MOSFETs Silicon N-channel MOS (U-MOS ₩-H)

TK100A06N1

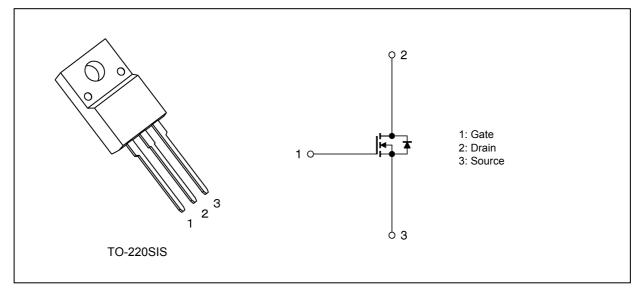
1. Applications

Switching Voltage Regulators

2. Features

- (1) Low drain-source on-resistance: $R_{DS(ON)} = 2.2 \text{ m}\Omega$ (typ.) ($V_{GS} = 10 \text{ V}$)
- (2) Low leakage current: $I_{DSS} = 10 \ \mu A \ (max) \ (V_{DS} = 60 \ V)$
- (3) Enhancement mode: V_{th} = 2.0 to 4.0 V (V_{DS} = 10 V, I_{D} = 1.0 mA)

3. Packaging and Internal Circuit



4. Absolute Maximum Ratings (Note) (Ta = 25°C unless otherwise specified)

| Characte | Symbol | Rating | Unit | | |
|-------------------------------|-------------------------|--------------------|------------------|------------|----|
| Drain-source voltage | | | V _{DSS} | 60 | V |
| Gate-source voltage | | | V _{GSS} | ±20 | 1 |
| Drain current (DC) | (Silicon limit) | (Note 1), (Note 2) | I _D | 263 | A |
| Drain current (DC) | (T _c = 25°C) | (Note 1) | Ι _D | 100 | 1 |
| Drain current (pulsed) | (t = 1 ms) | (Note 1) | I _{DP} | 584 | 1 |
| Power dissipation | (T _c = 25°C) | | PD | 45 | W |
| Single-pulse avalanche energy | | (Note 3) | E _{AS} | 413 | mJ |
| Avalanche current | | | I _{AR} | 100 | A |
| Channel temperature | | | T _{ch} | 150 | °C |
| Storage temperature | | | T _{stg} | -55 to 150 | 1 |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

5. Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|---------------------------------------|-----------------------|------|------|
| Channel-to-case thermal resistance | R _{th(ch-c)} | 2.77 | °C/W |
| Channel-to-ambient thermal resistance | R _{th(ch-a)} | 62.5 | |

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: Limited by silicon chip capability. Package limit is 100A.

Note 3: V_{DD} = 48 V, T_{ch} = 25°C (initial), L = 31.8 μ H, I_{AR} = 100 A

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

6. Electrical Characteristics

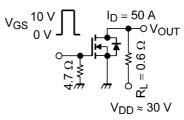
6.1. Static Characteristics (Ta = 25°C unless otherwise specified)

| Characteristics | Symbol | Test Condition | Min | Тур. | Max | Unit |
|---|----------------------|---|-----|------|------|------|
| Gate leakage current | I _{GSS} | V_{GS} = ±20 V, V_{DS} = 0 V | _ | _ | ±0.1 | μA |
| Drain cut-off current | I _{DSS} | V _{DS} = 60 V, V _{GS} = 0 V | - | — | 10 | |
| Drain-source breakdown voltage | V _{(BR)DSS} | I _D = 10 mA, V _{GS} = 0 V | 60 | | _ | V |
| Drain-source breakdown voltage (Note 4) | V _{(BR)DSX} | I _D = 10 mA, V _{GS} = -20 V | 45 | _ | _ | |
| Gate threshold voltage | V _{th} | V _{DS} = 10 V, I _D = 1.0 mA | 2.0 | — | 4.0 | |
| Drain-source on-resistance | R _{DS(ON)} | V _{GS} = 10 V, I _D = 50 A | _ | 2.2 | 2.7 | mΩ |

Note 4: If a reverse bias is applied between gate and source, this device enters V_{(BR)DSX} mode. Note that the drainsource breakdown voltage is lowered in this mode.

