

COMPOUND FIELD EFFECT POWER TRANSISTOR
 μ PA1601

MONOLITHIC POWER MOS FET ARRAY

DESCRIPTION

The μ PA1601 is Monolithic N-channel Power MOS FET Array that built in 7 circuits and resistance designed for LED, Relay, Thermal Head, and so on.

FEATURES

- Direct driving is possible by standard Logic IC or Microcomputer. (4 V driving is possible)
- Output Voltage: $V_o = 30$ V MAX.
Output Current: $I_o = 500$ mA MAX.
- $R_{on} = 3 \Omega$ TYP. at: $I_o = 150$ mA, $V_i = 4$ V
- Large Operation Temperature: -40 to $+85$ °C

ORDERING INFORMATION

| Part Number | Package | Quality Grade |
|----------------|------------|---------------|
| μ PA1601CX | 16-Pin DIP | Standard |
| μ PA1601GS | 16-Pin SOP | Standard |

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

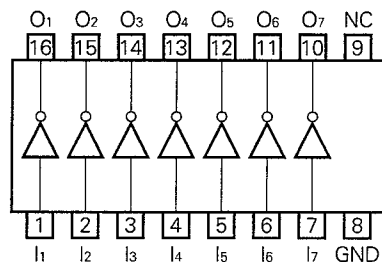
ABSOLUTE MAXIMUM RATINGS ($T_a = 25$ °C)

| | | | |
|--------------------------|----------------|-----------------|---------|
| Output Voltage | $V_{O(DC)}$ | 30 | V |
| Output Peak Voltage* | $V_{O(peak)}$ | 50 | V |
| Input Voltage | V_i | -0.5 to $+20$ | V |
| Output Current (DC) | $I_{O(DC)}$ | 430 | mA/unit |
| Output Current (pulse)** | $I_{O(pulse)}$ | 500 | mA/unit |
| Input Current | I_i | ± 10 | mA/unit |
| Total Power Dissipation | P_T | 1.0 | W/PKG |
| Operating Temperature | T_{opt} | -40 to $+85$ | °C |
| Storage Temperature | T_{stg} | -55 to $+150$ | °C |

* $PW \leq 10$ ms, Duty Cycle ≤ 10 %

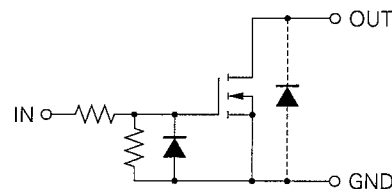
** $PW \leq 10$ ms, Duty Cycle ≤ 30 %

CONNECTION DIAGRAM



I : Input
O : Output

Equivalent Circuits (1 unit)



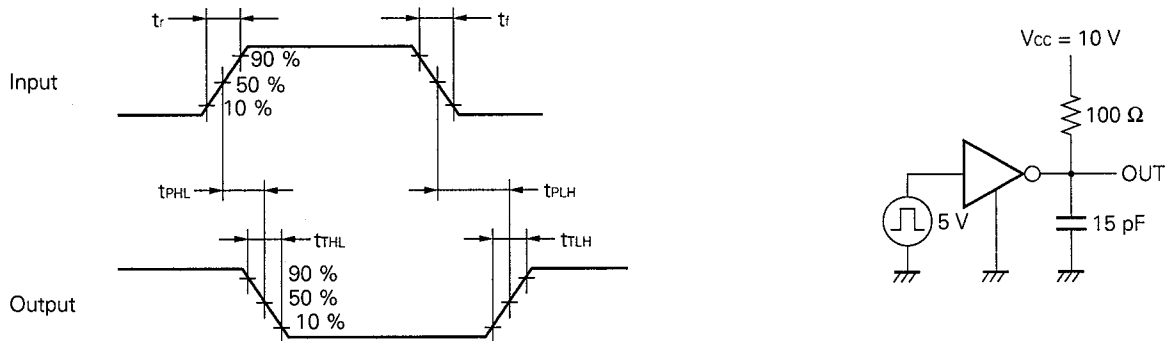
RECOMMENDED OPERATING CONDITIONS (T_a = -40 to +85 °C)

