

# MOSFET – Power, P-Channel

**-60 V, 6.5 mΩ, -100 A**

## ATP304

### Features

- ON-Resistance  $R_{DS(on)1} = 5.0 \text{ m}\Omega$  (typ)
- Input Capacitance  $C_{iss} = 13000 \text{ pF}$  (typ)
- 4.5 V Drive
- This Device is Pb-Free, Halogen Free and RoHS Compliant

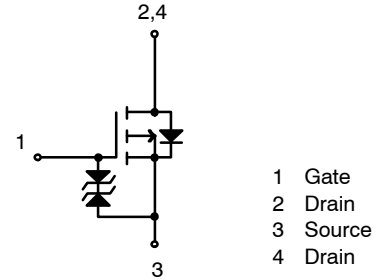
### MAXIMUM RATINGS (Ta = 25°C) (Note 1)

| Parameter  | Symbol    | Value       | Unit |
|--|-----------|-------------|------|
| Drain-to-Source Voltage                              | $V_{DSS}$ | -60         | V    |
| Gate-to-Source Voltage                               | $V_{GSS}$ | $\pm 20$    | V    |
| Drain Current (DC)                                   | $I_D$     | -100        | A    |
| Drain Current (Pulse)<br>PW ≤ 10 μs, duty cycle ≤ 1% | $I_{DP}$  | -400        | A    |
| Allowable Power Dissipation<br>Tc = 25°C             | $P_D$     | 90          | W    |
| Channel Temperature                                  | $T_{ch}$  | 150         | °C   |
| Storage Temperature                                  | $T_{stg}$ | -55 to +150 | °C   |
| Avalanche Energy (Single Pulse) (Note 1)             | $E_{AS}$  | 656         | mJ   |
| Avalanche Current (Note 2)                           | $I_{AV}$  | -75         | A    |

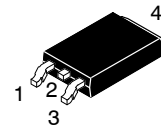
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1.  $V_{DD} = -36 \text{ V}$ ,  $L = 100 \text{ }\mu\text{H}$ ,  $I_{AV} = -75 \text{ A}$  (Figure 1)
2.  $L \leq 100 \text{ }\mu\text{H}$ , Single pulse

| $V_{DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|-----------|--------------------------|-------------------|
| -60 V     | 6.5 mΩ @ -10 V           | -100 A            |
|           | 8.9 mΩ @ -4.5 V          |                   |

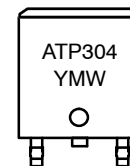


### ELECTRICAL CONNECTION P-CHANNEL



DPAK (Single Gauge) / ATPAK  
CASE 369AM

### MARKING DIAGRAM



ATP304 = Specific Device Code  
Y = Year of Production  
M = Assembly Operation Month  
W = Work Week in the Month

### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

# ATP304

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter                                  | Symbol        | Test Condition   | Value      |       |      | Unit             |
|--|---------------|--|------------|-------|------|------------------|
|  |               |  | Min        | Typ   | Max  |                  |
| Drain to Source Breakdown Voltage          | $V_{(BR)DSS}$ | $I_D = -1 \text{ mA}, V_{GS} = 0 \text{ V}$  | -60        | -     | -    | V                |
| Zero-Gate Voltage Drain Current            | $I_{DSS}$     | $V_{DS} = -60 \text{ V}, V_{GS} = 0 \text{ V}$                                     | -          | -     | -10  | $\mu\text{A}$    |
| Gate to Source Leakage Current             | $I_{GSS}$     | $V_{GS} = +16 \text{ V}, V_{DS} = 0 \text{ V}$                                     | -          | -     | +10  | $\mu\text{A}$    |
| Cutoff Voltage                             | $V_{GS(off)}$ | $V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$                                      | -1.2       | -     | -2.6 | V                |
| Forward Transfer Admittance                | $ y_{fs} $    | $V_{DS} = -10 \text{ V}, I_D = -50 \text{ A}$                                      | -          | 100   | -    | S                |
| Static Drain to Source On-State Resistance | $R_{DS(on)1}$ | $I_D = -50 \text{ A}, V_{GS} = -10 \text{ V}$                                      | -          | 5.0   | 6.5  | $\text{m}\Omega$ |
|  | $R_{DS(on)2}$ | $I_D = -50 \text{ A}, V_{GS} = -4.5 \text{ V}$                                     | -          | 6.4   | 8.9  | $\text{m}\Omega$ |
| Input Capacitance                          | $C_{iss}$     | $V_{DS} = -20 \text{ V}, f = 1 \text{ MHz}$  | -          | 13000 | -    | $\text{pF}$      |
| Output Capacitance                         | $C_{oss}$     |  | -          | 1080  | -    | $\text{pF}$      |
| Reverse Transfer Capacitance               | $C_{rss}$     |  | -          | 760   | -    | $\text{pF}$      |
| Turn-ON Delay Time                         | $t_d(on)$     |  | (Figure 2) | -     | 80   | -                |
| Rise Time                                  | $t_r$         | -  |            | 650   | -    | ns               |
| Turn-OFF Delay Time                        | $t_d(off)$    | -  |            | 780   | -    | ns               |
| Fall Time                                  | $t_f$         | -  |            | 460   | -    | ns               |
| Total Gate Charge                          | $Q_g$         | $V_{DS} = -36 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -100 \text{ A}$             | -          | 250   | -    | nC               |
| Gate to Source Charge                      | $Q_{gs}$      |  | -          | 55    | -    | nC               |
| Gate to Drain "Miller" Charge              | $Q_{gd}$      |  | -          | 50    | -    | nC               |
| Diode Forward Voltage                      | $V_{SD}$      | $I_S = -100 \text{ A}, V_{GS} = 0 \text{ V}$                                       | -          | -1.0  | -1.5 | V                |
| Reverse Recovery Time                      | $t_{rr}$      | (Figure 3)   | -          | 90    | -    | ns               |
| Reverse Recovery Charge                    | $Q_{rr}$      | $I_S = -100 \text{ A}, V_{GS} = 0 \text{ V}, di/dt = -100 \text{ A} / \mu\text{s}$ | -          | 245   | -    | nC               |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

