

8A, 100V, 0.180 Ohm, N-Channel Power MOSFET

The 2N6796 is an N-Channel enhancement mode silicon gate power field effect transistor designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high power bipolar switching transistors requiring high speed and low gate drive power. This type can be operated directly from integrated circuits.

Ordering Information

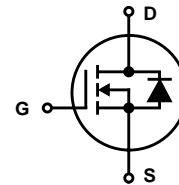
| PART NUMBER | PACKAGE | BRAND |
|-------------|----------|--------|
| 2N6796 | TO-205AF | 2N6796 |

NOTE: When ordering, use the entire part number.

Features

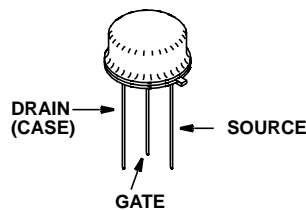
- 8A, 100V
- $r_{DS(ON)} = 0.180\Omega$
- SOA is Power Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device
- Related Literature
 - TB334 "Guidelines for Soldering Surface Mount Components to PC Boards"

Symbol



Packaging

JEDEC TO-205AF



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, Unless Otherwise Specified

| | 2N6796 | UNITS |
|---|----------------|---------------------------------|
| Drain to Source Breakdown Voltage (Note 1) | V_{DS} | 100 V |
| Drain to Gate Voltage ($R_{GS} = 20k\Omega$) (Note 1) | V_{DGR} | 100 V |
| Continuous Drain Current (Note 1) | I_D | 8 A |
| $T_C = 100^\circ\text{C}$ | I_D | 5 A |
| Pulsed Drain Current (Note 1) | I_{DM} | 32 A |
| Gate to Source Voltage (Note 1) | V_{GS} | ± 20 V |
| Continuous Source Current (Body Diode) | I_S | 8 A |
| Pulse Source Current (Body Diode) | I_{SM} | 32 A |
| Maximum Power Dissipation (Figure 1) | P_D | 25 W |
| Linear Derating Factor (Figure 1) | | 0.20 $W/^\circ\text{C}$ |
| Operating and Storage Temperature | T_J, T_{STG} | -55 to 150 $^\circ\text{C}$ |
| Maximum Temperature for Soldering | | |
| Leads at 0.063in (1.6mm) from Case for 10s | T_L | 300 $^\circ\text{C}$ |
| Package Body for 10s, See Techbrief 334 | T_{pkg} | 260 $^\circ\text{C}$ |

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. $T_J = 25^\circ\text{C}$ to 125°C .

Electrical Specifications $T_C = 25^\circ\text{C}$, Unless Otherwise Specified

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|--|-----------------|---|--|------|-----------|--------------------|
| Drain to Source Breakdown Voltage | BV_{DSS} | $I_D = 0.25\text{mA}, V_{GS} = 0\text{V}$ | 100 | - | - | V |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 0.5\text{mA}$ | 2 | - | 4 | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 100\text{V}, V_{GS} = 0\text{V}$ | - | - | 250 | μA |
| | | $V_{DS} = 80\text{V}, V_{GS} = 0\text{V}, T_C = 125^\circ\text{C}$ | - | - | 1000 | μA |
| On-State Drain Current (Note 2) | $V_{DS(ON)}$ | $I_D = 8\text{A}, V_{GS} = 10\text{V}$ | - | - | 1.56 | V |
| Gate to Source Leakage Current | I_{GSS} | $V_{GS} = \pm 20\text{V}$ | - | - | ± 100 | nA |
| Drain to Source On Resistance (Note 2) | $r_{DS(ON)}$ | $I_D = 5\text{A}, V_{GS} = 10\text{V}$ | - | 0.14 | 0.180 | Ω |
| | | $I_D = 5\text{A}, V_{GS} = 10\text{V}, T_C = 125^\circ\text{C}$ | - | - | 0.350 | Ω |
| Diode Forward Voltage (Note 2) | V_{SD} | $T_C = 25^\circ\text{C}, I_S = 8\text{A}, V_{GS} = 0\text{V}$ | 0.75 | - | 1.5 | V |
| Forward Transconductance (Note 2) | g_{fs} | $V_{DS} = 5\text{V}, I_D = 5\text{A}$ | 3 | 5.5 | 9 | S |
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{DD} \cong 30\text{V}, I_D = 5\text{A}, R_G = 50\Omega$ (Figure 17) MOSFET Switching Times are Essentially Independent of Operating Temperature | - | - | 30 | ns |
| Rise Time | t_r | | - | - | 75 | ns |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | - | - | 40 | ns |
| Fall Time | t_f | | - | - | 45 | ns |
| Input Capacitance | C_{ISS} | | $V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$, (Figure 11) | 350 | 600 | 900 |
| Output Capacitance | C_{OSS} | 150 | | 300 | 500 | pF |
| Reverse Transfer Capacitance | C_{RSS} | 50 | | 100 | 150 | pF |
| Thermal Resistance Junction to Case | $R_{\theta JC}$ | | - | - | 5 | $^\circ\text{C/W}$ |
| Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | Free Air Operation | - | - | 175 | $^\circ\text{C/W}$ |
| Safe Operating Area | SOA | $V_{DS} = 80\text{V}, I_D = 310\text{mA}$ | 25 | - | - | W |
| | | $V_{DS} = 3.12\text{V}, I_D = 8\text{A}$ | 25 | - | - | W |

