

FDMS8690

N-Channel Power Trench® MOSFET

30V, 27A, 9.0mΩ

Features

- Max $r_{DS(on)}$ = 9.0mΩ at $V_{GS} = 10V$, $I_D = 14.0A$
- Max $r_{DS(on)}$ = 12.5mΩ at $V_{GS} = 4.5V$, $I_D = 11.5A$
- High performance trench technology for extremely low $r_{DS(on)}$ and gate charge
- Minimal Qgd (2.9nC typical)
- RoHS Compliant

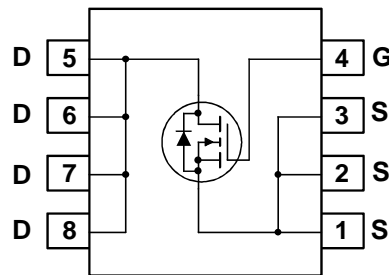
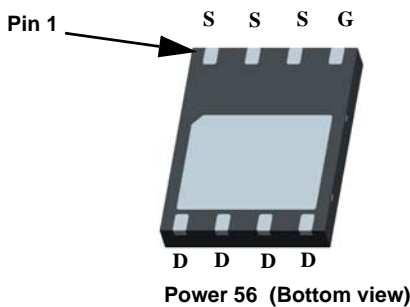


General Description

This device has been designed specifically to improve the efficiency of DC/DC converters. Using new techniques in MOSFET construction, the various components of gate charge and capacitance have been optimized to reduce switching losses. Low gate resistance and very low Miller charge enable excellent performance with both adaptive and fixed dead time gate drive circuits. Very low $r_{DS(on)}$ has been maintained to provide an extremely versatile device.

Application

- High Efficiency DC-DC converters.
- Notebook CPU power supply
- Multi purpose Point of Load



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Ratings | Units |
|----------------|--|-------------|------------------|
| V_{DS} | Drain to Source Voltage | 30 | V |
| V_{GS} | Gate to Source Voltage | ±20 | V |
| I_D | Drain Current -Continuous (Package limited) $T_C = 25^\circ\text{C}$ | 27 | A |
| | -Continuous (Silicon limited) $T_C = 25^\circ\text{C}$ | 52 | |
| | -Continuous $T_A = 25^\circ\text{C}$ (Note 1a) | 14 | |
| | -Pulsed | 100 | |
| P_D | Power Dissipation $T_C = 25^\circ\text{C}$ | 37.8 | W |
| | Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a) | 2.5 | |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ\text{C}$ |

Thermal Characteristics

| | | | |
|-----------------|---|-----|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 3.3 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 50 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|----------|----------|-----------|------------|------------|
| FDMS8690 | FDMS8690 | Power 56 | 13" | 12mm | 3000 units |

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

Off Characteristics

| | | | | | | |
|--------------------------------------|---|---|----|----|-----------|----------------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ | 30 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$, referenced to 25°C | | 34 | | mV/ $^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$ | | | 1 | μA |
| I_{GSS} | Gate to Source Leakage Current | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ | | | ± 100 | nA |

On Characteristics

| | | | | | | |
|--|--|--|---|------|------|----------------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ | 1 | 1.6 | 3 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$, referenced to 25°C | | -4.5 | | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$ | Drain to Source On Resistance | $V_{GS} = 10\text{V}, I_D = 14.0\text{A}$ | | 7.4 | 9.0 | m Ω |
| | | $V_{GS} = 4.5\text{V}, I_D = 11.5\text{A}$ | | 9.9 | 12.5 | |
| | | $V_{GS} = 10\text{V}, I_D = 14.0\text{A}, T_J = 125^\circ\text{C}$ | | 10.6 | 13.3 | |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|--|-------------------|------|------|-----|
| C_{iss} | Input Capacitance | $V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ | | 1260 | 1680 | pF |
| C_{oss} | Output Capacitance | | | 535 | 715 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 80 | 120 | pF |
| R_g | Gate Resistance | | $f = 1\text{MHz}$ | | 1.1 | 5.0 |