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|--------------------------|-----------------------|------|------|------|---------|--|
| Output Voltage | V _{O(DC)} | | | 24 | V | |
| Output Current | I _o | | | 270 | mA/unit | DC, 1 circuit |
| | I _{O(pulse)} | | | 200 | mA/unit | PW ≤ 10 ms, Duty Cycle ≤ 25 %, 7 circuits |
| Input Voltage | V _I | 0 | | 15 | V | |
| High-Level Input Voltage | V _{IH} | 2 | | | V | |
| Low-Level Input Voltage | V _{IL} | | | 0.8 | V | |

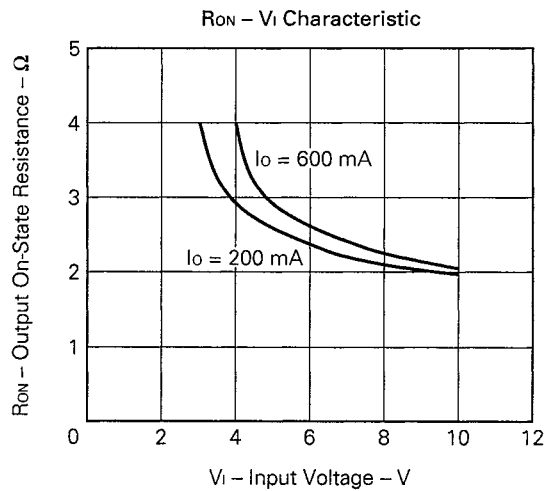
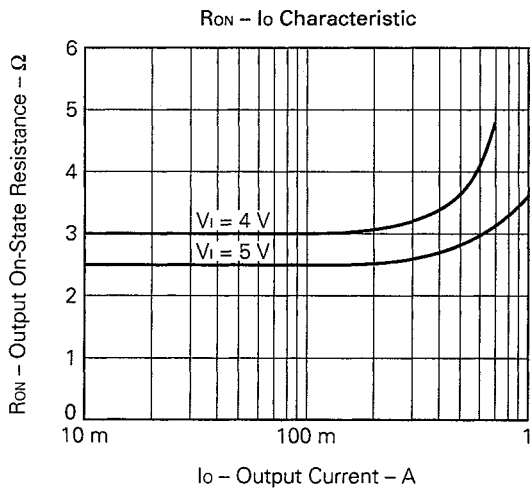
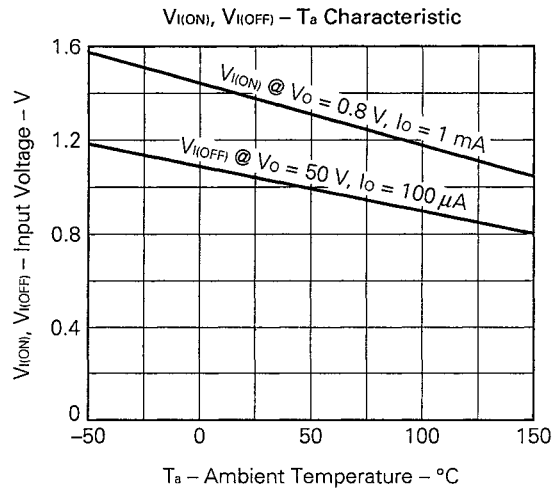
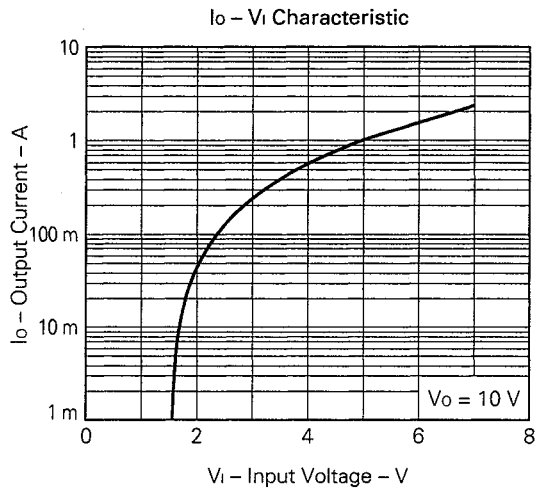
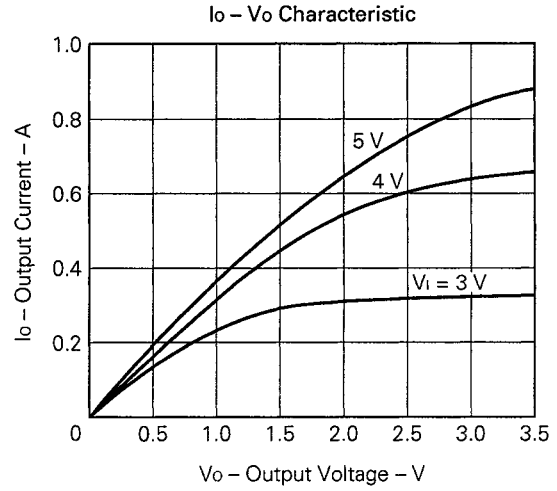
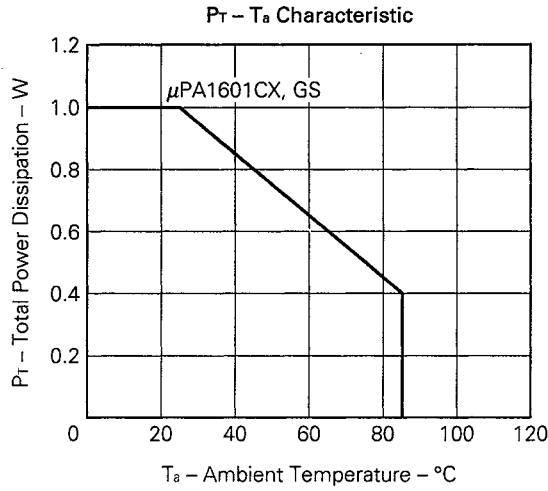
ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|------------------------------|---------------------|------|------|------|------|--|
| Output Leakage Current | I _{O(OFF)} | | | 10 | μA | V _I = 0 V, V _O = 30 V |