Source to Drain Diode Specifications

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------------|----------|---|-----|-----|-----|---------------|
| Reverse Recovery Time | t_{rr} | $T_J = 150^\circ\text{C}, I_{SD} = 8\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$ | - | 300 | - | ns |
| Reverse Recovered Charge | Q_{RR} | $T_J = 150^\circ\text{C}, I_{SD} = 8\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$ | - | 1.5 | - | μC |

NOTES:

2. Pulse test: pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
3. Repetitive rating: pulse width limited by maximum junction temperature. See Transient Thermal Impedance curve (Figure 3).

Typical Performance Curves Unless Otherwise Specified

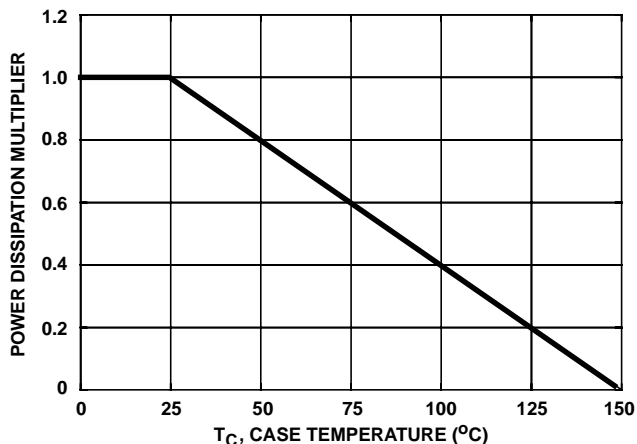


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

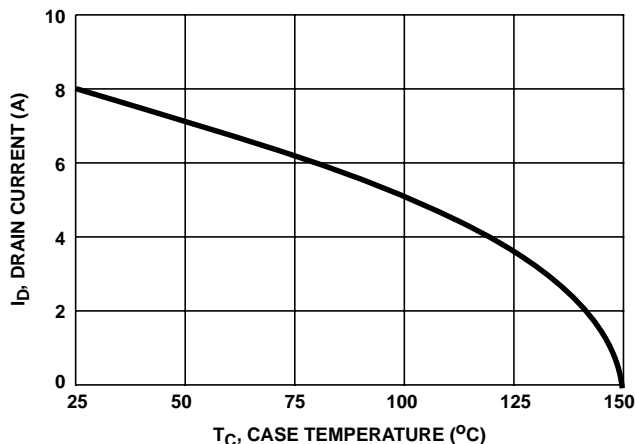


FIGURE 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs CASE TEMPERATURE

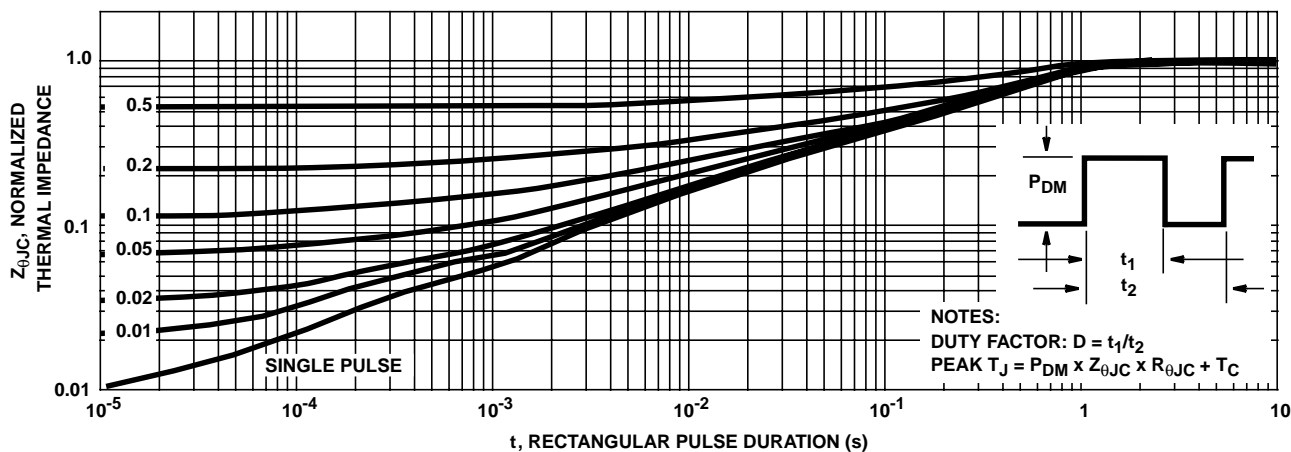


FIGURE 3. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

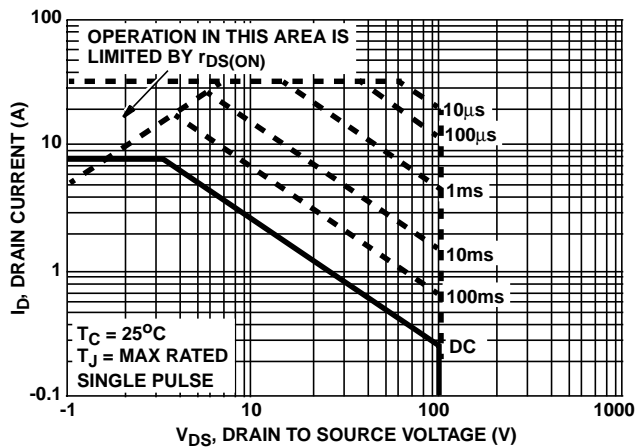


FIGURE 4. FORWARD BIAS SAFE OPERATING AREA

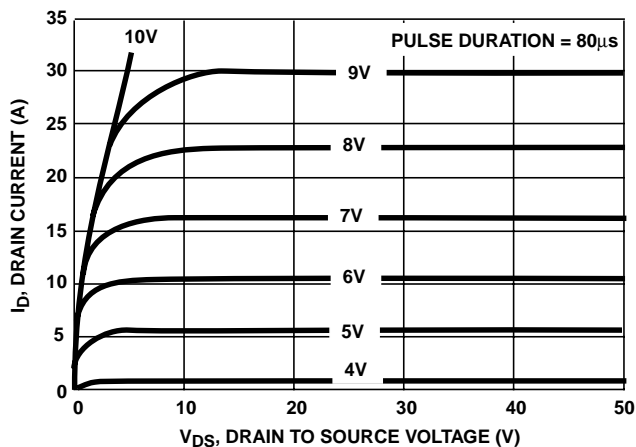


FIGURE 5. OUTPUT CHARACTERISTICS

Typical Performance Curves Unless Otherwise Specified (Continued)

