

P-Channel Enhancement Mode Power MOSFET

Description

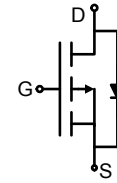
The HM2305D uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

General Features

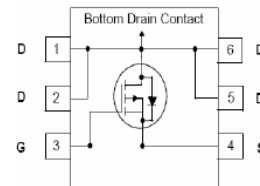
- $V_{DS} = -20V, I_D = -8.0A$
 $R_{DS(ON)} < 75m\Omega @ V_{GS} = -2.5V$
 $R_{DS(ON)} < 52m\Omega @ V_{GS} = -4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

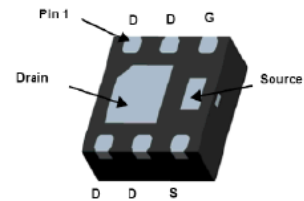
- PWM applications
- Load switch
- Power management



Schematic diagram



Pin assignment



DFN2X2-6L bottom view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|---------|----------------|-----------|------------|------------|
| PT 2305D | HM2305D | DFN2X2-6L | Ø180mm | 8 mm | 3000 units |

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

| Parameter | | Symbol | Limit | Unit |
|--|--------------------|----------------|------------|------------|
| Drain-Source Voltage | | V_{DS} | -20 | V |
| Gate-Source Voltage | | V_{GS} | ± 12 | V |
| Continuous Drain Current | $T_C = 25^\circ C$ | I_D | -8.0 | A |
| | $T_C = 70^\circ C$ | | -6.4 | |
| | $T_A = 25^\circ C$ | | -6.0 | |
| | $T_A = 70^\circ C$ | | -4.8 | |
| Drain Current - Pulsed (Note 1) | | I_{DM} | -32 | A |
| Maximum Power Dissipation | | P_D | 6.8 | 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) | $R_{\theta JA}$ | 74 | $^\circ C/W$ |
|--|-----------------|----|--------------|

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|------------------------------------|---------------------|---|-------|------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V I _D =-250μA | -20 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =-20V, V _{GS} =0V | - | - | -1 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±12V, V _{DS} =0V | - | - | ±100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =-250μA | -0.45 | -0.7 | -1.0 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =-4.5V, I _D =-4.1A | - | 39 | 52 | mΩ |
| | | V _{GS} =-2.5V, I _D =-3A | - | 58 | 75 | |
| Forward Transconductance | g _{FS} | V _{DS} =-5V, I _D =-2A | 6 | - | - | S |
| Dynamic Characteristics (Note4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =-4V, V _{GS} =0V, F=1.0MHz | - | 740 | - | PF |
| Output Capacitance | C _{oss} | | - | 290 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 190 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =-4V, I _D =-3.3A , R _L =-1.2Ω, V _{GEN} =-4.5V, R _g =1Ω | - | 12 | - | nS |
| Turn-on Rise Time | t _r | | - | 35 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 30 | - | nS |
| Turn-Off Fall Time | t _f | | - | 10 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =-4V, I _D =-4.1A, V _{GS} =-4.5V | - | 7.8 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 1.2 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 1.6 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =-1.6A | - | - | -1.2 | V |
| Diode Forward Current (Note 2) | I _S | | - | - | 1.6 | A |