| Output On-state Resistance | R _{on} | | 3 | 5.3 | Ω | V _I = 4 V, I _o = 150 mA |
| Output On-state Voltage | V _{O(ON)1} | | | 0.2 | V | V _I = 5 V, I _o = 10 mA |
| | V _{O(ON)2} | | | 0.8 | V | V _I = 5 V, I _o = 150 mA |
| Input Voltage | V _{I(OFF)} | | | 0.8 | V | V _O = 50 V, I _o = 100 μA |
| | V _{I(ON)1} | 2 | | | V | V _O = 0.8 V, I _o = 1 mA |
| | V _{I(ON)2} | 4 | | | V | V _O = 0.8 V, I _o = 150 mA |
| Input Current | I _{IH} | | | 2 | mA | V _I = 20 V, V _O = 0 V |
| | I _{IL} | | | -1 | μA | V _I = 0 V, V _O = 50 V |
| Input Capacitance | C _{iss} | | 15 | | pF | V _I = 0 V |
| Output Capacitance | C _{oss} | | 18 | | pF | V _O = 10 V |
| Reverse Transfer Capacitance | C _{rss} | | 34 | | pF | f = 1 MHz |
| Delay Time | t _{PHL} | | 10 | | ns | V _{CC} = 10 V, R _L = 100 Ω C _L = 15 pF t _r , t _f ≤ 5 ns See Fig. 1 |
| | t _{PLH} | | 110 | | ns | |
| Rise Time | t _{TLH} | | 90 | | ns | |
| Fall Time | t _{THL} | | 20 | | ns | |

