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April 1st, 2010
Renesas Electronics Corporation

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RENESAS

# INTEGRATED LOAD SWITCH
# μPA1981

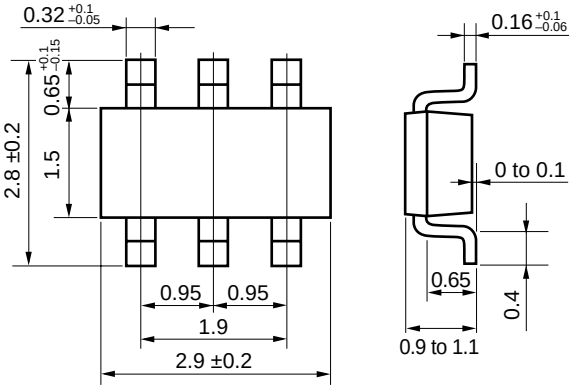
## N-CHANNEL/P-CHANNEL MOS FET PAIR FOR LOAD SWITCH

### DESCRIPTION

The μPA1981 is a N-Channel/P-Channel MOS FET pair for compact power management in portable electronic equipment where 2.5 to 8 V input and 2.8 A output current capability are needed.

This load switch integrated a small N-Channel MOS FET (Q1), which drives a large P-Channel MOS FET (Q2) in one tiny package (SC-95).

### PACKAGE DRAWING (Unit: mm)




### FEATURES

- $V_{S2D2}1$ = 0.2 V MAX. ($V_{S2S1}$ = 5.0 V, $I_{D2}$ = –2.8 A, $R_{D2S2(on)}1$ = 70 mΩ)
- $V_{S2D2}2$ = 0.2 V MAX. ($V_{S2S1}$ = 2.5 V, $I_{D2}$ = –1.9 A, $R_{D2S2(on)}2$ = 105 mΩ)

### ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|---|---|
| μPA1981TE | SC-95 (Mini Mold Thin Type) |

**Marking**: TZ

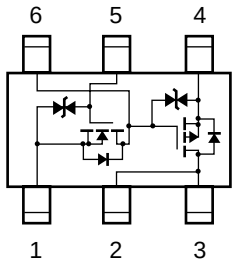
### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C)

| | | | |
|---|---|---|---|
| Source2 to Source1 Input Voltage Range | $V_{S2S1}$ | 2.5 to 8.0 | V |
| Gate1 to Source1 On Voltage Range | $V_{G1S1}$ | 1.5 to 7.0 | V |
| Drain2 Current (DC) Note1 | $I_{D2(DC)}$ | –2.8 | A |
| Drain2 Current (pulse) Note2 | $I_{D2(pulse)}$ | –10.0 | A |
| Total Power Dissipation Note1 | $P_T$ | 1.0 | W |
| Channel Temperature | $T_{ch}$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | –55 to +150 | °C |

**Notes 1.** Mounted on FR-4 Board of 2500 $mm^2$ x 1.6 mm, t ≤ 5 sec

**2.** PW ≤ 10 μs, Duty Cycle ≤ 1%

### PIN CONNECTION (Top View)




1. S1(Q1)
2. D2(Q2)
3. D2(Q2)
4. S2(Q2)
5. G1(Q1)
6. G2/D1

**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device 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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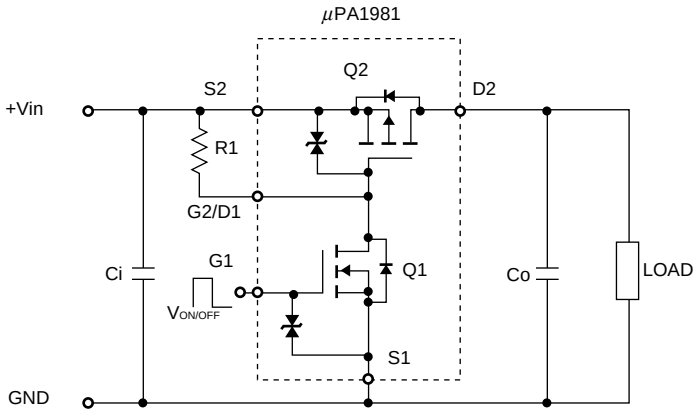
## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C)

| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Q2-S2 to D2 Leakage Current | $I_{S2D2}$ | $V_{S2D2}$ = 8.0 V, $V_{G1S1}$ = 0 V | | | 1.0 | μA |
| Q1-D1 to S1 Leakage Current | $I_{D1S1}$ | $V_{D1S1}$ = 8.0 V, $V_{G1S1}$ = 0 V | | | 1.0 | μA |
| **ON CHARACTERISTICS** | | | | | | |
| Q2-S2 to D2 Voltage **Note** | $V_{S2D2}1$ | $V_{S2S1}$ = 5.0 V, $V_{G1S1}$ = 3.3 V, $I_{D2}$ = –2.8 A | | 0.15 | 0.2 | V |
| | $V_{S2D2}2$ | $V_{S2S1}$ = 2.5 V, $V_{G1S1}$ = 3.3 V, $I_{D2}$ = –1.9 A | | 0.15 | 0.2 | V |
| Q2-Static On-Resistance **Note** | $R_{D2S2(on)}1$ | $V_{G2S2}$ = –5.0 V, $I_{D2}$ = –2.8A | | 52 | 70 | mΩ |
| | $R_{D2S2(on)}2$ | $V_{G2S2}$ = –2.5 V, $I_{D2}$ = –1.9 A | | 76 | 105 | mΩ |
| Q2-S2 to D2 Current **Note** | $I_{S2D2}1$ | $V_{S2D2}$ = 0.2 V, $V_{S2S1}$ = 5.0 V, $V_{G1S1}$ = 3.3 V | 2.8 | | | A |
| | $I_{S2D2}2$ | $V_{S2D2}$ = 0.2 V, $V_{S2S1}$ = 2.5 V, $V_{G1S1}$ = 3.3 V | 1.9 | | | A |

**Note** Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

## CIRCUIT1 EXAMPLE OF APPLICATION CIRCUIT




## RECOMMENDATION OF CIRCUIT1

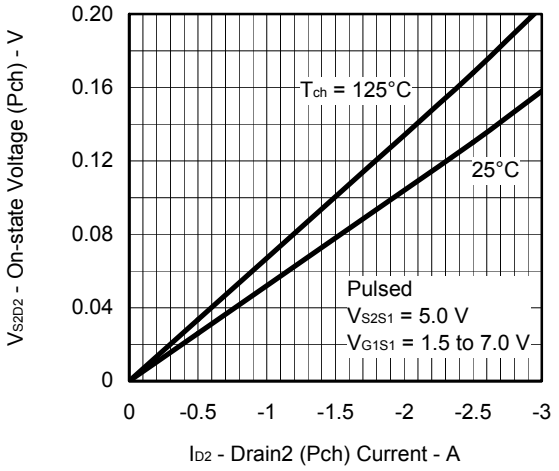
Co ≤ 1 μF for applications

R1 is required to turn Q2 off.

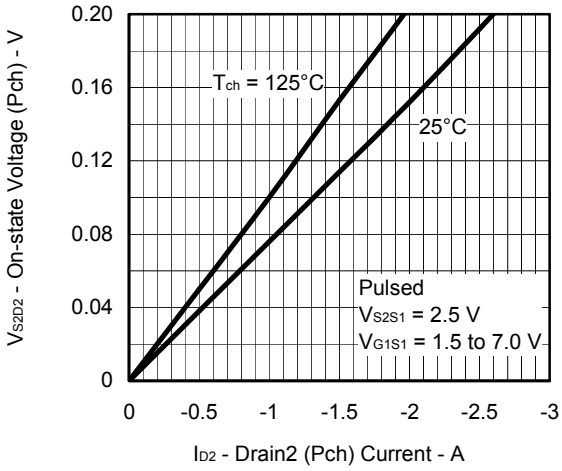
Select R1 in the range of 10 to 470 kΩ.