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

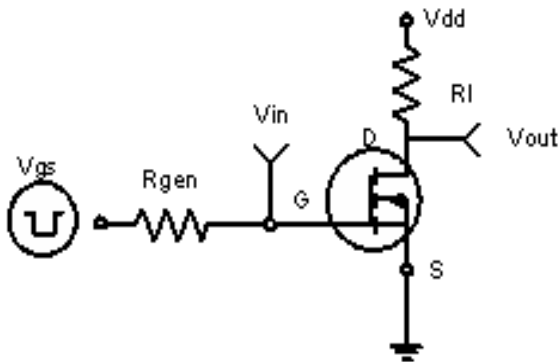


Figure 1: Switching Test Circuit

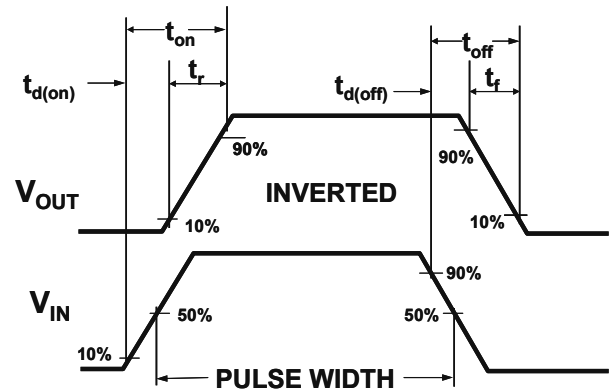


Figure 2: Switching Waveforms

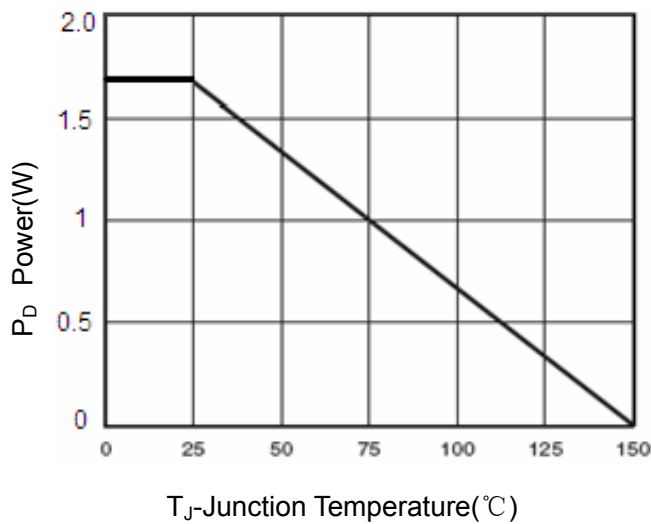


Figure 3 Power Dissipation

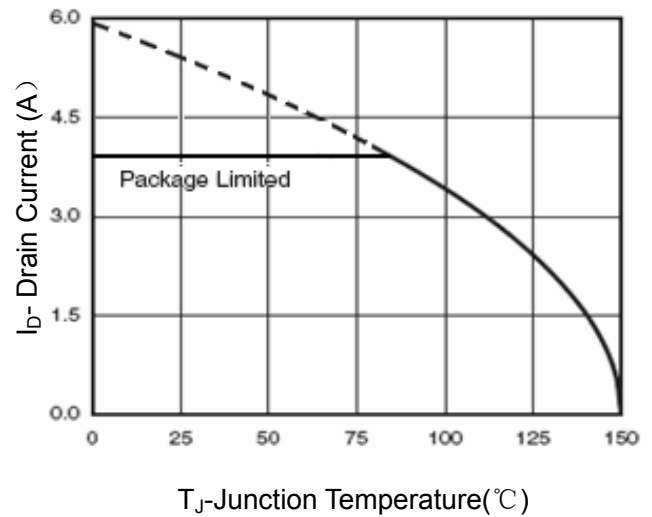


Figure 4 Drain Current

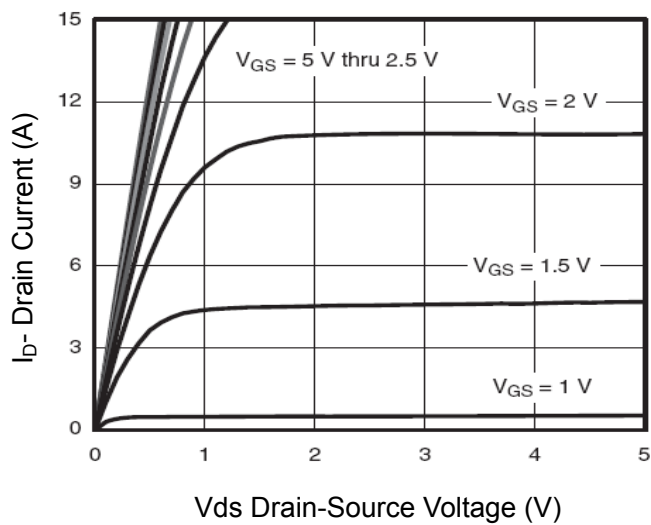


Figure 5 Output Characteristics

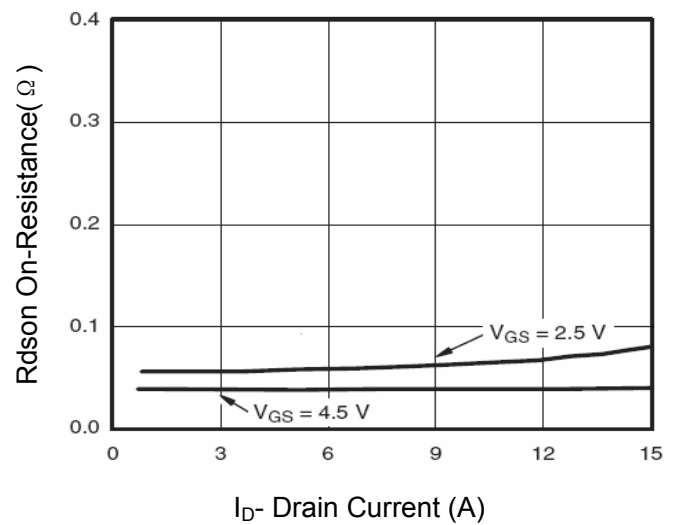


