

MT4160

N-Channel PowerTrench[®] MOSFET

60V, 9A, 10mΩ



MT Semiconductor[®]

<http://www.mtsemi.com>

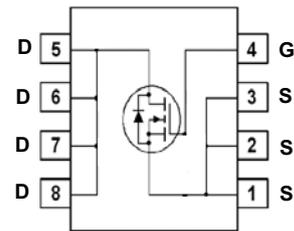
General Description

This N-Channel MOSFET is produced using Mos-tech Semiconductor's advanced Power mosfet process that has been especially tailored to minimize the on-state resistance. This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.

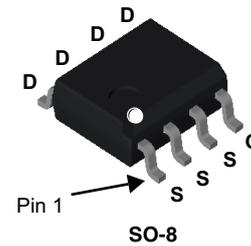
Features

- Max $R_{DS(on)} = 10m\Omega$, $V_{GS} = 10V$, $I_D = 9A$
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability
- RoHS compliant

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|--------------------|------------|------------|
| Drain-Source Voltage | V_{DS} | 60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 9 | A |
| Drain Current-Continuous($T_C=100^\circ C$) | $I_D(100^\circ C)$ | 6.4 | A |
| Pulsed Drain Current | I_{DM} | 36 | A |
| Maximum Power Dissipation | P_D | 2.6 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 150 | $^\circ C$ |

Thermal Characteristic

| | | | |
|---|-----------------|----|--------------|
| Thermal Resistance, Junction-to-Ambient ^(Note 2) | $R_{\theta JA}$ | 48 | $^\circ C/W$ |
|---|-----------------|----|--------------|

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|--------|----------------|-----------|------------|------------|
| MT4160 | MT4160 | SOP-8 | 13" | 12mm | 2500 units |

Electrical Characteristics (TC=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|--------------|---|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 60 | | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=60V, V_{GS}=0V$ | - | - | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 1.2 | 1.8 | 2.2 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=9A$ | - | 10 | 12 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=5V, I_D=9A$ | 25 | - | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C_{ISS} | $V_{DS}=30V, V_{GS}=0V,$ $F=1.0MHz$ | - | 2180 | - | PF |
| Output Capacitance | C_{OSS} | | - | 350 | - | PF |
| Reverse Transfer Capacitance | C_{RSS} | | - | 270 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=30V, R_L=1\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$ | - | 8.5 | - | nS |
| Turn-on Rise Time | t_r | | - | 6 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 30 | - | nS |
| Turn-Off Fall Time | t_f | | - | 5 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=30V, I_D=8A,$ $V_{GS}=10V$ | - | 58 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 8 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 17 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=9A$ | - | - | 1.2 | V |
| Diode Forward Current (Note 2) | I_S | - | - | - | 9 | A |
| Reverse Recovery Time | t_{rr} | $T_J = 25^\circ C, I_F=9A$ $di/dt = 100A/\mu s$ (Note 3) | - | 30 | - | nS |
| Reverse Recovery Charge | Q_{rr} | | - | 44 | - | nC |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics (Curves)

