NEC

# MOS FIELD EFFECT TRANSISTOR

# μPA610TA

## P-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR HIGH SPEED SWITCHING

### DESCRIPTION

The μPA610TA is a switching device which can be driven directly by a 2.5 V power source.

The μPA610TA has excellent switching characteristics, and is suitable for use as a high-speed switching device in digital circuits.

### FEATURES

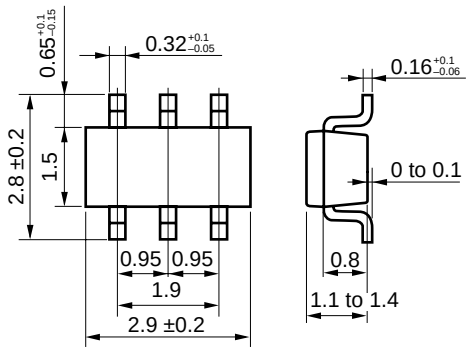
- Can be driven by a 2.5 V power source.
- Low Gate Cut-off Voltage.

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C)

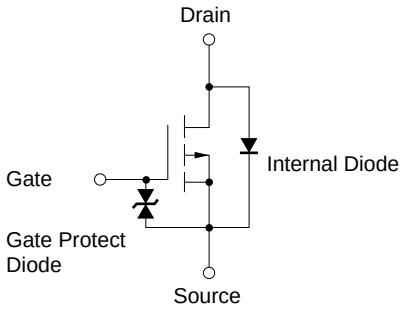
| | | | |
|---|---|---|---|
| Drain to Source Voltage | $V_{DSS}$ | –30 | V |
| Gate to Source Voltage | $V_{GSS}$ | ∓20 | V |
| Drain Current (DC) | $I_{D(DC)}$ | ∓0.1 | A |
| Drain Current (pulse) | $I_{D(pulse)}$ | ∓0.4 **Note** | A |
| Total Power Dissipation | $P_T$ | 300 (TOTAL) | mW |
| Channel Temperature | $T_{ch}$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | –55 to +150 | °C |

**Note** PW ≤ 10 μs, Duty Cycle ≤ 1 %

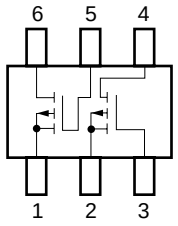
**Package Drawings (unit: mm)**




**Equivalent Circuit**




**Pin Connection (Top View)**




1. Source 1
2. Source 2
3. Gate 2
4. Drain 2
5. Gate 1
6. Drain 1

Marking : JB

The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device is actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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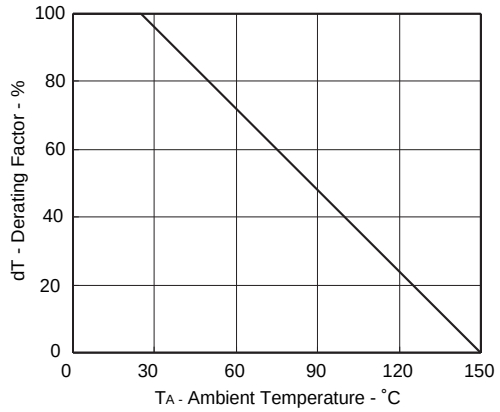
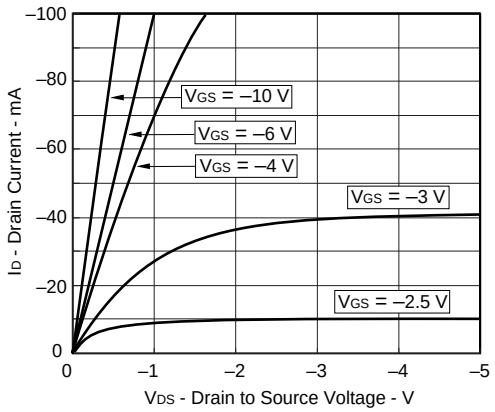
## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C)