Figure 6 Drain-Source On-Resistance

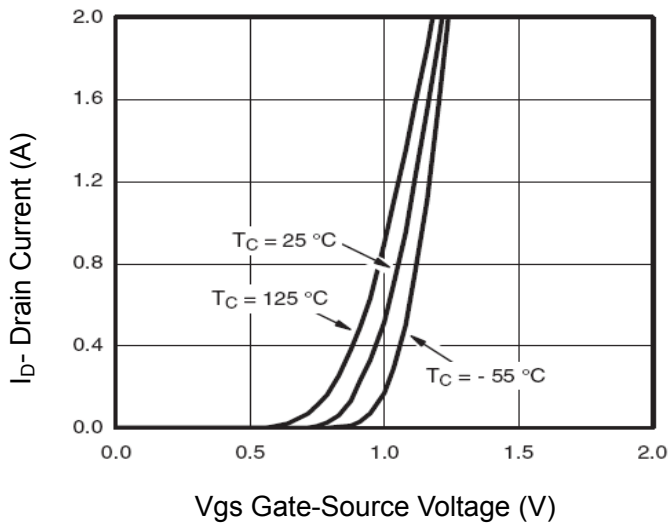


Figure 7 Transfer Characteristics

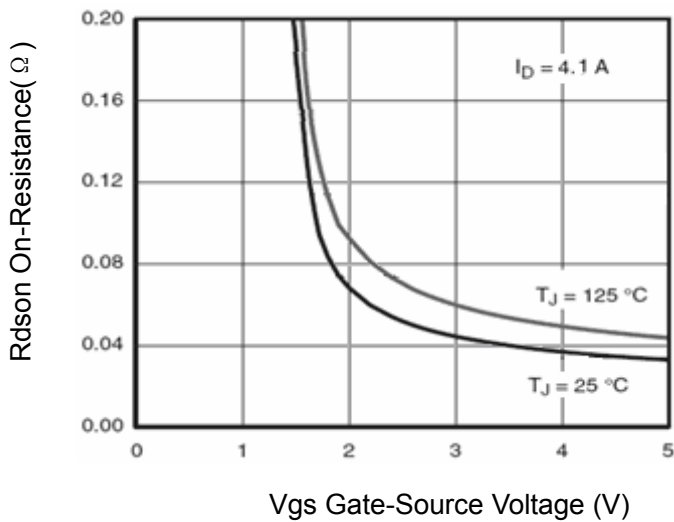


Figure 9 $R_{DS(on)}$ vs V_{GS}

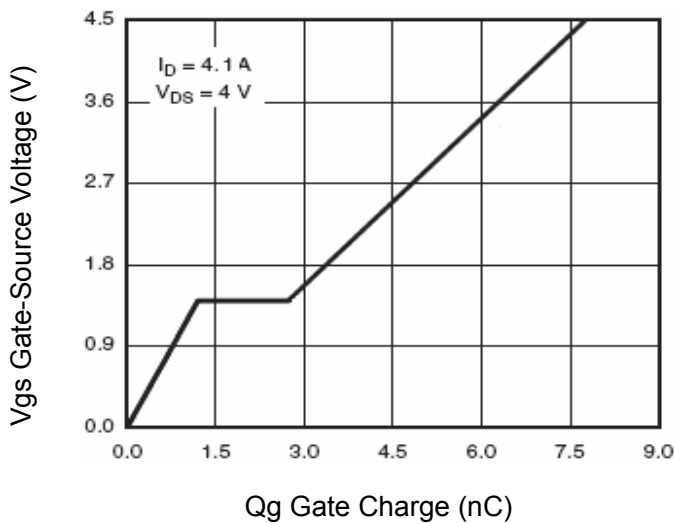


Figure 11 Gate Charge

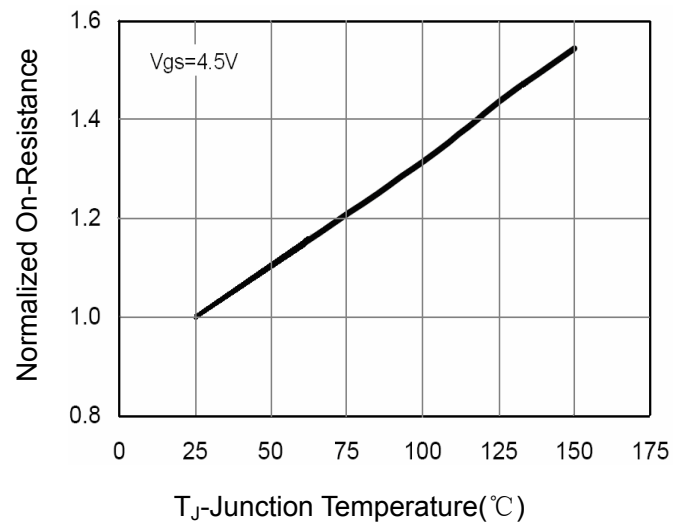


Figure 8 Drain-Source On-Resistance

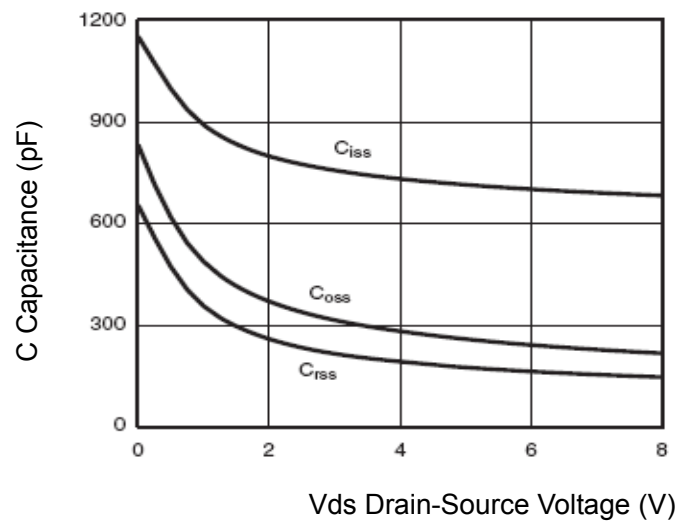


Figure 10 Capacitance vs V_{DS}

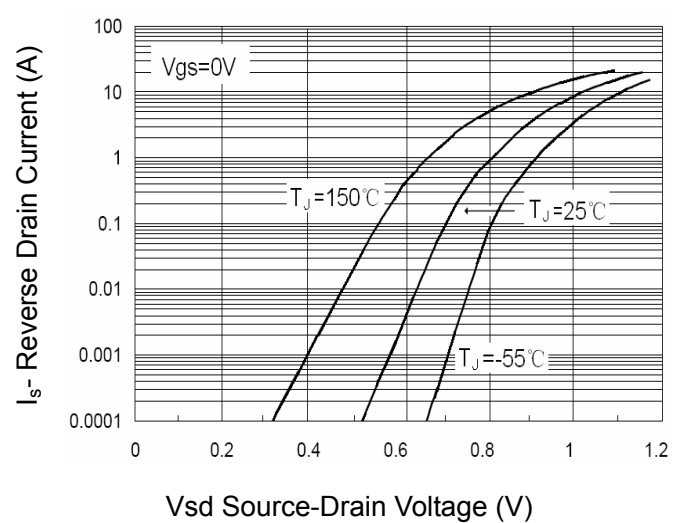