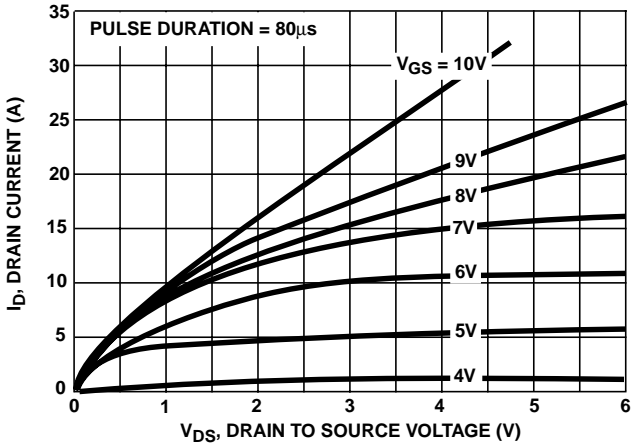


FIGURE 6. SATURATION CHARACTERISTICS

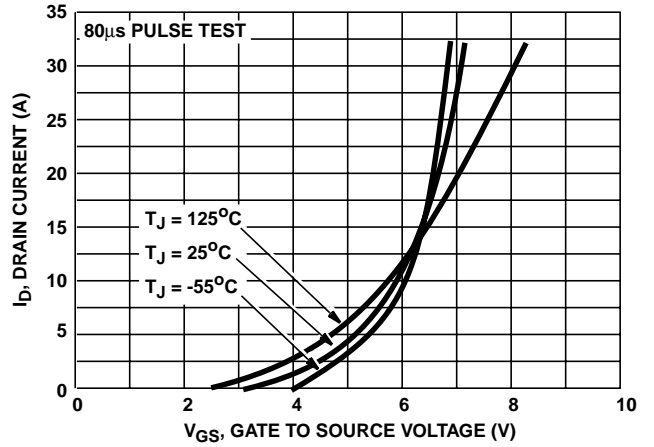
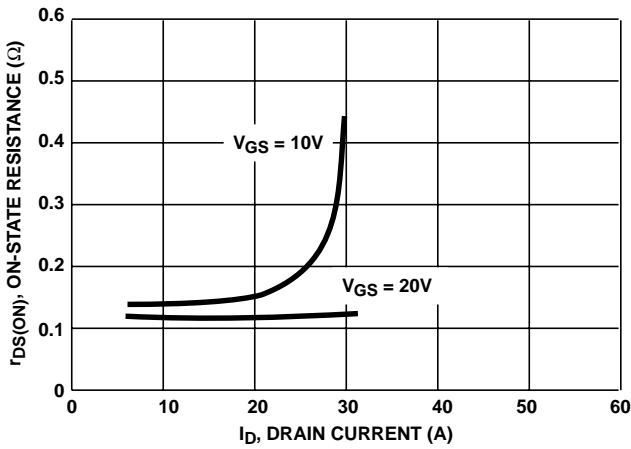


FIGURE 7. TRANSFER CHARACTERISTICS



NOTE: Heating effect of 2µs pulse is minimal.

