DATA SHEET

NEC

# MOS FIELD EFFECT TRANSISTOR

# μPA2708TP

## SWITCHING
## N-CHANNEL POWER MOS FET

### DESCRIPTION

The μPA2708TP which has a heat spreader is N-channel MOS Field Effect Transistor designed for DC/DC converter and power management applications of notebook computer.

### ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|---|---|
| μPA2708TP-E1 | Power HSOP8 |
| μPA2708TP-E1-AZ Note | Power HSOP8 |
| μPA2708TP-E2 | Power HSOP8 |
| μPA2708TP-E2-AZ Note | Power HSOP8 |

**Note** Pb-free (This product does not contain Pb in external electrode.)

### FEATURES

- Low on-state resistance
  $R_{DS(on)1}$ = 5.5 mΩ MAX. ($V_{GS}$ = 10 V, $I_D$ = 9.0 A)
  $R_{DS(on)2}$ = 7.5 mΩ MAX. ($V_{GS}$ = 4.5 V, $I_D$ = 9.0 A)
- Low $C_{iss}$: $C_{iss}$ = 4700 pF TYP. ($V_{DS}$ = 10 V, $V_{GS}$ = 0 V)
- Small and surface mount package (Power HSOP8)

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C, All terminals are connected.)

| | | | |
|---|---|---|---|
| Drain to Source Voltage ($V_{GS}$ = 0 V) | $V_{DSS}$ | 30 | V |
| Gate to Source Voltage ($V_{DS}$ = 0 V) | $V_{GSS}$ | ±20 | V |
| Drain Current (DC) | $I_{D(DC)}$ | ±40 | A |
| Drain Current (pulse) Note1 | $I_{D(pulse)}$ | ±68 | A |
| Total Power Dissipation ($T_C$ = 25°C) | $P_{T1}$ | 34 | W |
| Total Power Dissipation Note2 | $P_{T2}$ | 4.3 | W |
| Channel Temperature | $T_{ch}$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | –55 to +150 | °C |
| Single Avalanche Current Note3 | $I_{AS}$ | 17 | A |
| Single Avalanche Energy Note3 | $E_{AS}$ | 28.9 | mJ |

**Notes 1.** PW ≤ 10 μs, Duty Cycle ≤ 1%

**2.** Mounted on glass epoxy board of 1 inch x 1 inch x 0.8 mm, PW =10 sec

**3.** Starting $T_{ch}$ = 25°C, $V_{DD}$ = 15 V, $R_G$ = 25 Ω, L = 100 μH, $V_{GS}$ = 20 → 0 V

### THERMAL RESISTANCE

| | | | |
|---|---|---|---|
| Channel to Ambient Note | $R_{th(ch-A)}$ | 96.2 | °C/W |
| Channel to Case | $R_{th(ch-C)}$ | 3.68 | °C/W |

**Note** Mounted on glass epoxy board of 1 inch x 1 inch x 0.8 mm



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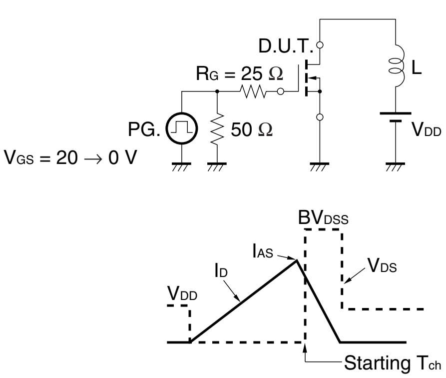
## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C, All terminals are connected.)