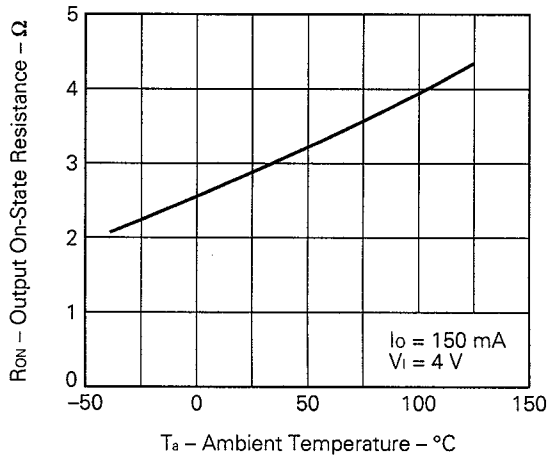
Fig. 1 Switching Wave Forms and Test Circuits



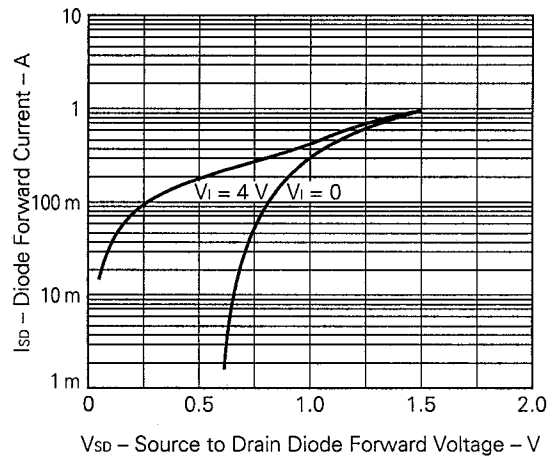
TYPICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)