Switching Characteristics

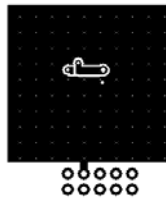
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|--------------|-------------------------------|--|-------------------------------------|---|------|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 15\text{V}, I_D = 1.0\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$ | | 8 | 16 | ns |
| t_r | Rise Time | | | 1.8 | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 26 | 42 | ns |
| t_f | Fall Time | | | 19 | 35 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V | | $V_{GS} = 0\text{V to } 10\text{V}$ | $V_{DD} = 15\text{V}$ $I_D = 14.0\text{A}$ | 18.8 | 27 |
| $Q_{g(5)}$ | Total Gate Charge at 5V | $V_{GS} = 0\text{V to } 5\text{V}$ | 10 | | 14 | nC |
| Q_{gs} | Gate to Source Gate Charge | | 3.5 | | | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | 2.9 | | | nC |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|---------------------------------------|---|--|-----|-----|----|
| V_{SD} | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = 2.1\text{A}$ (Note 2) | | 0.7 | 1.2 | V |
| t_{rr} | Reverse Recovery Time | $I_F = 14.0\text{A}, di/dt = 100\text{A}/\mu\text{s}$ | | | 45 | ns |
| Q_{rr} | Reverse Recovery Charge | | | | 33 | nC |

Notes:

1: R_{thJA} is determined with the device mounted on a 1in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R_{thJC} is guaranteed by design while R_{thCA} is determined by the user's board design.



a. $50^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b. $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