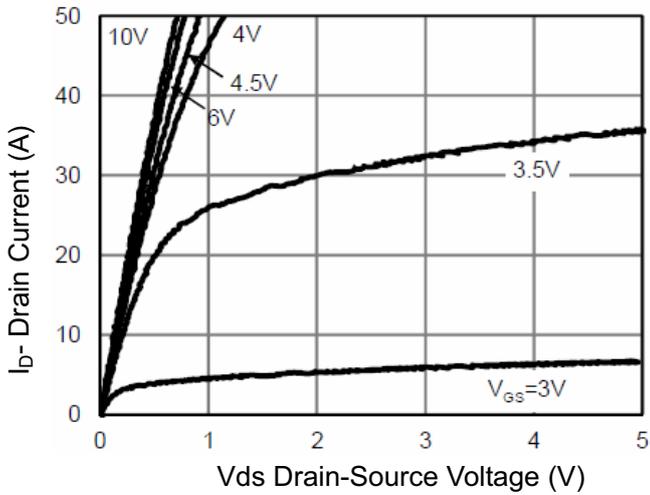


Figure 1 Output Characteristics

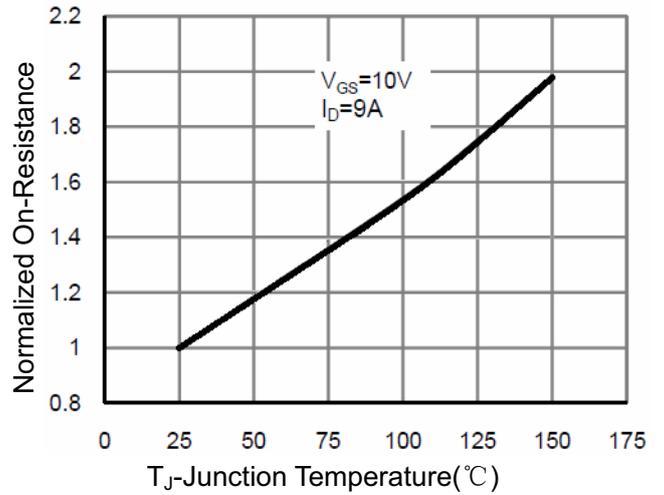


Figure 2 Rdson-Junction Temperature

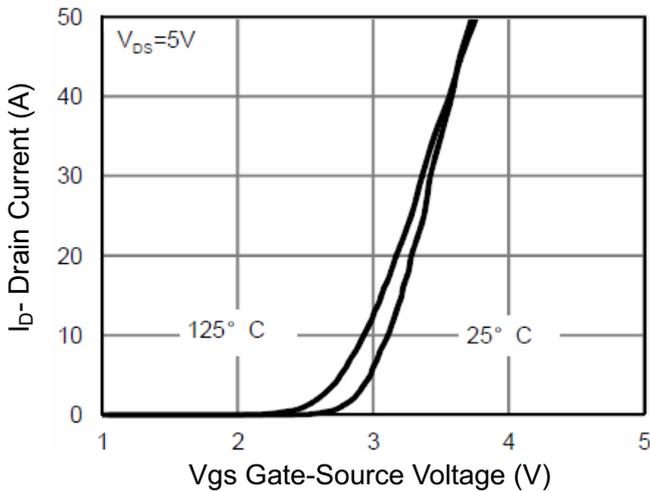


Figure 3 Transfer Characteristics

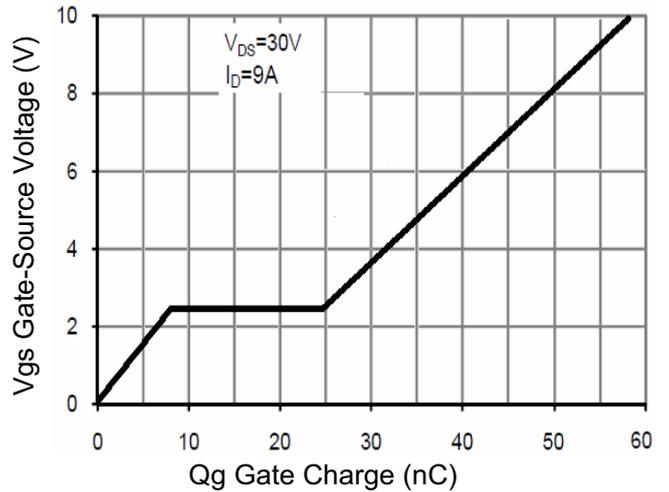