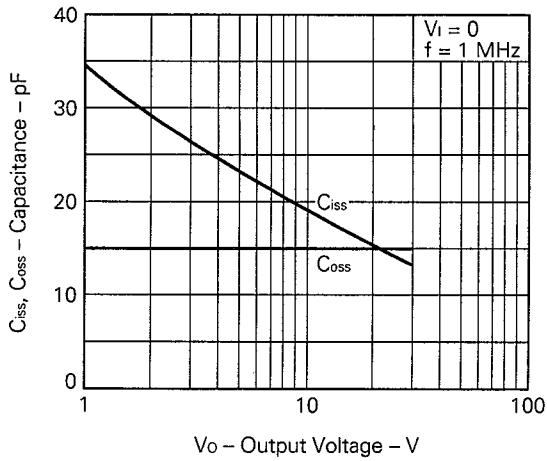
$R_{ON} - T_a$ Characteristic



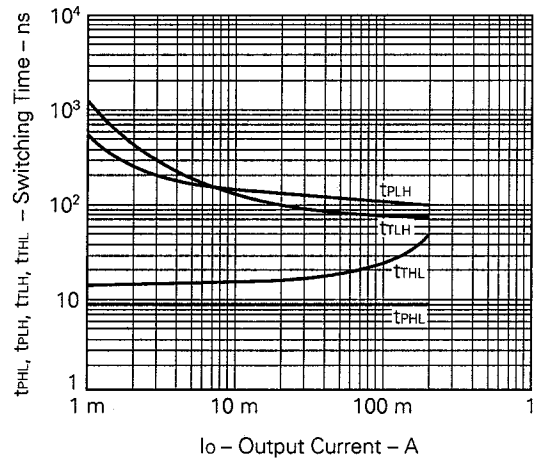
$I_{SD} - V_{SD}$ Characteristic



$C_{iss}, C_{oss} - V_o$ Characteristic



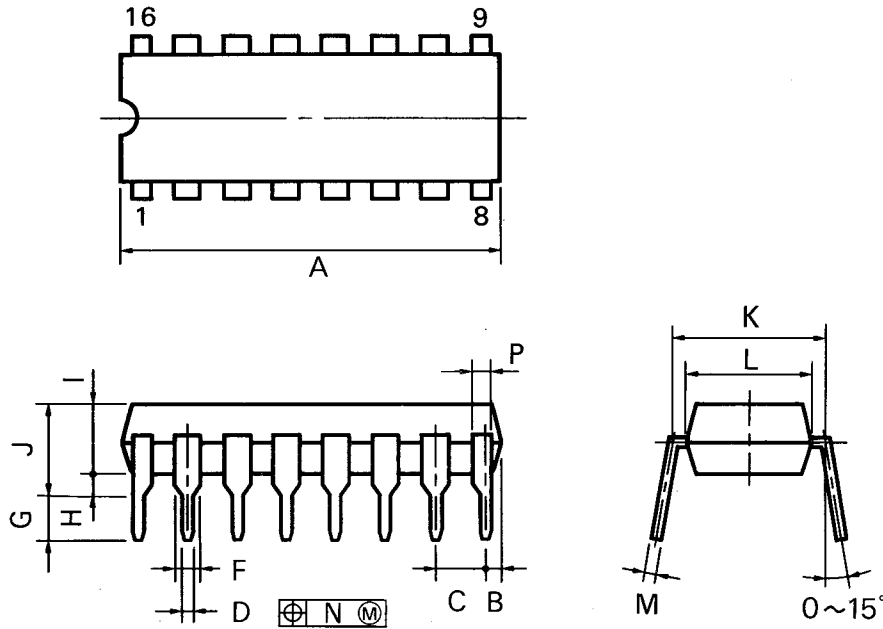
$t_{PHL}, t_{PLH}, t_{THL}, t_{TLH} - I_o$ Characteristic



PACKAGE DIMENSIONS

• μPA1601CX

16PIN PLASTIC DIP (300 mil)



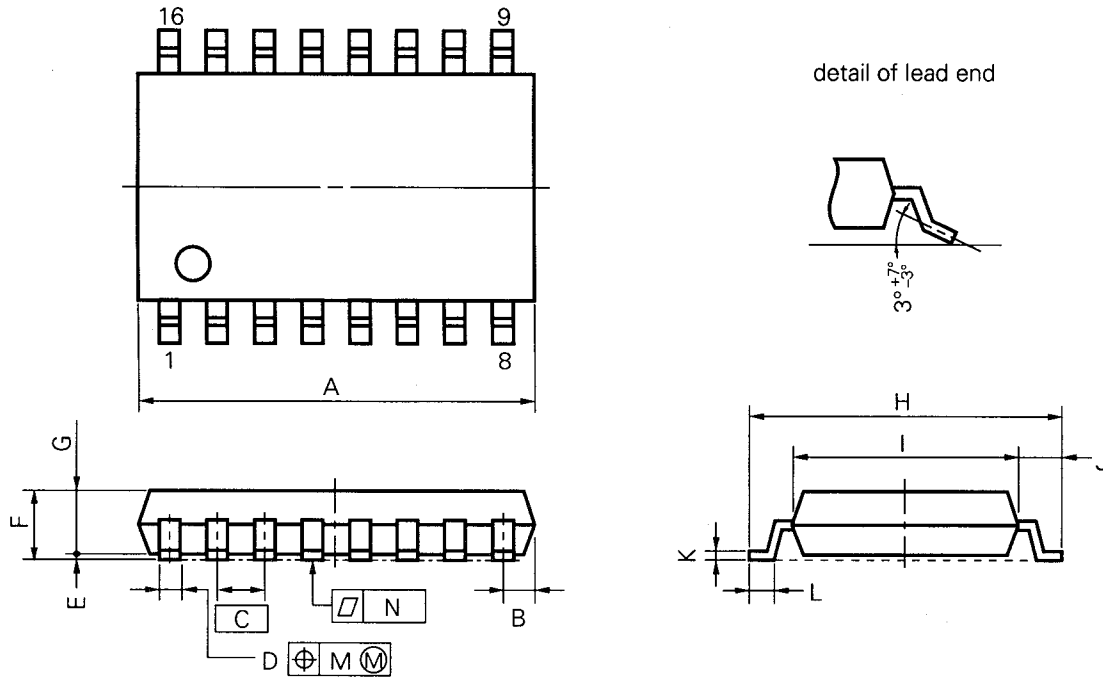
P16C-100-300A,C

NOTES

- 1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.
- 2) Item "K" to center of leads when formed parallel.