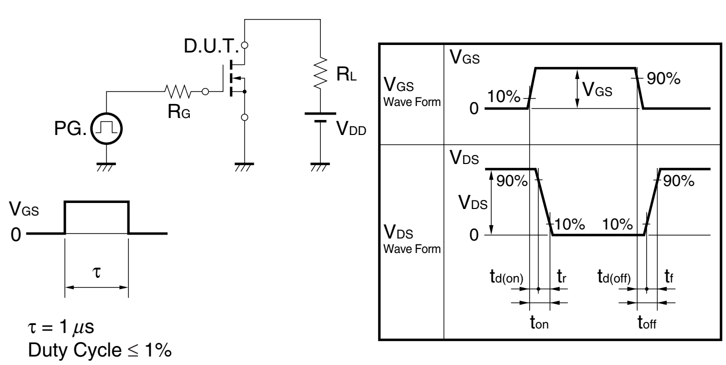
| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V | | | 10 | $\mu$A |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | | | ±100 | nA |
| Gate Cut-off Voltage | $V_{GS(off)}$ | $V_{DS}$ = 10 V, $I_D$ = 1 mA | 1.0 | | 2.5 | V |
| Forward Transfer Admittance Note | $\mid y_{fs} \mid$ | $V_{DS}$ = 10 V, $I_D$ = 9.0 A | 10 | | | S |
| Drain to Source On-state Resistance Note | $R_{DS(on)1}$ | $V_{GS}$ = 10 V, $I_D$ = 9.0 A | | 4.5 | 5.5 | mΩ |
| | $R_{DS(on)2}$ | $V_{GS}$ = 4.5 V, $I_D$ = 9.0 A | | 5.6 | 7.5 | mΩ |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 10 V | | 4700 | | pF |
| Output Capacitance | $C_{oss}$ | $V_{GS}$ = 0 V | | 670 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | f = 1 MHz | | 340 | | pF |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 15 V, $I_D$ = 9.0 A | | 19 | | ns |
| Rise Time | $t_r$ | $V_{GS}$ = 10 V | | 26 | | ns |
| Turn-off Delay Time | $t_{d(off)}$ | $R_G$ = 10 Ω | | 100 | | ns |
| Fall Time | $t_f$ | | | 27 | | ns |
| Total Gate Charge | $Q_G$ | $V_{DD}$ = 15 V | | 38 | | nC |
| Gate to Source Charge | $Q_{GS}$ | $V_{GS}$ = 5 V | | 13 | | nC |
| Gate to Drain Charge | $Q_{GD}$ | $I_D$ = 17 A | | 12 | | nC |
| Body Diode Forward Voltage Note | $V_{F(S-D)}$ | $I_F$ = 17 A, $V_{GS}$ = 0 V | | 0.8 | | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = 17 A, $V_{GS}$ = 0 V | | 33 | | ns |
| Reverse Recovery Charge | $Q_{rr}$ | di/dt = 100 A/$\mu$s | | 27 | | nC |
| Gate Resistance | $R_G$ | f = 1 MHz | | 1.2 | | Ω |