Figure 12 Source- Drain Diode Forward

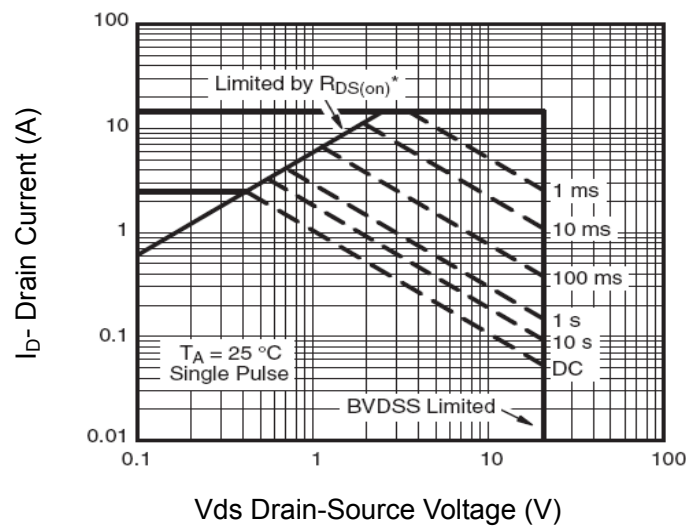


Figure 13 Safe Operation Area

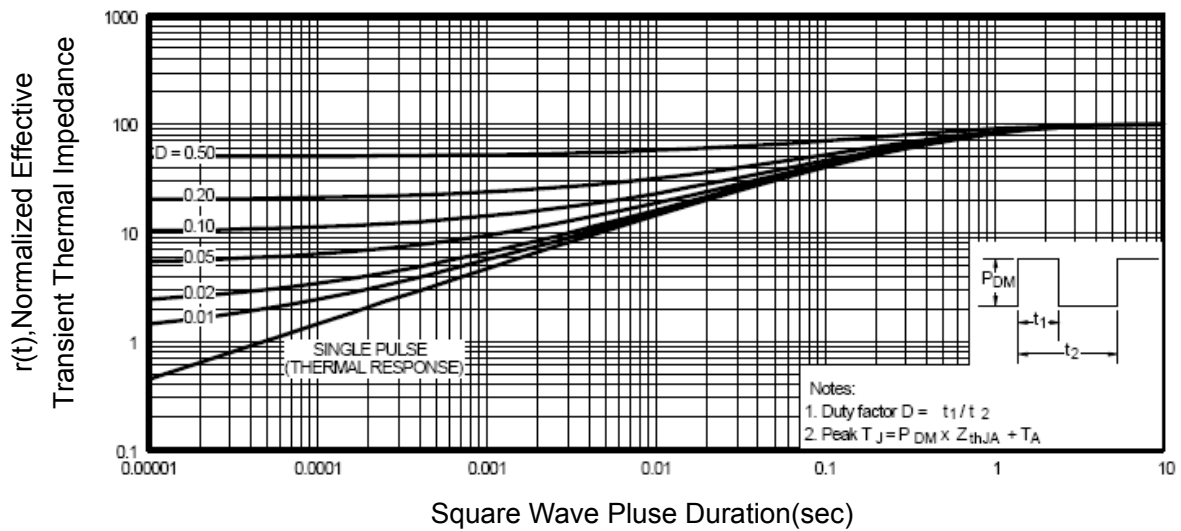
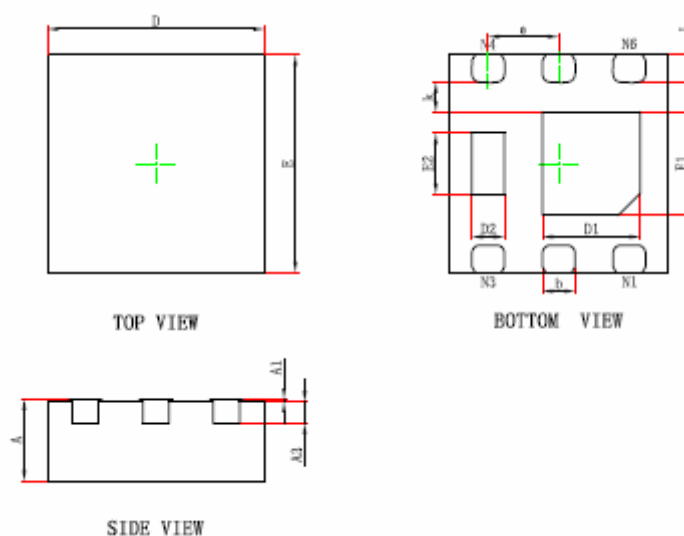


Figure 14 Normalized Maximum Transient Thermal Impedance

DFN2X2-6L Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.700 | 0.800 | 0.028 | 0.031 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.203REF. | | 0.008REF. | |
| D | 1.924 | 2.076 | 0.076 | 0.082 |
| E | 1.924 | 2.076 | 0.076 | 0.082 |
| D1 | 0.800 | 1.000 | 0.031 | 0.039 |
| E1 | 0.850 | 1.050 | 0.033 | 0.041 |
| D2 | 0.200 | 0.400 | 0.008 | 0.016 |
| E2 | 0.460 | 0.660 | 0.018 | 0.026 |
| k | 0.200MIN. | | 0.008MIN. | |
| b | 0.250 | 0.350 | 0.010 | 0.014 |
| e | 0.650TYP. | | 0.026TYP. | |
| L | 0.174 | 0.326 | 0.007 | 0.013 |

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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