FIGURE 8. DRAIN TO SOURCE ON RESISTANCE vs GATE VOLTAGE AND DRAIN CURRENT

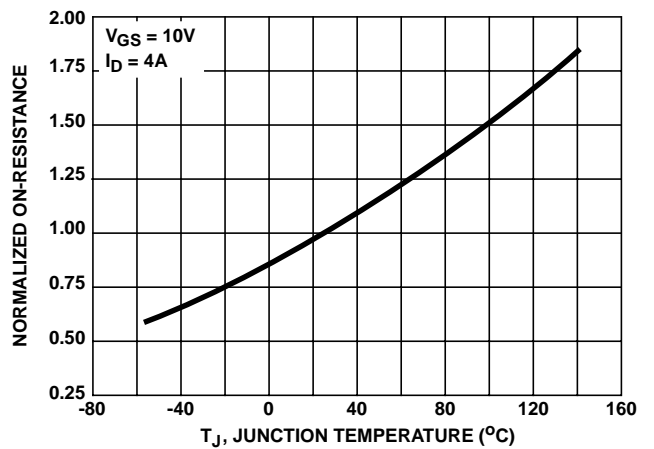


FIGURE 9. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

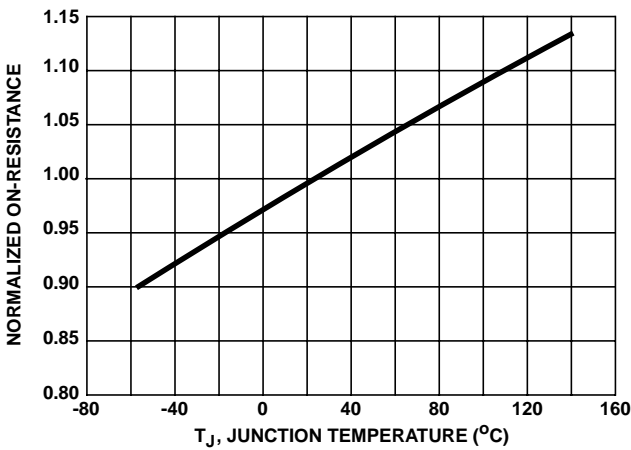


FIGURE 10. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

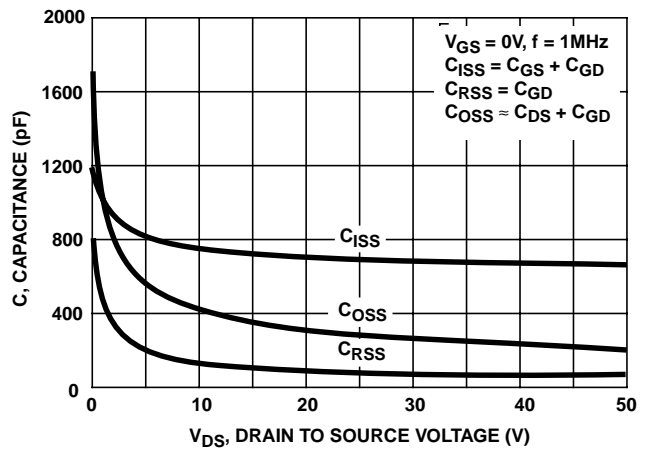


FIGURE 11. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE

Typical Performance Curves Unless Otherwise Specified (Continued)