**Note** Pulsed

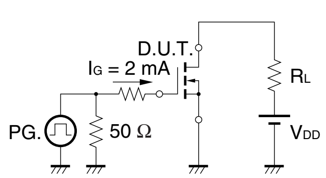
### TEST CIRCUIT 1 AVALANCHE CAPABILITY




### TEST CIRCUIT 2 SWITCHING TIME

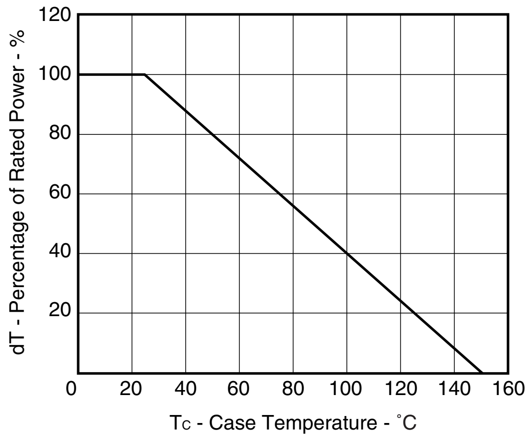



### TEST CIRCUIT 3 GATE CHARGE

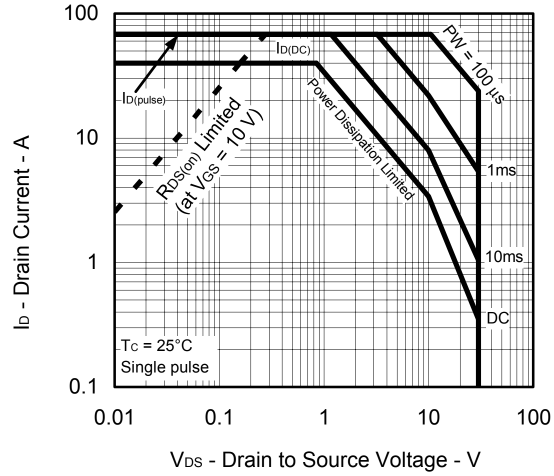


## TYPICAL CHARACTERISTICS ($T_A$ = 25°C)

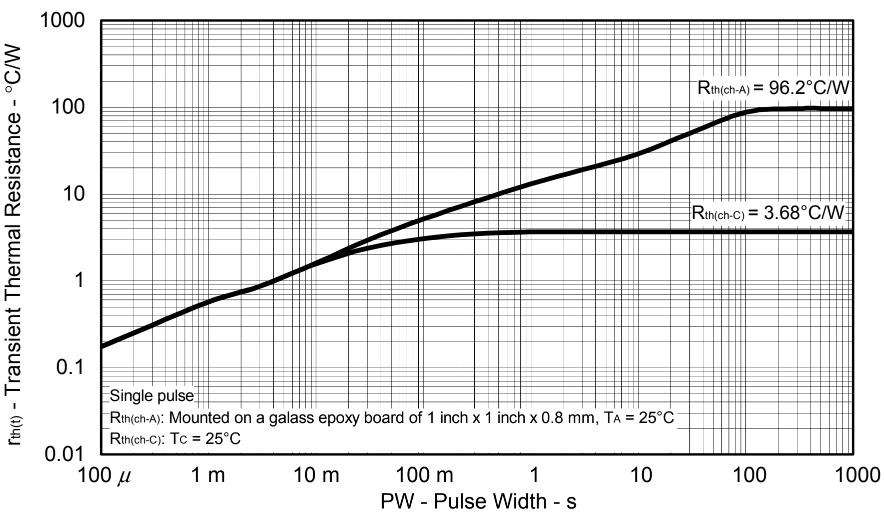
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