Figure 4 Gate Charge

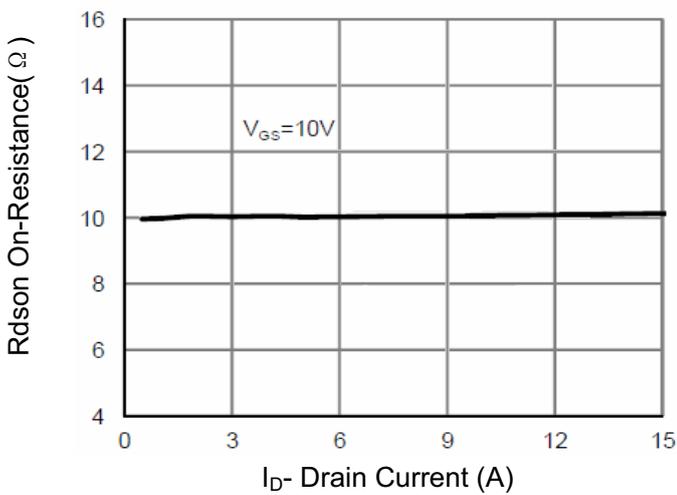


Figure 5 Rdson- Drain Current

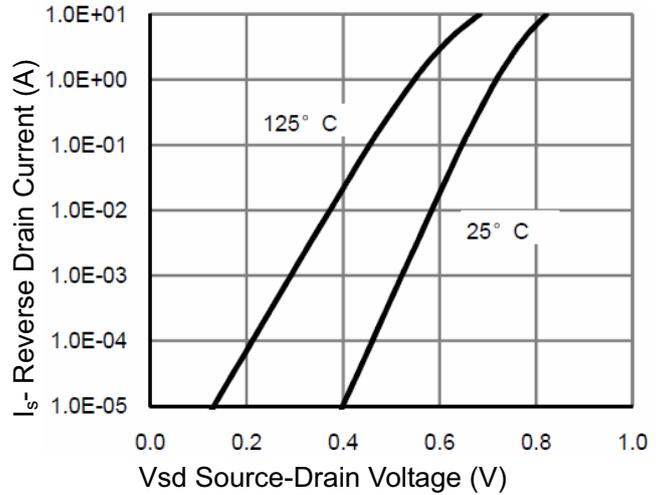


Figure 6 Source- Drain Diode Forward

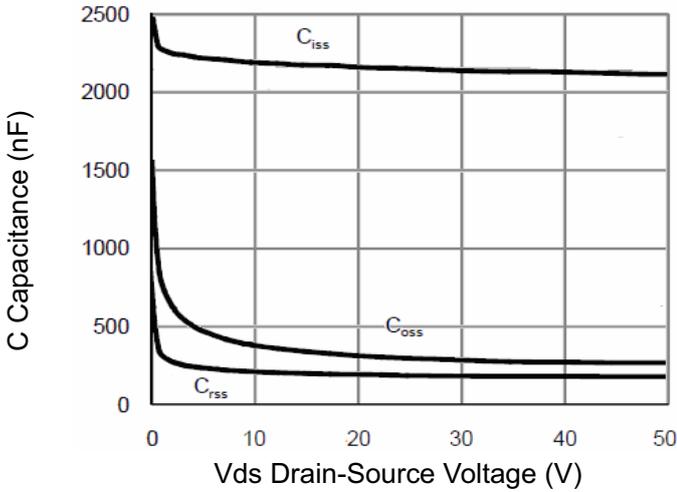


Figure 7 Capacitance vs Vds

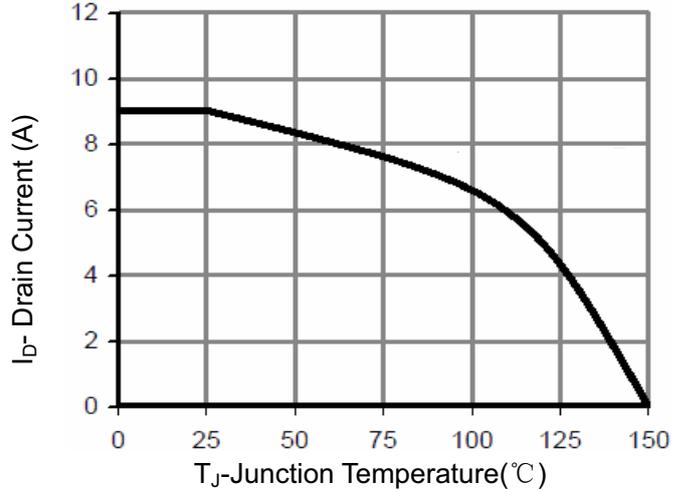