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

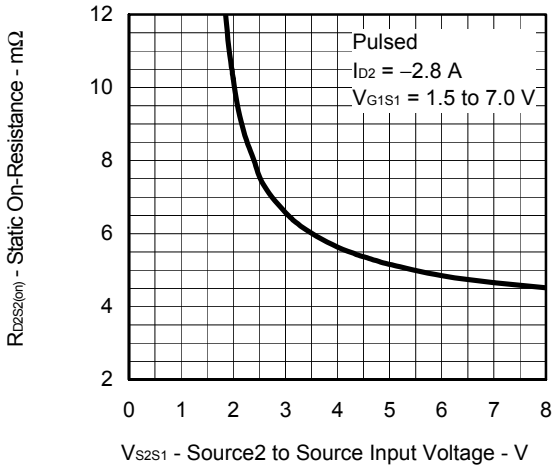
ON-STATE VOLTAGE (Pch) vs. DRAIN2 CURRENT



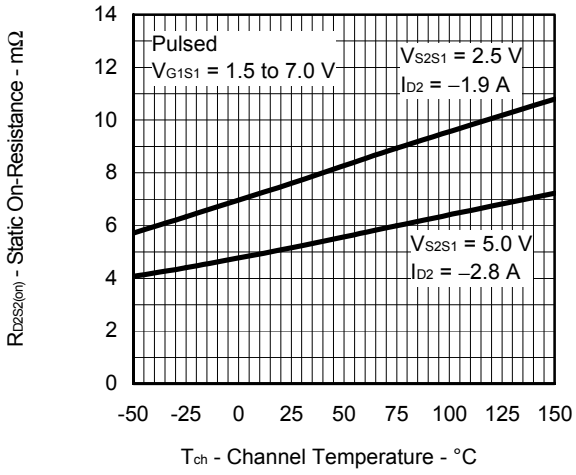

ON-STATE VOLTAGE (Pch) vs. CHANNEL TEMPERATURE



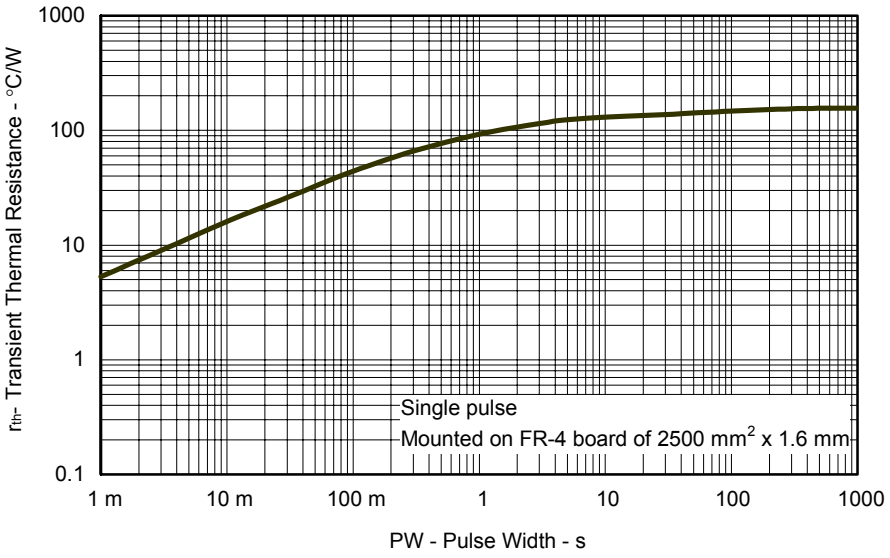

ON-STATE RESISTANCE (Pch) vs. INPUT VOLTAGE




ON-STATE RESISTANCE (Pch) vs. CHANNEL TEMPERATURE




TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



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