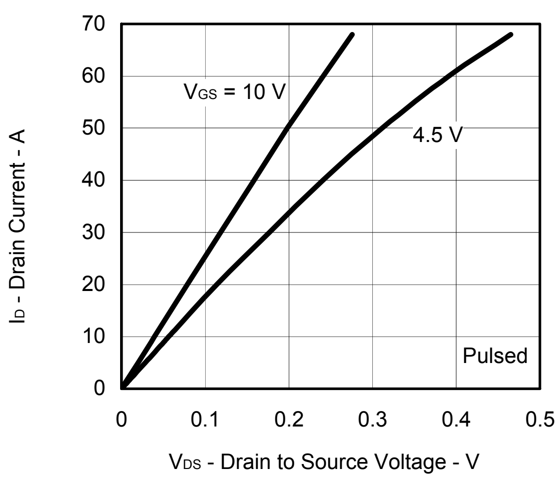

FORWARD BIAS SAFE OPERATING AREA



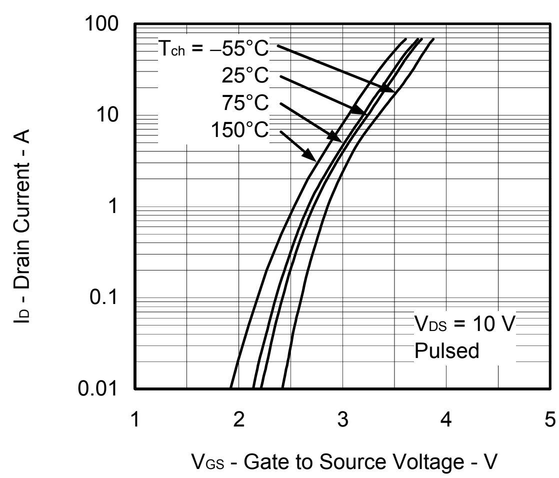

TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



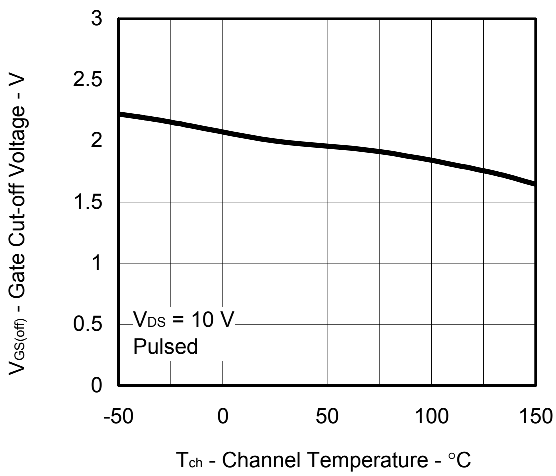

DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



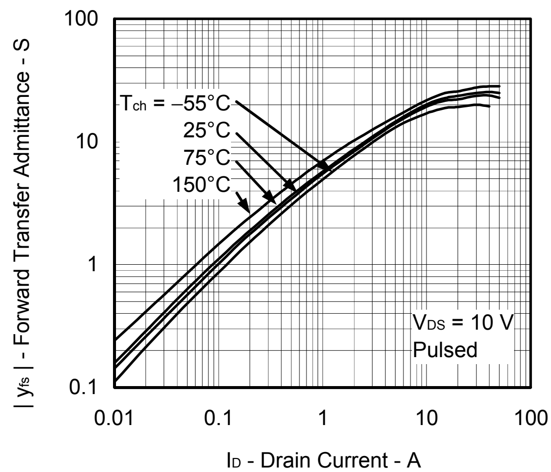

FORWARD TRANSFER CHARACTERISTICS



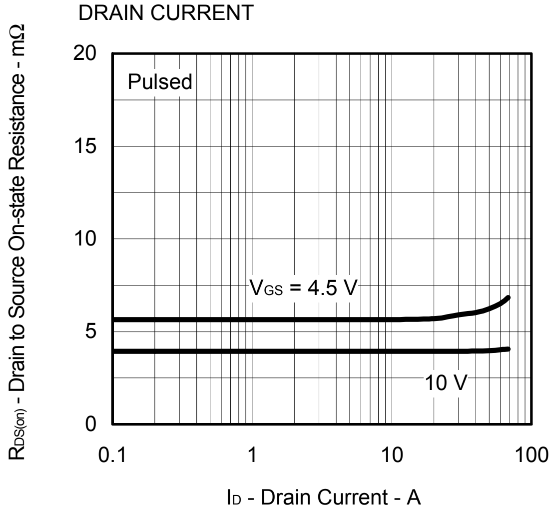
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