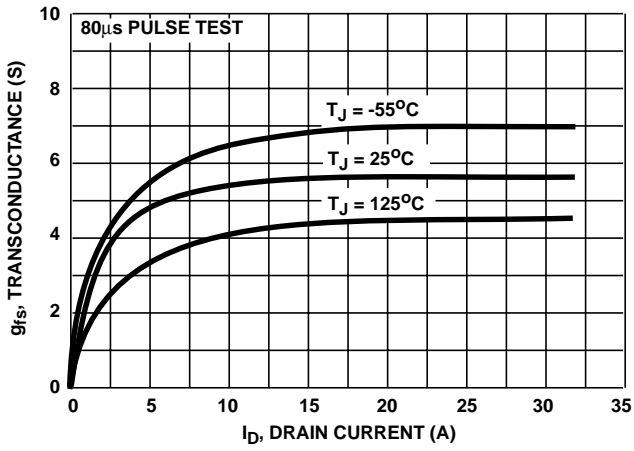


FIGURE 12. TRANSCONDUCTANCE vs DRAIN CURRENT

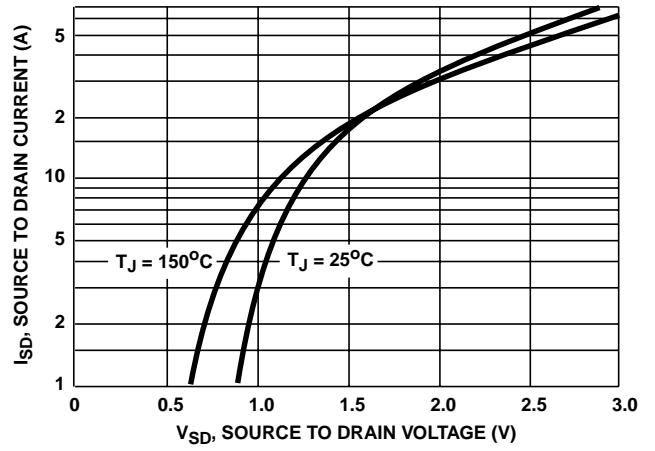


FIGURE 13. SOURCE TO DRAIN DIODE VOLTAGE

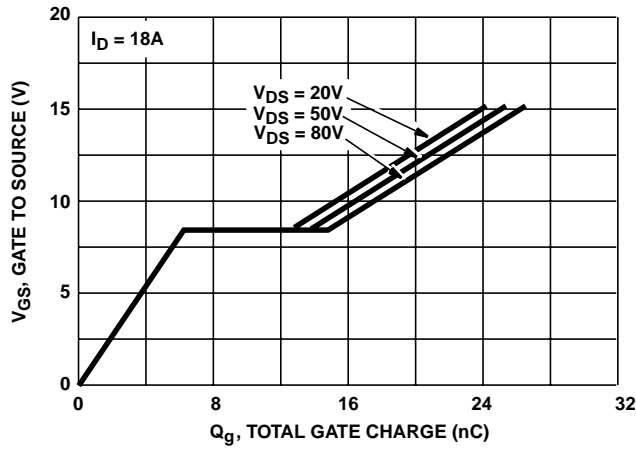


FIGURE 14. GATE TO SOURCE VOLTAGE vs GATE CHARGE

Test Circuits and Waveforms

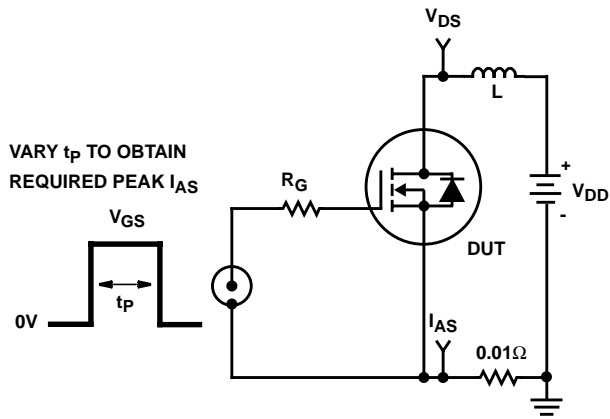


FIGURE 15. UNCLAMPED ENERGY TEST CIRCUIT

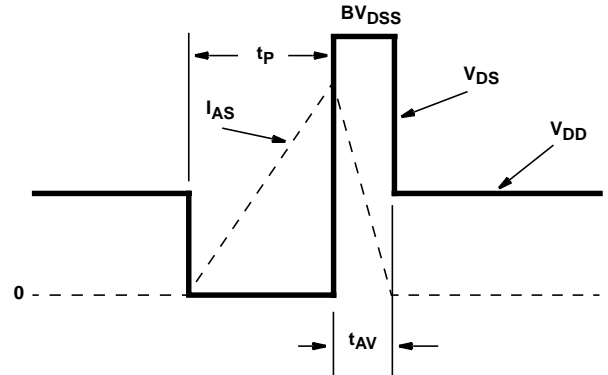


FIGURE 16. UNCLAMPED ENERGY WAVEFORMS

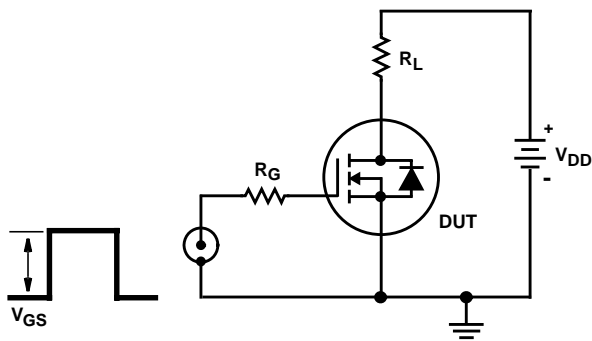


FIGURE 17. SWITCHING TIME TEST CIRCUIT

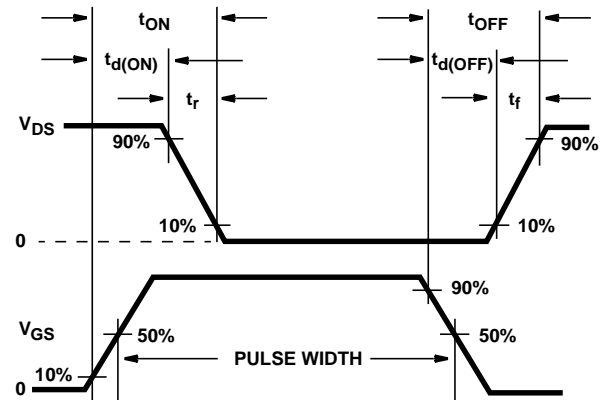


FIGURE 18. RESISTIVE SWITCHING WAVEFORMS

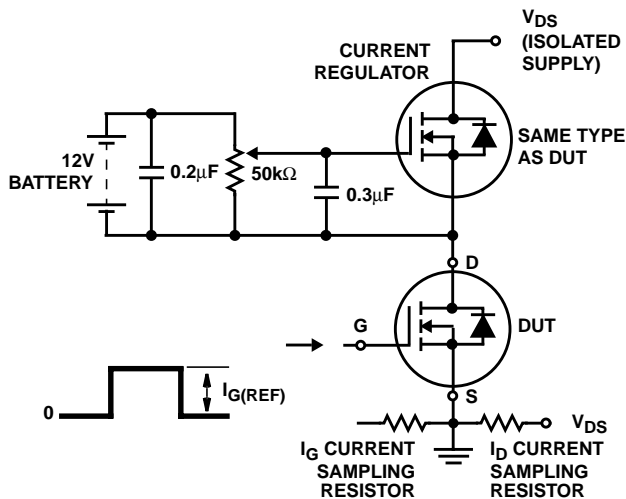


FIGURE 19. GATE CHARGE TEST CIRCUIT