| ITEM | MILLIMETERS | INCHES |
|------|--|---|
| A | 20.32 MAX. | 0.800 MAX. |
| B | 1.27 MAX. | 0.050 MAX. |
| C | 2.54 (T.P.) | 0.100 (T.P.) |
| D | 0.50 ^{+0.10} | 0.020 ^{+0.004} _{-0.005} |
| F | 1.2 MIN. | 0.047 MIN. |
| G | 3.5 ^{±0.3} | 0.138 ^{±0.012} |
| H | 0.51 MIN. | 0.020 MIN. |
| I | 4.31 MAX. | 0.170 MAX. |
| J | 5.08 MAX. | 0.200 MAX. |
| K | 7.62 (T.P.) | 0.300 (T.P.) |
| L | 6.4 | 0.252 |
| M | 0.25 ^{+0.10} _{-0.05} | 0.010 ^{+0.004} _{-0.003} |
| N | 0.25 | 0.01 |
| P | 1.0 MIN. | 0.039 MIN. |

• μPA1601GS
16 PIN PLASTIC SOP (300 mil)



P16GM-50-300B-3

NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

| ITEM | MILLIMETERS | INCHES |
|------|--|---|
| A | 10.46 MAX. | 0.412 MAX. |
| B | 0.78 MAX. | 0.031 MAX. |
| C | 1.27 (T.P.) | 0.050 (T.P.) |
| D | 0.40 ^{+0.10} _{-0.05} | 0.016 ^{+0.004} _{-0.003} |
| E | 0.1±0.1 | 0.004±0.004 |
| F | 1.8 MAX. | 0.071 MAX. |
| G | 1.55 | 0.061 |
| H | 7.7±0.3 | 0.303±0.012 |
| I | 5.6 | 0.220 |
| J | 1.1 | 0.043 |
| K | 0.20 ^{+0.10} _{-0.05} | 0.008 ^{+0.004} _{-0.002} |
| L | 0.6±0.2 | 0.024 ^{+0.008} _{-0.009} |
| M | 0.12 | 0.005 |
| N | 0.10 | 0.004 |

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be set when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI-1207).

μPA1601GS

| Soldering process | Soldering conditions | Symbol |
|---------------------|---|-----------|
| Infrared ray reflow | Peak package's surface temperature: 235 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: Inside of 2 times, Exposure limit*: None | IR35-00-1 |
| VPS | Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: Inside of 2 times, Exposure limit*: None | VP15-00-2 |
| Wave soldering | Solder temperature: 260 °C or below, Flow time: 10 seconds or below, Number of flow process: 1, Exposure Limit*: None | WS60-00 |

*: Exposure limit before soldering after dry-pack package is opened.

Storage conditions: 25 °C and relative humidity at 65 % or less.

Note: Do not apply more than a single process at once, except for "Partial heating method".

TYPES OF THROUGH HOLE MOUNT DEVICE

μPA1601CX

| Soldering process | Soldering conditions | Symbol |
|-------------------|--|--------|
| Wave soldering | Solder temperature: 260 °C or below, Flow time: 10 seconds or below | |

Reference

| Document name | Document No. |
|--|--------------|
| Quality control of NEC semiconductors devices. | TEI-1202 |
| Quality control guide of semiconductors devices. | MEI-1202 |
| Assembly manual of semiconductors devices. | IEI-1207 |
| Semiconductor device package manual | IEI-1213 |
| SMD surface mount technology manual | IEI-1207 |

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Application examples recommended by NEC Corporation.

Standard: Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tools, Industrial robots, Audio and Visual equipment, Other consumer products, etc.

Special: Automotive and Transportation equipment, Traffic control systems, Antidisaster systems, Anticrime systems, etc.