Figure 8 Current De-rating

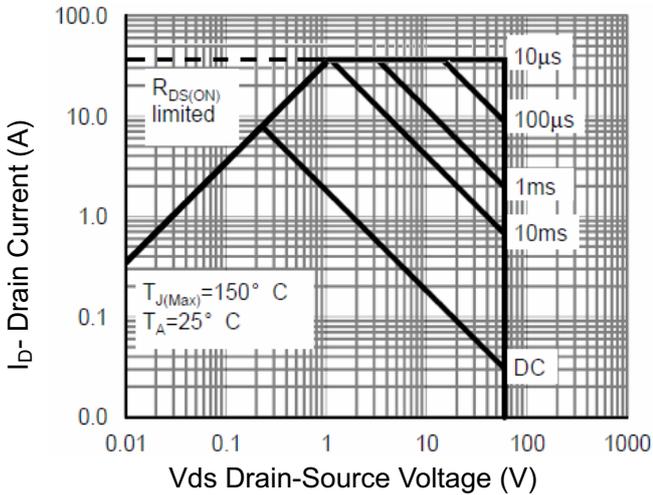


Figure 9 Safe Operation Area

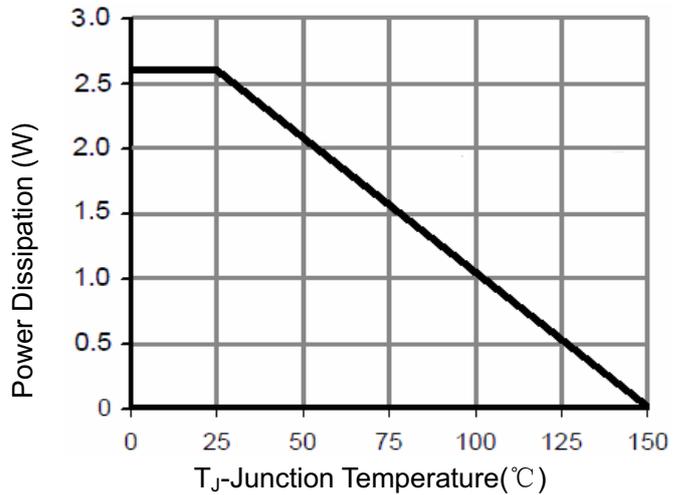


Figure 10 Power De-rating

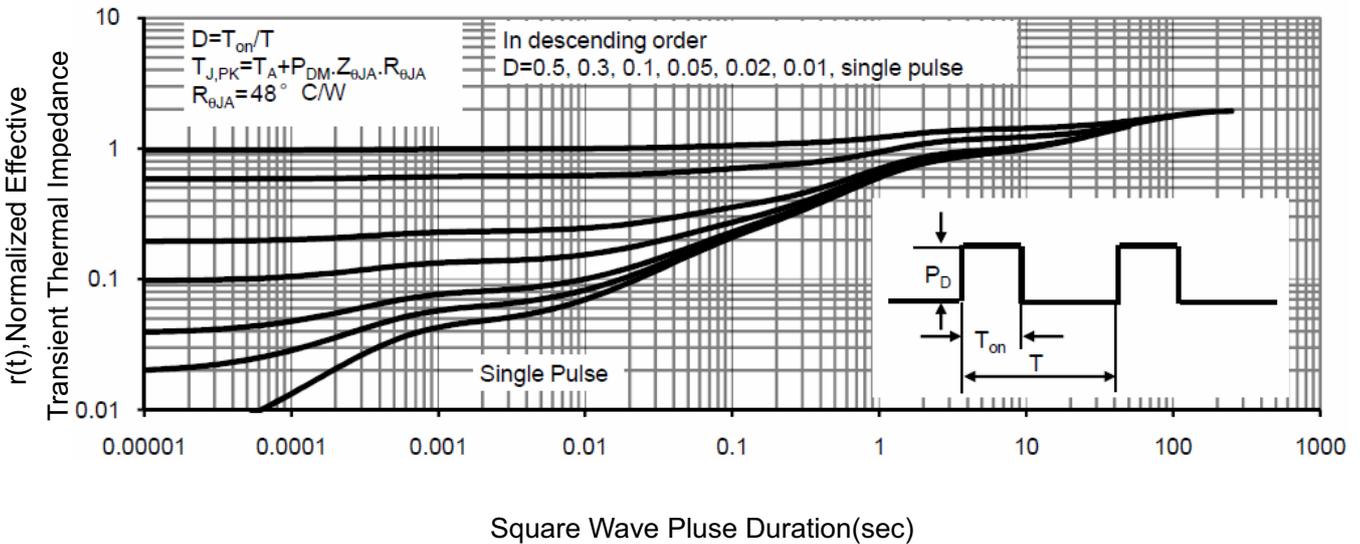
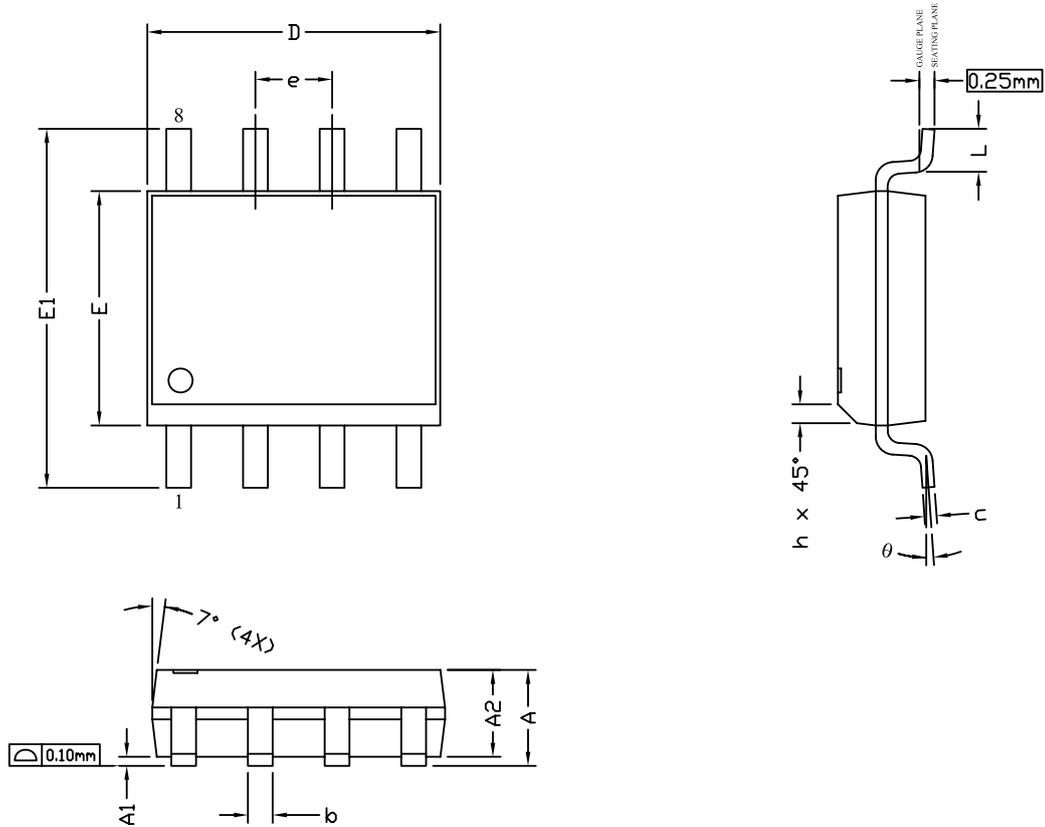


