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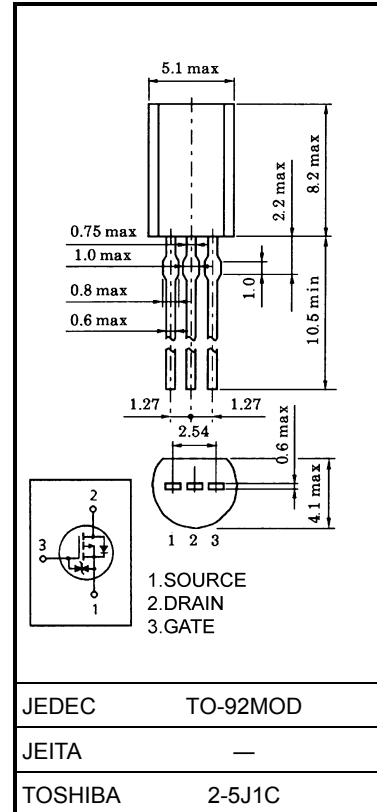
Chopper Regulator, DC-DC Converter and Motor Drive Applications

Unit: mm

- 4-V gate drive
- Low drain-source ON resistance : $R_{DS(ON)} = 0.5 \Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 1.0 S$ (typ.)
- Low leakage current : $I_{DSS} = -100 \mu A$ (max) ($V_{DS} = -60 V$)
- Enhancement mode : $V_{th} = -0.8 \sim -2.0 V$ ($V_{DS} = -10 V, I_D = -1 mA$)

Absolute Maximum Ratings ($T_a = 25^\circ C$)

| Characteristics | | Symbol | Rating | Unit |
|--|----------------|-----------|----------|------------|
| Drain-source voltage | | V_{DSS} | -60 | V |
| Drain-gate voltage ($R_{GS} = 20 k\Omega$) | | V_{DGR} | -60 | V |
| Gate-source voltage | | V_{GSS} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | -1 | A |
| | Pulse (Note 1) | I_{DP} | -3 | A |
| Drain power dissipation | | P_D | 0.9 | W |
| Single pulse avalanche energy (Note 2) | | E_{AS} | 249.6 | mJ |
| Avalanche current | | I_{AR} | -1 | A |
| Repetitive avalanche energy (Note 3) | | E_{AR} | 0.09 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ C$ |
| Storage temperature range | | T_{stg} | -55~150 | $^\circ C$ |



Weight: 0.36 g (typ.)

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).

Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|--|----------------|-----|----------------|
| Thermal resistance, channel to ambient | $R_{th(ch-a)}$ | 138 | $^\circ C / W$ |

Note 1: Ensure that the channel temperature does not exceed 150 $^\circ C$.

Note 2: $V_{DD} = -25 V, T_{ch} = 25^\circ C$ (initial), $L = 339 mH, R_G = 25 \Omega, I_{AR} = -1 A$

Note 3: Repetitive rating: pulse width limited by maximum channel temperature

This transistor is an electrostatic-sensitive device.
Please handle with caution.

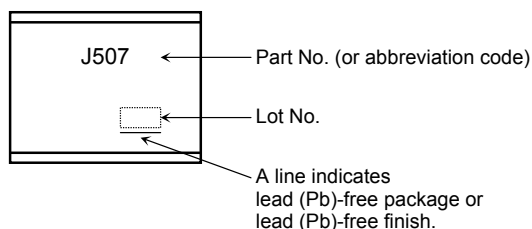
Electrical Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit | |
|---|----------------|--|------|------|----------|---------------|----|
| Gate leakage current | I_{GSS} | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$ | — | — | ± 10 | μA | |
| Drain cut-off current | I_{DSS} | $V_{DS} = -60 \text{ V}, V_{GS} = 0 \text{ V}$ | — | — | -100 | μA | |
| Drain-source breakdown voltage | $V_{(BR) DSS}$ | $I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$ | -60 | — | — | V | |
| Gate threshold voltage | V_{th} | $V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$ | -0.8 | — | -2.0 | V | |
| Drain-source ON resistance | $R_{DS(ON)}$ | $V_{GS} = -4 \text{ V}, I_D = -0.5 \text{ A}$ | — | 0.72 | 1.0 | Ω | |
| | | $V_{GS} = -10 \text{ V}, I_D = -0.5 \text{ A}$ | — | 0.5 | 0.7 | | |
| Forward transfer admittance | $ Y_{fs} $ | $V_{DS} = -10 \text{ V}, I_D = -0.5 \text{ A}$ | 0.5 | 1.0 | — | S | |
| Input capacitance | C_{iss} | $V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 170 | — | pF | |
| Reverse transfer capacitance | C_{rss} | | — | 25 | — | | |
| Output capacitance | C_{oss} | | — | 72 | — | | |
| Switching time | Rise time | t_r | | — | 20 | — | ns |
| | Turn-on time | t_{on} | | — | 35 | — | |
| | Fall time | t_f | | — | 30 | — | |
| | Turn-off time | t_{off} | | — | 135 | — | |
| Total gate charge (Gate-source plus gate-drain) | Q_g | $V_{DD} \approx -48 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -1 \text{ A}$ | — | 5.6 | — | nC | |
| Gate-source charge | Q_{gs} | | — | 3.9 | — | | |
| Gate-drain ("miller") charge | Q_{gd} | | — | 1.7 | — | | |

Source-Drain Ratings and Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|-----------|--|-----|------|-----|------|
| Continuous drain reverse current (Note 1) | I_{DR} | — | — | — | -1 | A |
| Pulse drain reverse current (Note 1) | I_{DRP} | — | — | — | -3 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = -1 \text{ A}, V_{GS} = 0 \text{ V}$ | — | — | 1.5 | V |
| Reverse recovery time | t_{rr} | $I_{DR} = -1 \text{ A}, V_{GS} = 0 \text{ V}, dI_{DR} / dt = 50 \text{ A} / \mu\text{s}$ | — | 58 | — | ns |
| Reverse recovery charge | Q_{rr} | | — | 72.5 | — | nC |

Marking



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