2: Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

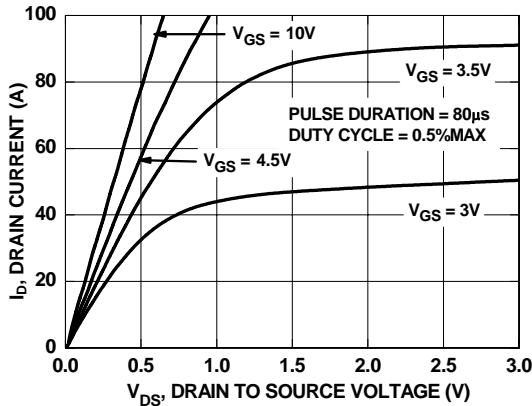


Figure 1. On-Region Characteristics

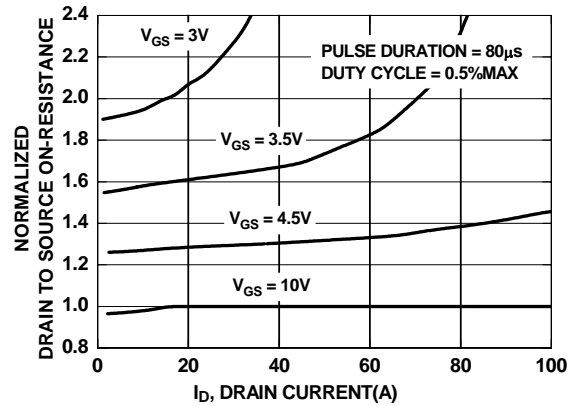


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

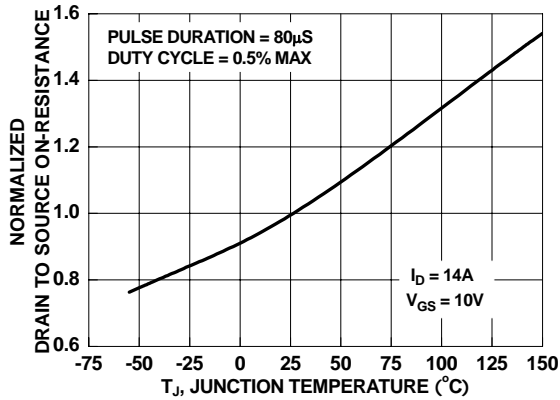


Figure 3. Normalized On-Resistance vs Junction Temperature

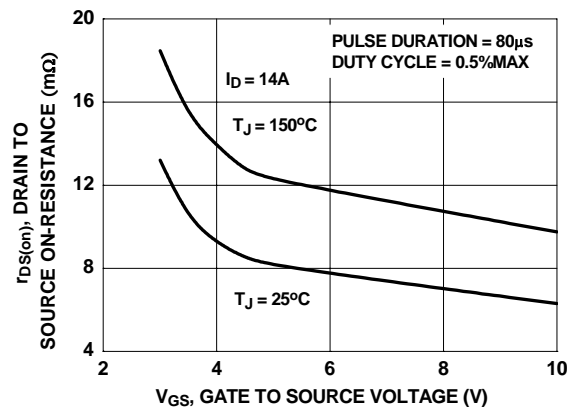


Figure 4. On-Resistance vs Gate to Source Voltage

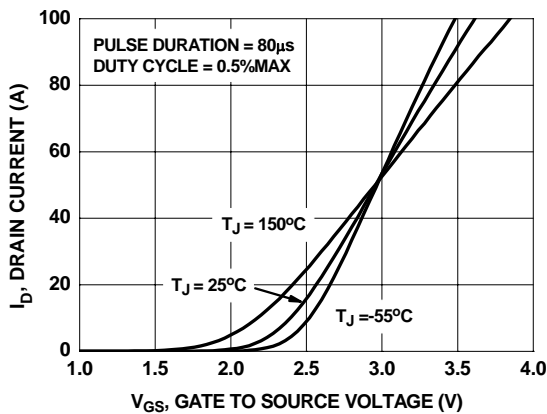


Figure 5. Transfer Characteristics