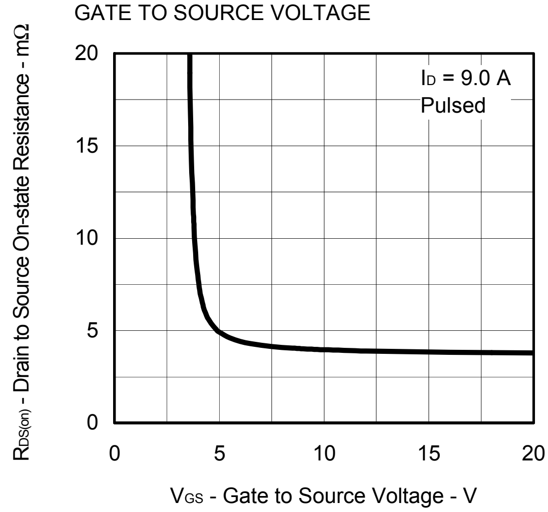

FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



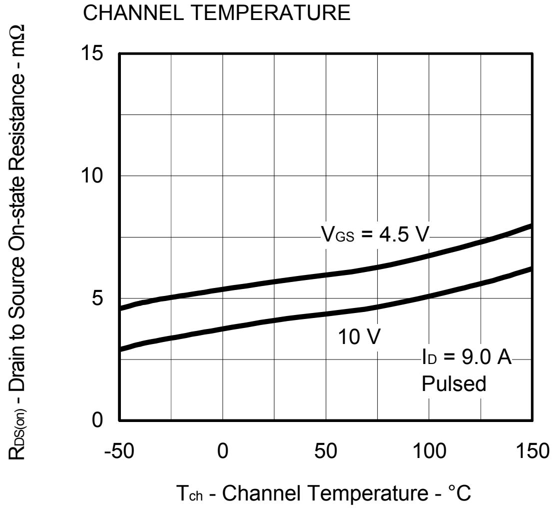

DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



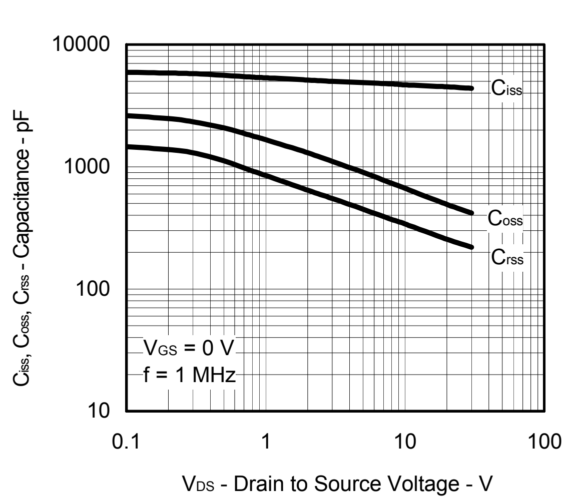

DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



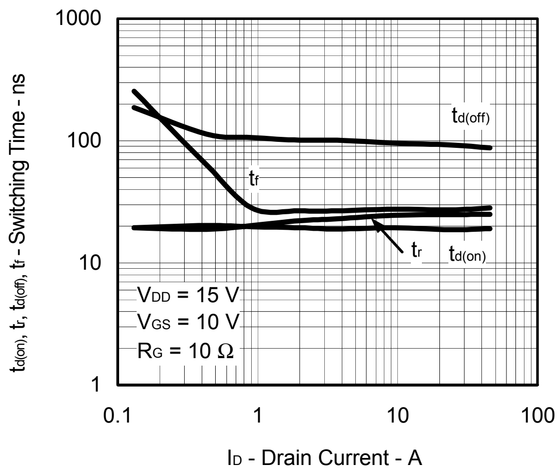

DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



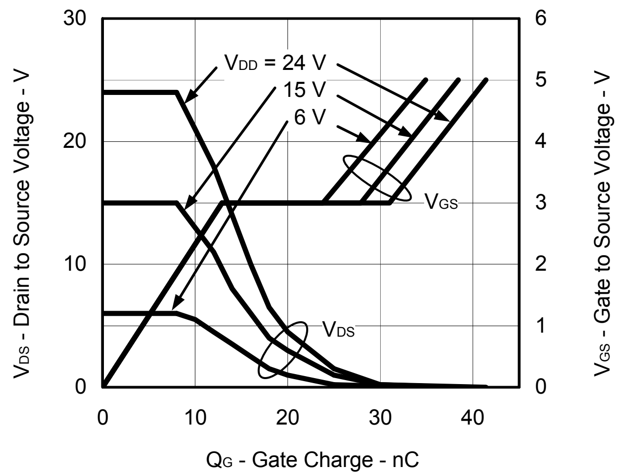

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



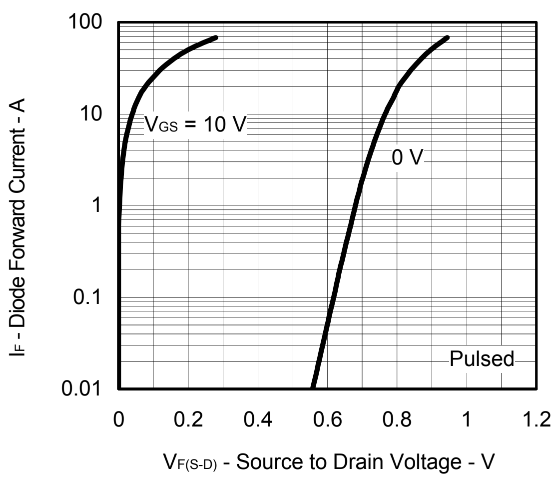
SWITCHING CHARACTERISTICS