6.2. Dynamic Characteristics ($T_a = 25^{\circ}C$ unless otherwise specified)

| Characteristics | Symbol | Test Condition | Min | Тур. | Max | Unit |
|--------------------------------|------------------|--|-----|-------|-----|------|
| Input capacitance | C _{iss} | V _{DS} = 30 V, V _{GS} = 0 V, f = 1 MHz | _ | 10500 | — | pF |
| Reverse transfer capacitance | C _{rss} | | _ | 50 | _ | |
| Output capacitance | C _{oss} | | _ | 3500 | — | |
| Gate resistance | r _g | — | _ | 3.0 | — | Ω |
| Switching time (rise time) | tr | See Figure 6.2.1. | _ | 67 | _ | ns |
| Switching time (turn-on time) | t _{on} | | _ | 110 | _ | |
| Switching time (fall time) | t _f | | _ | 64 | _ | |
| Switching time (turn-off time) | t _{off} | | | 180 | | |



 $Duty \le 1\%, \ t_w = 10 \ \mu s$ Fig. 6.2.1 Switching Time Test Circuit

6.3. Gate Charge Characteristics ($T_a = 25^{\circ}C$ unless otherwise specified)

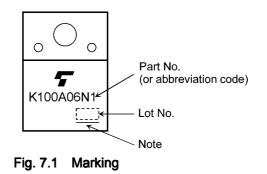
| Characteristics | Symbol | Test Condition | Min | Тур. | Max | Unit |
|---|------------------|---|-----|------|-----|------|
| Total gate charge (gate-source plus gate-drain) | Qg | $V_{DD} \approx 48$ V, V_{GS} = 10 V, I_D = 100 A | _ | 140 | — | nC |
| Gate-source charge 1 | Q _{gs1} | | _ | 44 | _ | |
| Gate-drain charge | Q _{gd} | | _ | 38 | _ | |
| Gate switch charge | Q _{SW} | | _ | 56 | _ | |

6.4. Source-Drain Characteristics ($T_a = 25^{\circ}C$ unless otherwise specified)

| Characteristics | | Symbol | Test Condition | Min | Тур. | Max | Unit |
|--------------------------------|----------|------------------|--|-----|------|------|------|
| Reverse drain current (DC) | (Note 5) | I _{DR} | — | _ | | 100 | А |
| Reverse drain current (pulsed) | (Note 5) | I _{DRP} | | _ | _ | 584 | |
| Diode forward voltage | | V _{DSF} | I _{DR} = 100 A, V _{GS} = 0 V | — | — | -1.2 | V |
| Reverse recovery time | (Note 6) | t _{rr} | I _{DR} = 100 A, V _{GS} = 0 V | _ | 100 | _ | ns |
| Reverse recovery charge | (Note 6) | Q _{rr} | -dI _{DR} /dt = 100 A/µs | _ | 220 | _ | nC |

Note 5: Ensure that the channel temperature does not exceed 150°C. Note 6: Ensure that V_{DS} peak does not exceed V_{DSS} .

7. Marking (Note)

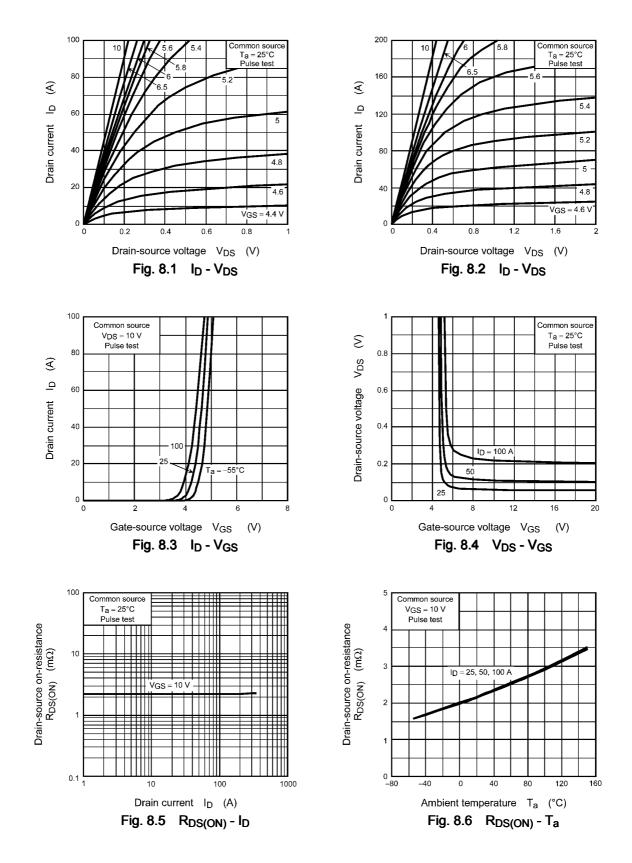


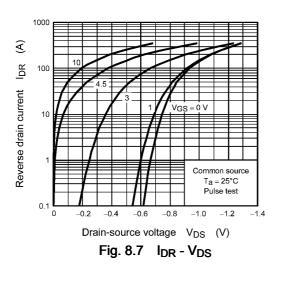
Note: A line under a Lot No. identifies the indication of product Labels. Not underlined: [[Pb]]/INCLUDES > MCV Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.