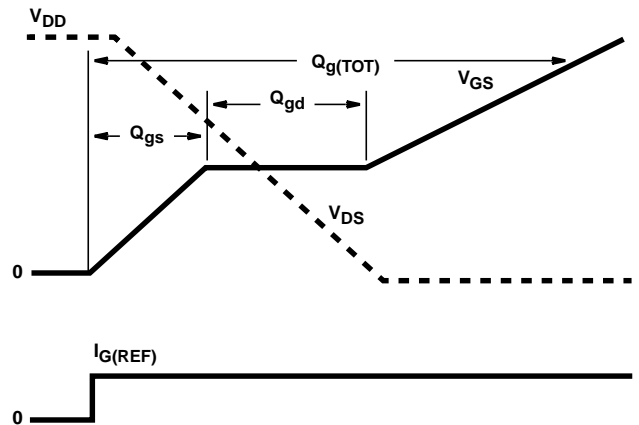
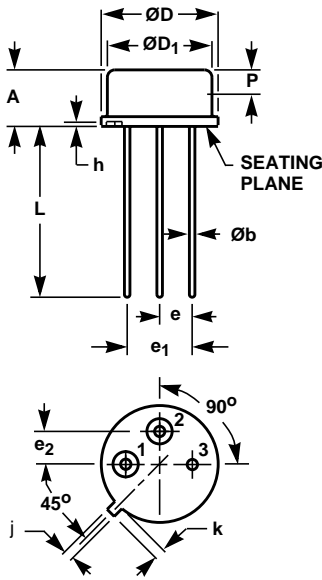


FIGURE 20. GATE CHARGE WAVEFORMS

TO-205AF

3 LEAD JEDEC TO-205AF HERMETIC METAL CAN PACKAGE



| SYMBOL | INCHES | | MILLIMETERS | | NOTES |
|-----------------|--------|-------|-------------|-------|-------|
| | MIN | MAX | MIN | MAX | |
| A | 0.160 | 0.180 | 4.07 | 4.57 | - |
| Øb | 0.016 | 0.021 | 0.41 | 0.53 | 2, 3 |
| ØD | 0.350 | 0.370 | 8.89 | 9.39 | - |
| ØD ₁ | 0.315 | 0.335 | 8.01 | 8.50 | - |
| e | 0.095 | 0.105 | 2.42 | 2.66 | 4 |
| e ₁ | 0.190 | 0.210 | 4.83 | 5.33 | 4 |
| e ₂ | 0.095 | 0.105 | 2.42 | 2.66 | 4 |
| h | 0.010 | 0.020 | 0.26 | 0.50 | - |
| j | 0.028 | 0.034 | 0.72 | 0.86 | - |
| k | 0.029 | 0.045 | 0.74 | 1.14 | - |
| L | 0.500 | 0.560 | 12.70 | 14.22 | 3 |
| P | 0.075 | - | 1.91 | - | 5 |

NOTES:

1. These dimensions are within allowable dimensions of Rev. E of JEDEC TO-205AF outline dated 11-82.
2. Lead dimension (without solder).
3. Solder coating may vary along lead length, add typically 0.002 inches (0.05mm) for solder coating.
4. Position of lead to be measured 0.100 inches (2.54mm) from bottom of seating plane.
5. This zone controlled for automatic handling. The variation in actual diameter within this zone shall not exceed 0.010 inches (0.254mm).
6. Lead no. 3 butt welded to stem base.
7. Controlling dimension: Inch.
8. Revision 3 dated 6-94.

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