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Drain Cut-off Current | $I_{DSS}$ | | | –1 | μA | $V_{DS}$ = –30 V, $V_{GS}$ = 0 |
| Gate Leakage Current | $I_{GSS}$ | | | ∓10 | μA | $V_{GS}$ = ∓20 V, $V_{DS}$ = 0 |
| Gate Cut-off Voltage | $V_{GS(off)}$ | –1.0 | –1.4 | –1.7 | V | $V_{DS}$ = –3 V, $I_D$ = –10 μA |
| Forward Transfer Admittance | $\lvert y_{fs} \rvert$ | 20 | | | mS | $V_{DS}$ = –3 V, $I_D$ = –10 mA |
| Drain to Source On-State Resistance | $R_{DS(on)1}$ | | 23 | 60 | Ω | $V_{GS}$ = –2.5 V, $I_D$ = –1 mA |
| Drain to Source On-State Resistance | $R_{DS(on)2}$ | | 11 | 23 | Ω | $V_{GS}$ = –4 V, $I_D$ = –10 mA |
| Drain to Source On-State Resistance | $R_{DS(on)3}$ | | 6 | 13 | Ω | $V_{GS}$ = –10 V, $I_D$ = –10 mA |
| Input Capacitance | $C_{iss}$ | | 5 | | pF | $V_{DS}$ = –3 V |
| Output Capacitance | $C_{oss}$ | | 15 | | pF | $V_{GS}$ = 0 |
| Reverse Transfer Capacitance | $C_{rss}$ | | 1.3 | | pF | f = 1 MHz |
| Turn-on Delay Time | $t_{d(on)}$ | | 140 | | ns | $V_{DD}$ = –3 V, $I_D$ = –10 mA |
| Rise Time | $t_r$ | | 330 | | ns | $V_{GS(on)}$ = –4 V, $R_G$ = 10 Ω |
| Turn-off Delay Time | $t_{d(off)}$ | | 220 | | ns | $R_L$ = 300 Ω |
| Fall Time | $t_f$ | | 320 | | ns | |

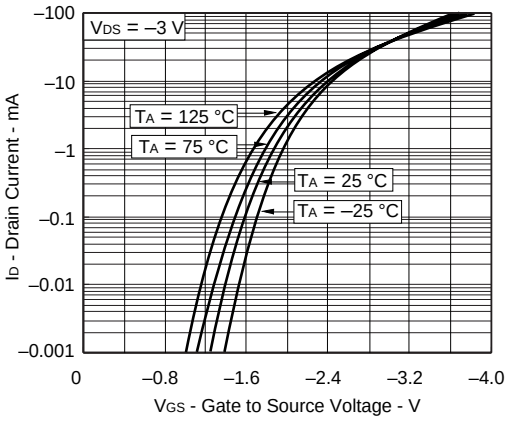
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