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8. Characteristics Curves (Note)





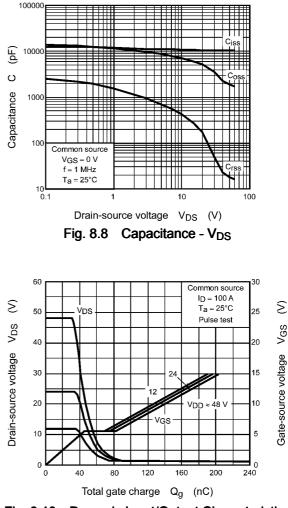
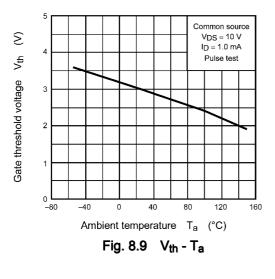
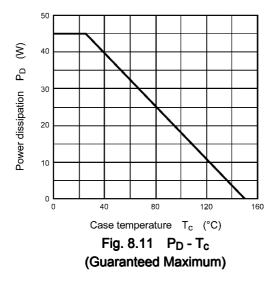
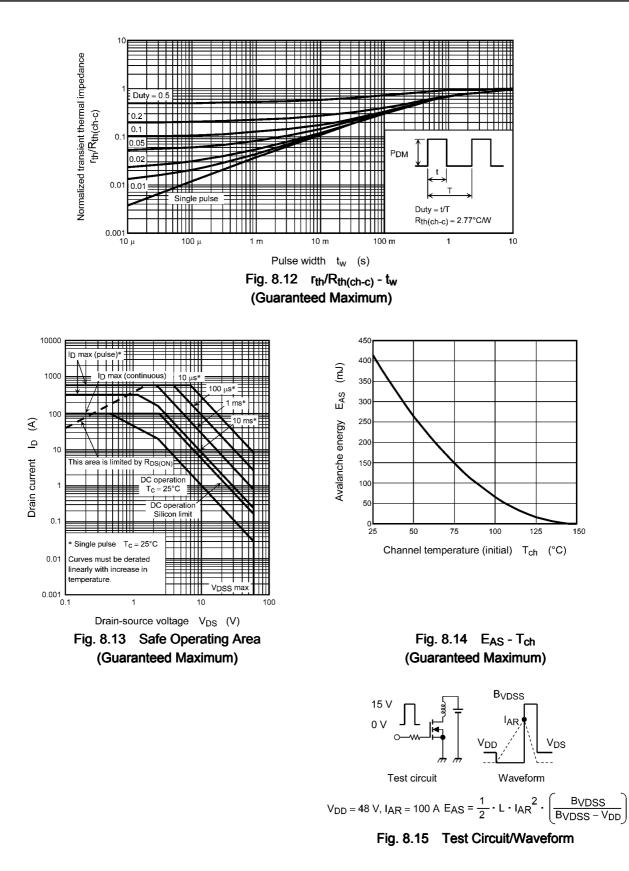


Fig. 8.10 Dynamic Input/Output Characteristics



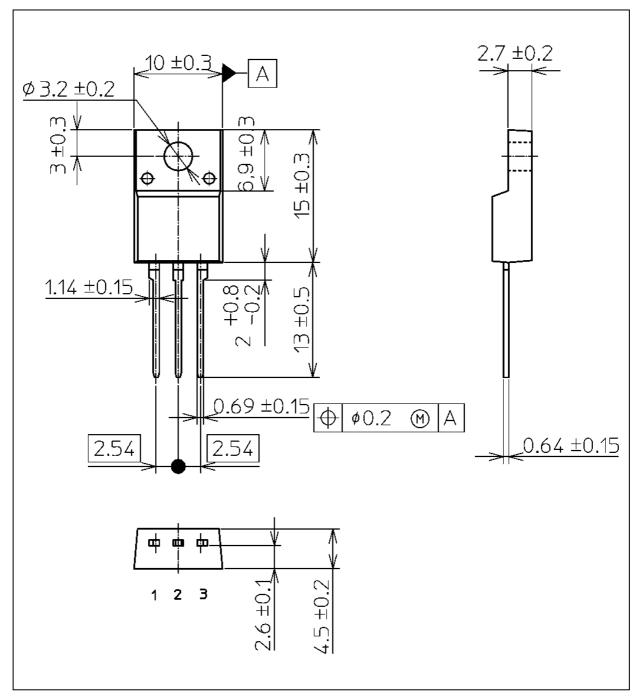




Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Package Dimensions

Unit: mm



Weight: 1.7 g (typ.)

| | Package Name(s) |
|---------------------|-----------------|
| JEITA: SC-67 | |
| TOSHIBA: 2-10U1S | |
| Nickname: TO-220SIS | |

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