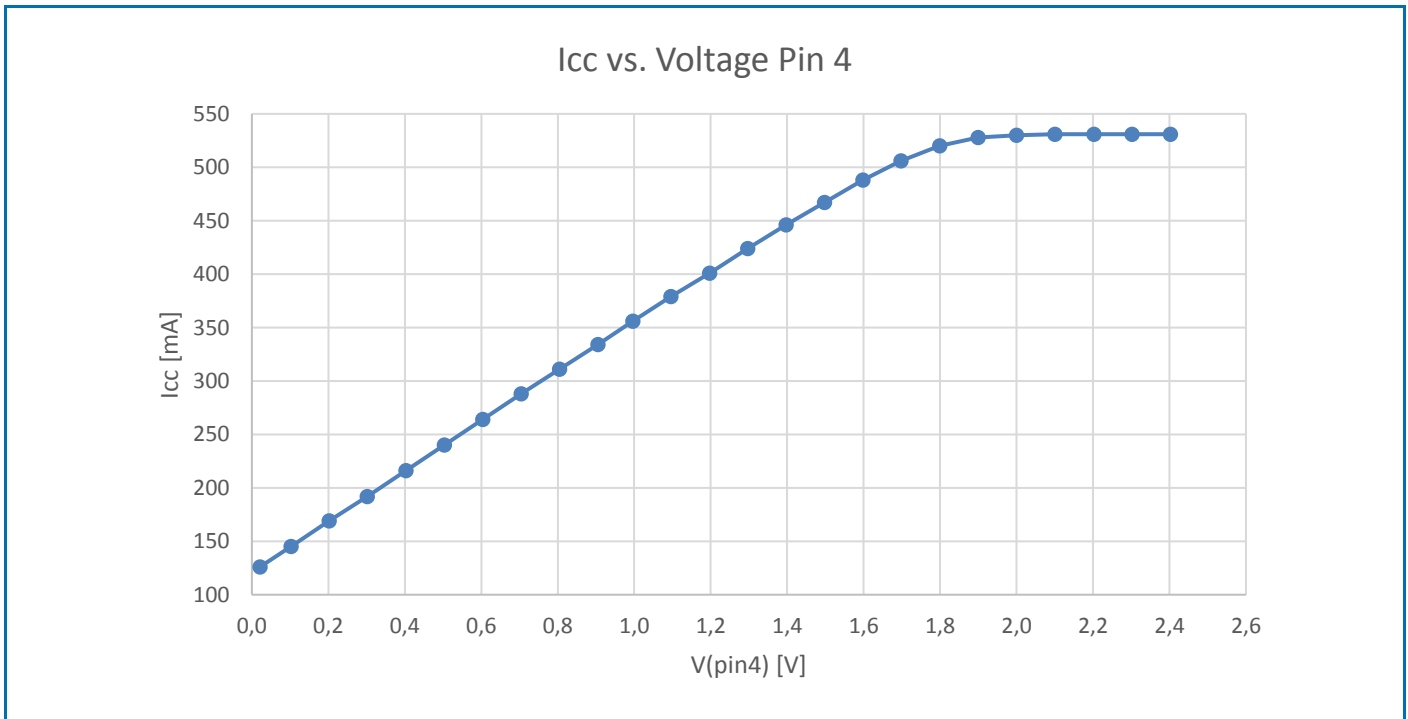
## Change of Device Current vs. External Voltage

The current of QPA3250 can also be adjusted by an external voltage which has the capability to pull a negative current. This voltage applied between pin 4 and GND ( $V_{pin4}$ ) allows variation of current between 530mA and 120mA (typ.).