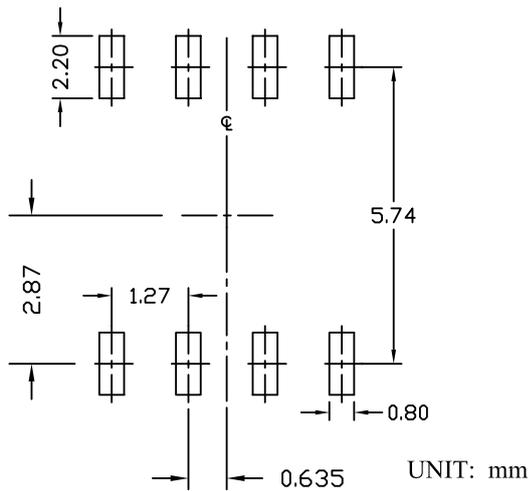
Figure 11 Normalized Maximum Transient Thermal Impedance

| | |
|--------------|----------|
| Document No. | PO-00004 |
| Version | rev H |

S08 PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|---------|---------------------------|------|------|----------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.35 | 1.65 | 1.75 | 0.053 | 0.065 | 0.069 |
| A1 | 0.10 | --- | 0.25 | 0.004 | --- | 0.010 |
| A2 | 1.25 | 1.50 | 1.65 | 0.049 | 0.059 | 0.065 |
| b | 0.31 | --- | 0.51 | 0.012 | --- | 0.020 |
| c | 0.17 | --- | 0.25 | 0.007 | --- | 0.010 |
| D | 4.80 | 4.90 | 5.00 | 0.189 | 0.193 | 0.197 |
| E | 3.80 | 3.90 | 4.00 | 0.150 | 0.154 | 0.157 |
| e | 1.27 BSC | | | 0.050 BSC | | |
| E1 | 5.80 | 6.00 | 6.20 | 0.228 | 0.236 | 0.244 |
| h | 0.25 | --- | 0.50 | 0.010 | --- | 0.020 |
| L | 0.40 | --- | 1.27 | 0.016 | --- | 0.050 |
| θ | 0° | --- | 8° | 0° | --- | 8° |

NOTE

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
4. DIMENSION L IS MEASURED IN GAUGE PLANE.
5. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

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