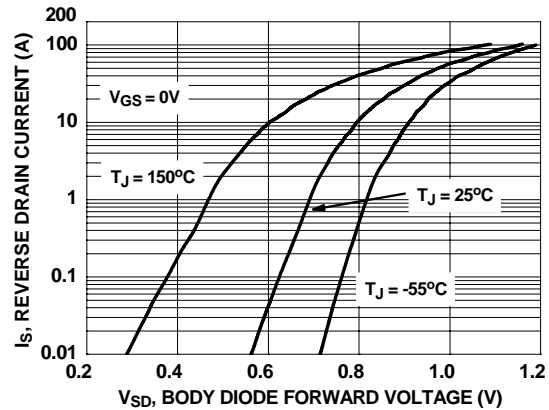


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

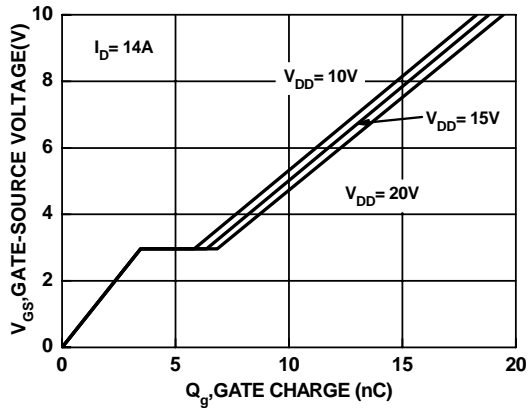


Figure 7. Gate Charge Characteristics

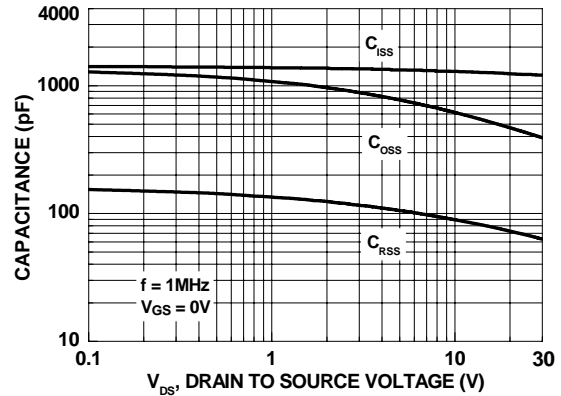


Figure 8. Capacitance vs Drain to Source Voltage

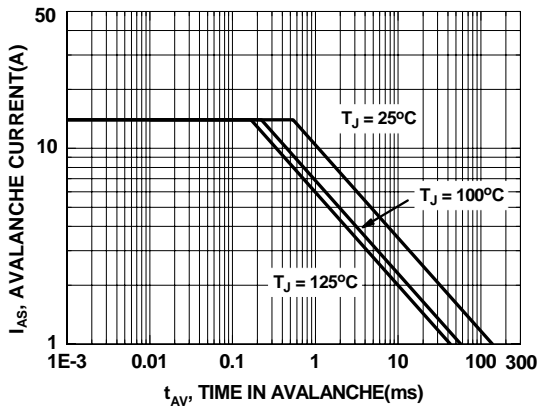


Figure 9. Unclamped Inductive Switching Capability

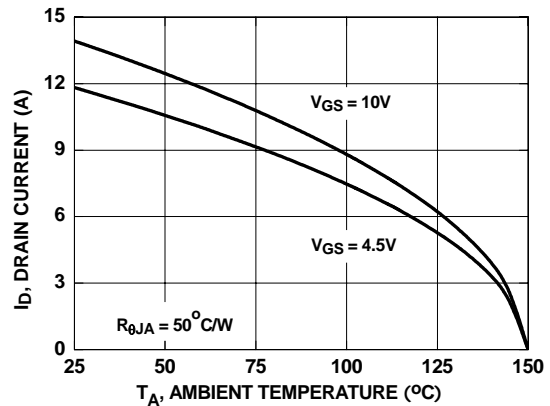


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

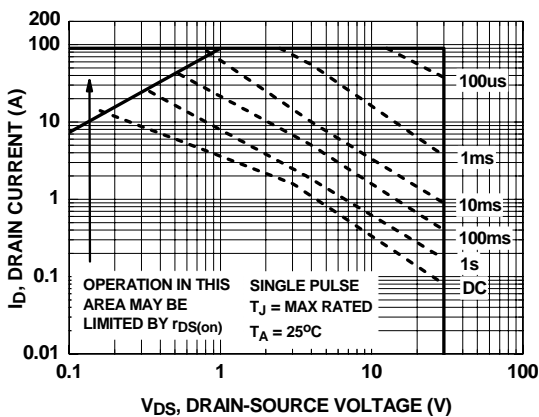