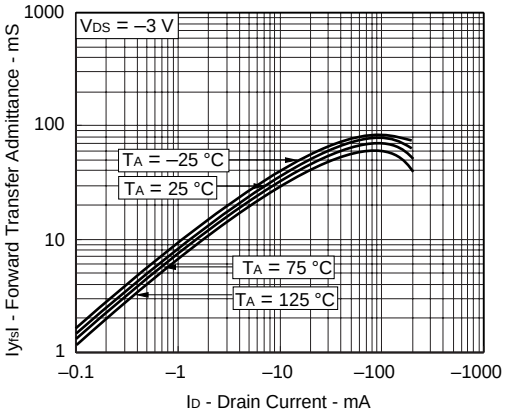

DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



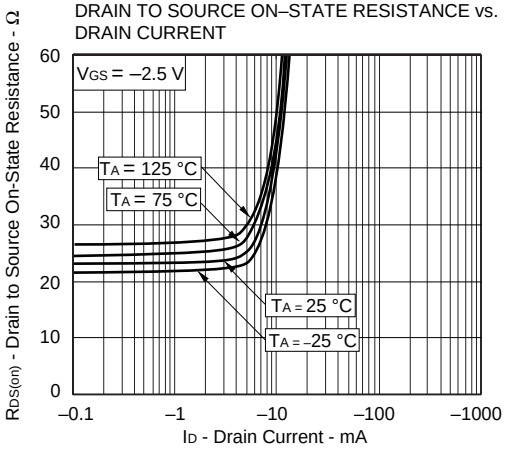

TRANSFER CHARACTERISTICS



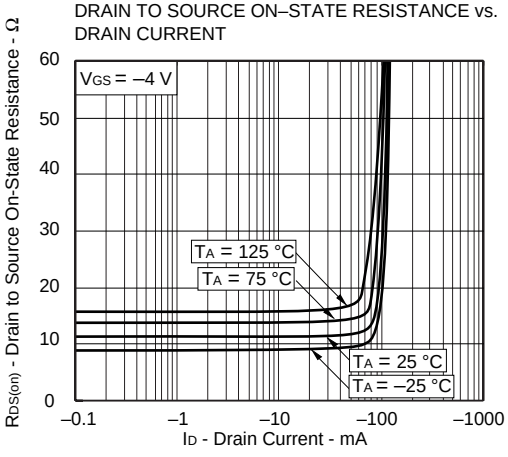

FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



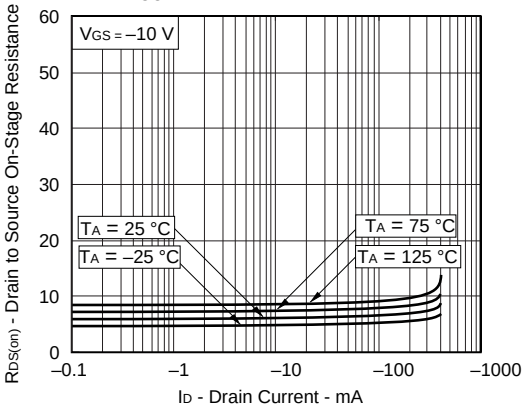

DRAIN TO SOURCE ON–STATE RESISTANCE vs. DRAIN CURRENT



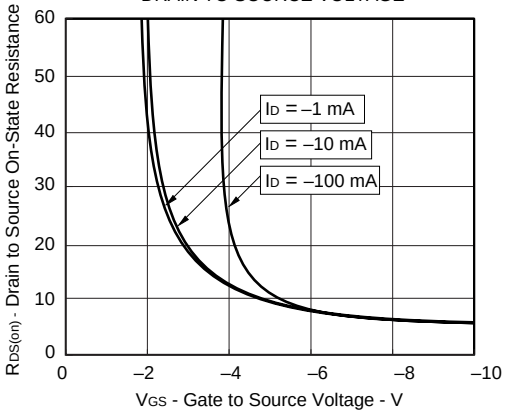

DRAIN TO SOURCE ON–STATE RESISTANCE vs. DRAIN CURRENT



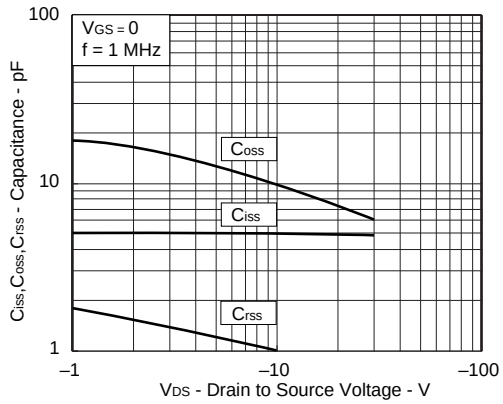
DRAIN TO SOURCE ON–STATE RESISTANCE vs.
DRAIN CURRENT



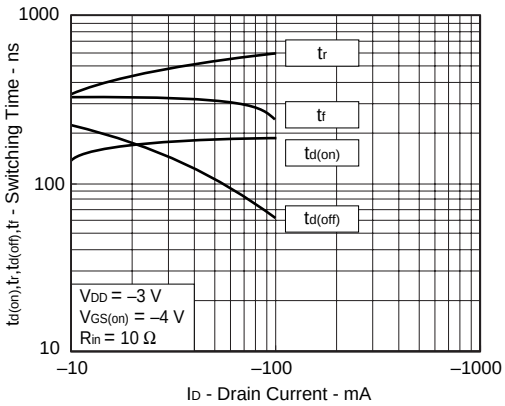

DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



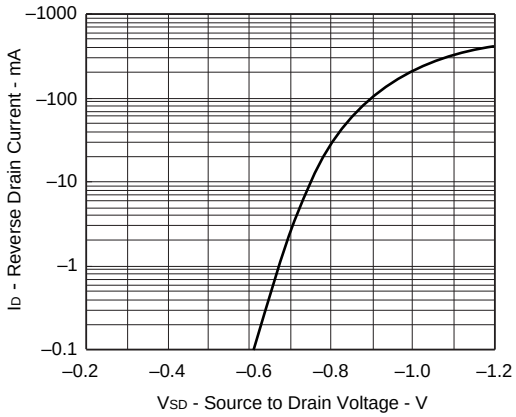

CAPACITANCE vs.
DRAIN TO SOURCE VOLTAGE




SWITCHING CHARACTERISTICS




SOURCE TO DRAIN DIODE
FORWARD VOLTAGE



## REFERENCE

| Document Name | Document No. |
|---|---|
| NEC semiconductor device reliability/quality control system | TEI-1202 |
| Quality grade on NEC semiconductor devices | C11531E |
| Semiconductor device mounting technology manual | C10535E |
| Guide to quality assurance for semiconductor devices | MEI-1202 |
| Semiconductor selection guide | X10679E |

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