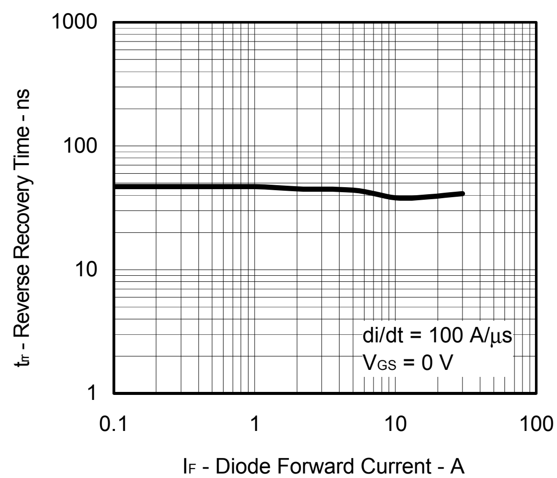

DYNAMIC INPUT/OUTPUT CHARACTERISTICS



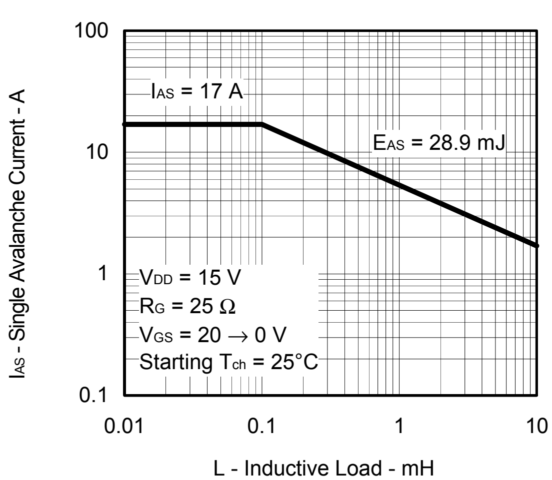

SOURCE TO DRAIN DIODE FORWARD VOLTAGE



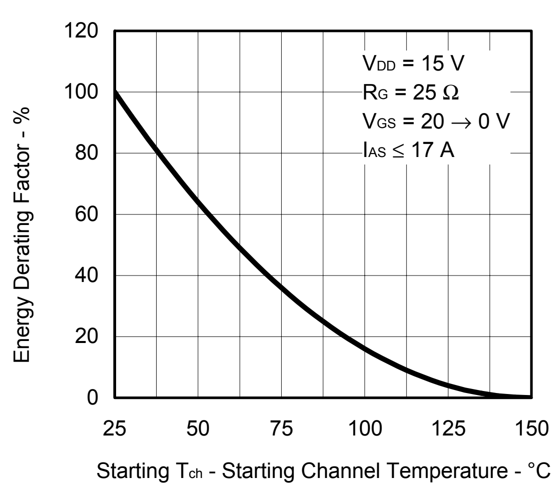

REVERSE RECOVERY TIME vs.
DIODE FORWARD CURRENT




SINGLE AVALANCHE CURRENT vs.
INDUCTIVE LOAD

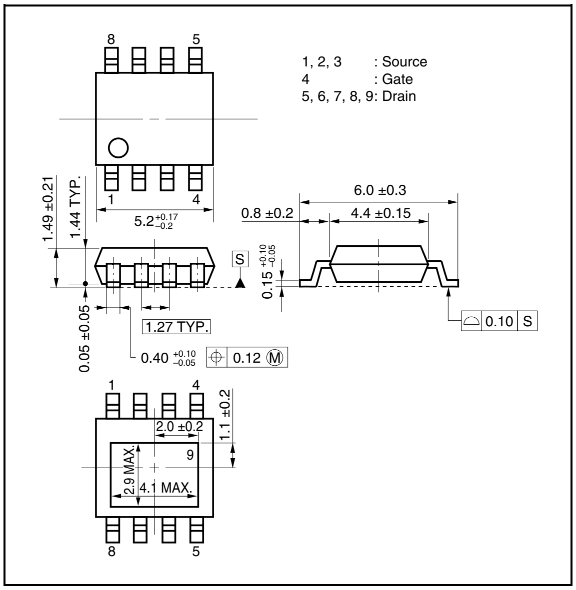



SINGLE AVALANCHE ENERGY
DERATING FACTOR

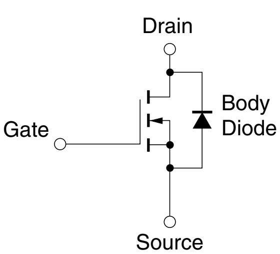


## PACKAGE DRAWING (Unit: mm)

**Power HSOP8**




## EQUIVALENT CIRCUIT




**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.