Figure 11. Forward Bias Safe Operating Area

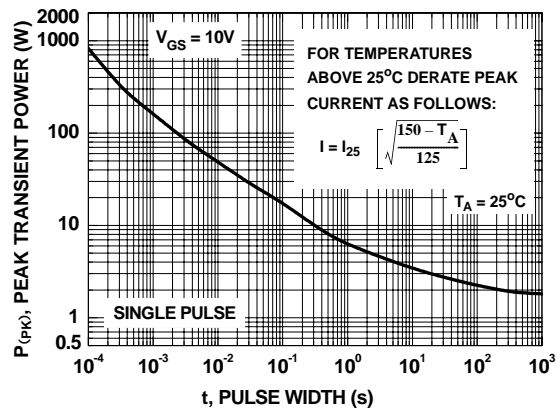


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

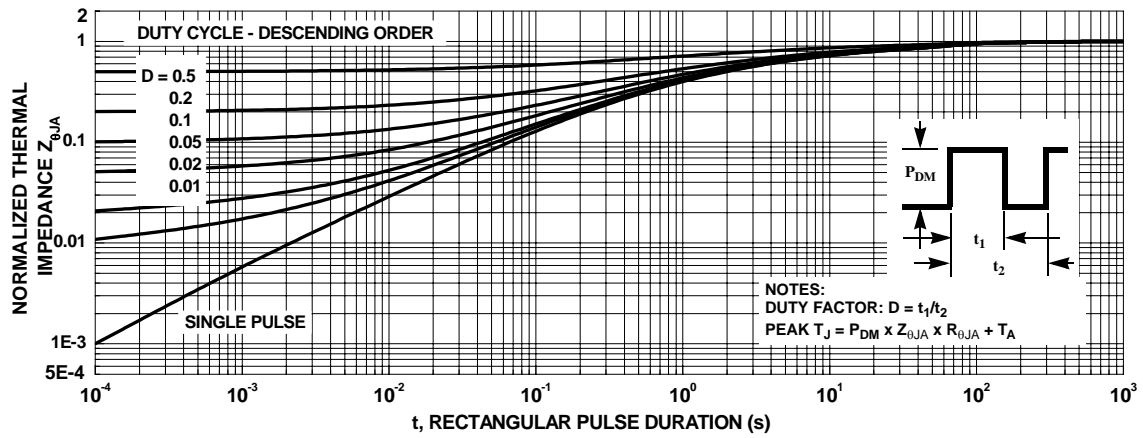
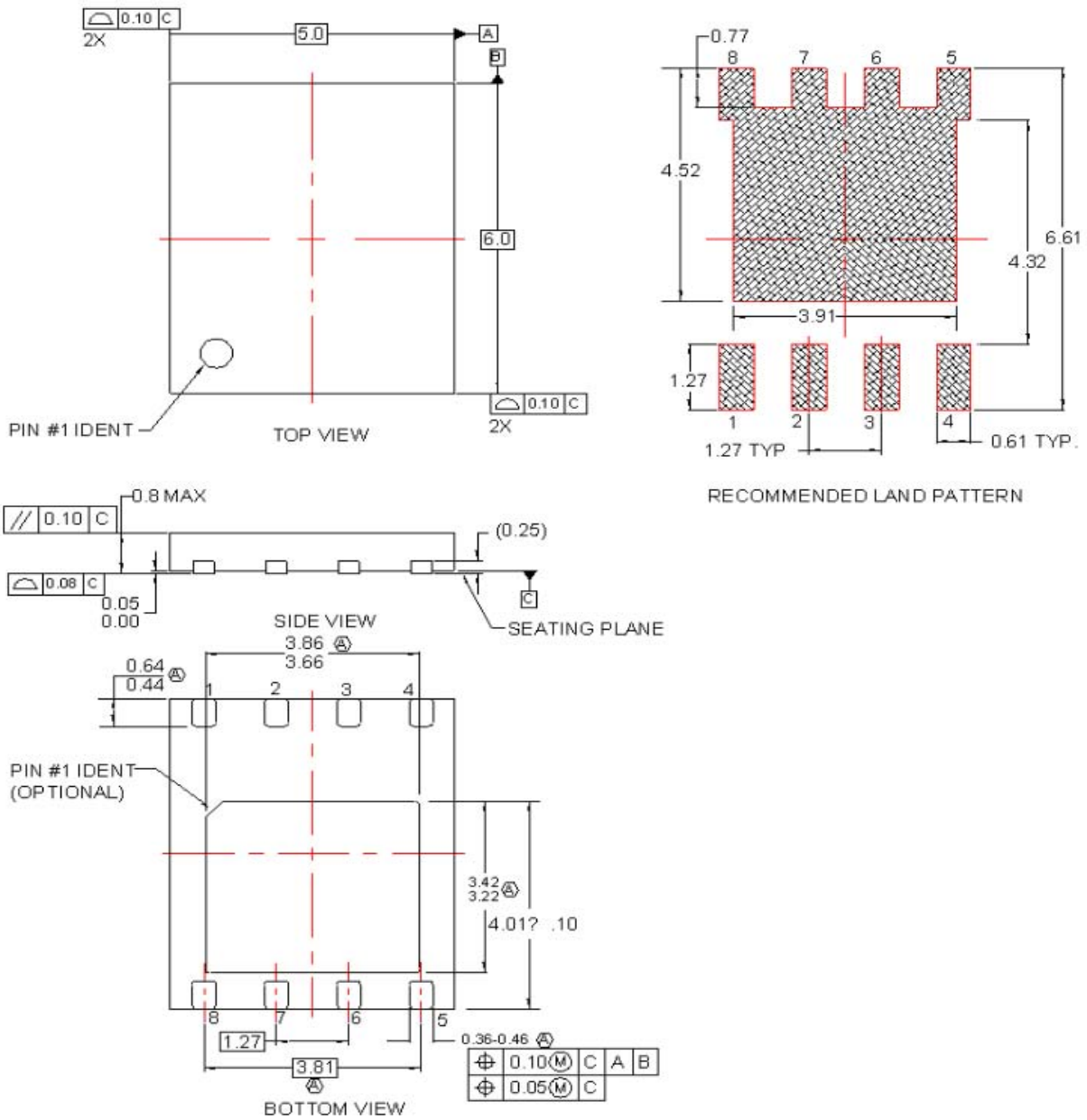


Figure 13. Transient Thermal Response Curve



NOTES:


- (A) DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229, DATED 11/2001.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. TERMINALS 5,6,7 AND 8 ARE TIED TO THE EXPOSED PADDLE

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