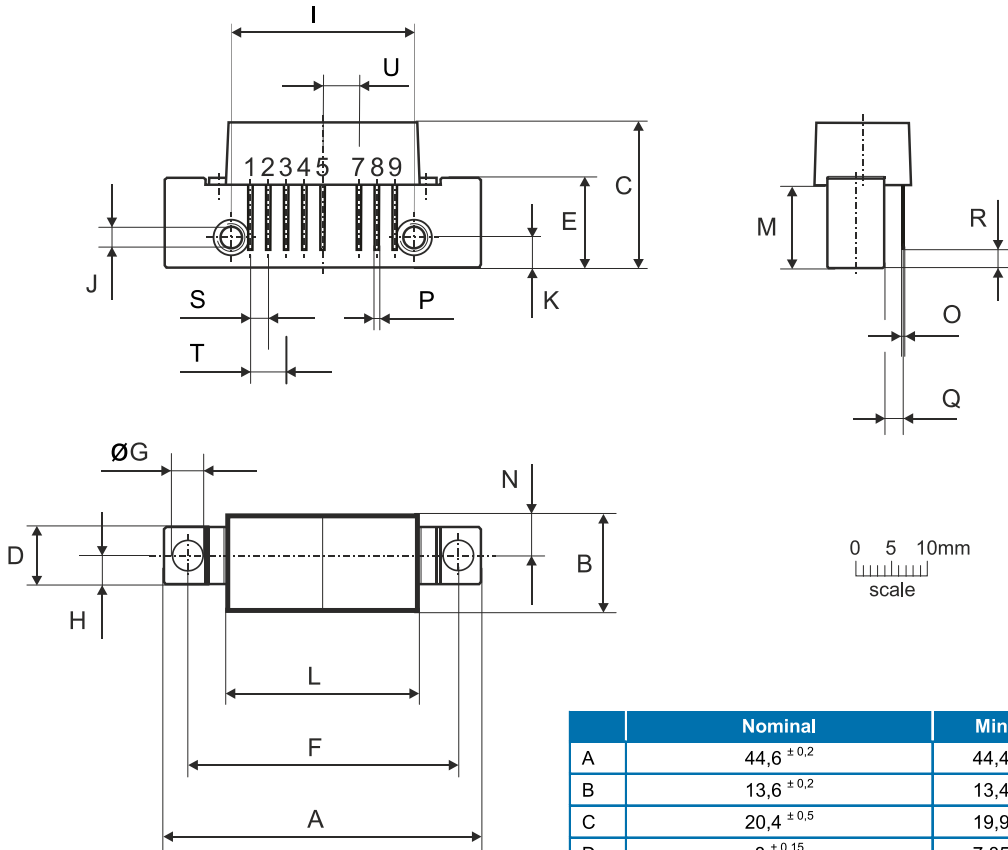
Connecting a voltage to pin 4:



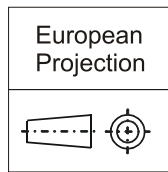
| Device Current [mA], Typical                                     | External Setting Voltage [V] |
|--|------------------------------|
| 530  | > 2.0                        |
| 520  | 1.8                          |
| 495  | 1.6                          |
| 450  | 1.4                          |
| 400  | 1.2                          |
| 355  | 1.0                          |
| 310  | 0.8                          |
| 260  | 0.6                          |
| 120  | 0.0                          |
| $V_+ = 34V;$<br>$T_{MB} = 35^\circ C;$<br>$Z_S = Z_L = 75\Omega$ |                              |



Package Drawing (Dimensions in millimeters)



Notes:



Pinning:

| Pin | Name            |
|-----|-----------------|
| 1   | Input           |
| 2-3 | GND             |
| 4   | CURRENT SETTING |
| 5   | V+              |
| 6   |                 |
| 7-8 | GND             |
| 9   | Output          |

|   | Nominal                 | Min   | Max   |
|---|-------------------------|-------|-------|
| A | 44,6 ± 0,2              | 44,4  | 44,8  |
| B | 13,6 ± 0,2              | 13,4  | 13,8  |
| C | 20,4 ± 0,5              | 19,9  | 20,9  |
| D | 8 ± 0,15                | 7,85  | 8,15  |
| E | 12,6 ± 0,15             | 12,45 | 12,75 |
| F | 38,1 ± 0,2              | 37,9  | 38,3  |
| G | 4 <sup>+0,2/-0,05</sup> | 3,95  | 4,2   |
| H | 4 ± 0,2                 | 3,8   | 4,2   |
| I | 25,4 ± 0,2              | 25,2  | 25,6  |
| J | UNC 6-32                | -     | -     |
| K | 4,2 ± 0,2               | 4,0   | 4,4   |
| L | 27,2 ± 0,2              | 27,0  | 27,4  |
| M | 11,6 ± 0,5              | 11,1  | 12,1  |
| N | 5,8 ± 0,4               | 5,4   | 6,2   |
| O | 0,25 ± 0,02             | 0,23  | 0,27  |
| P | 0,45 ± 0,03             | 0,42  | 0,48  |
| Q | 2,54 ± 0,3              | 2,24  | 2,84  |
| R | 2,54 ± 0,5              | 2,04  | 3,04  |
| S | 2,54 ± 0,25             | 2,29  | 2,79  |
| T | 5,08 ± 0,25             | 4,83  | 5,33  |
| U | 5,08 ± 0,25             | 4,83  | 5,33  |

## Handling Precautions

| Parameter                        | Rating | Standard     |
|----------------------------------|--------|--------------|
| ESD – Human Body Model (HBM)     | 2      | JEDEC JS-001 |
| ESD – Charged Device Model (CDM) | C3     | JEDEC JS-002 |



Caution!  
ESD-Sensitive Device

## RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

## Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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