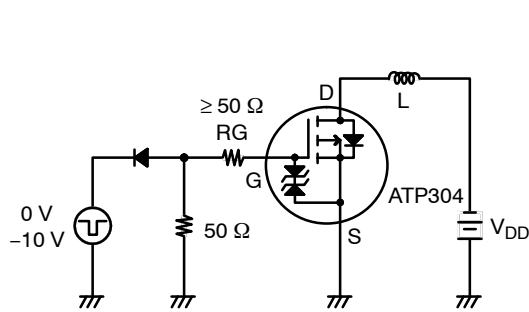


Figure 1. Unclamped Inductive Switching Test Circuit

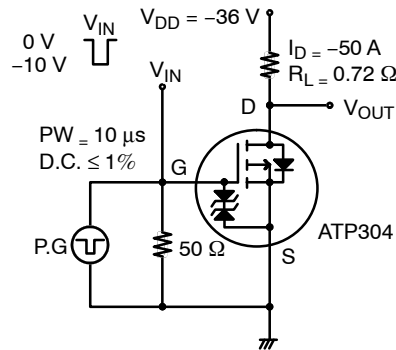


Figure 2. Switching Time Test Circuit

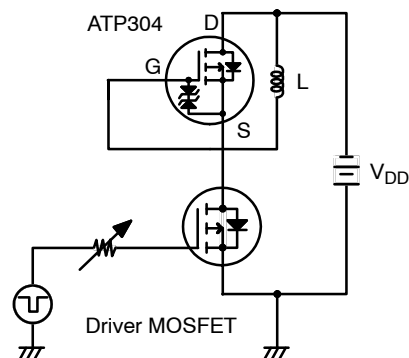


Figure 3. Reverse Recovery Time Test Circuit

TYPICAL CHARACTERISTICS

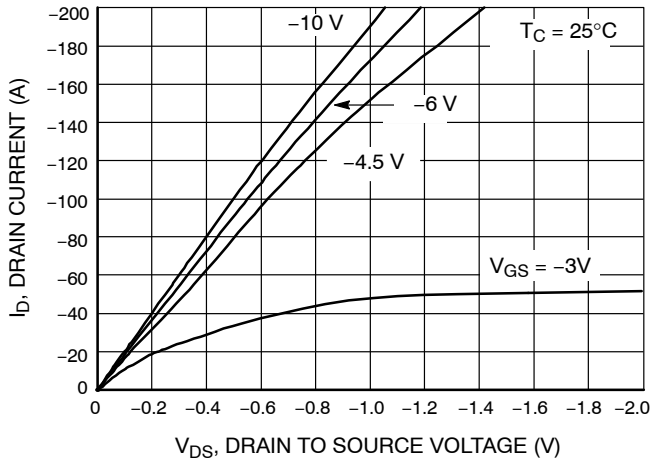


Figure 4.  $I_D - V_{DS}$

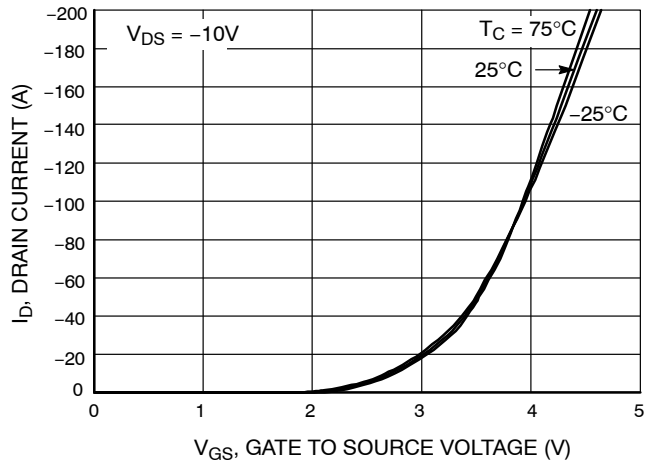


Figure 5.  $I_D - V_{GS}$  (off)

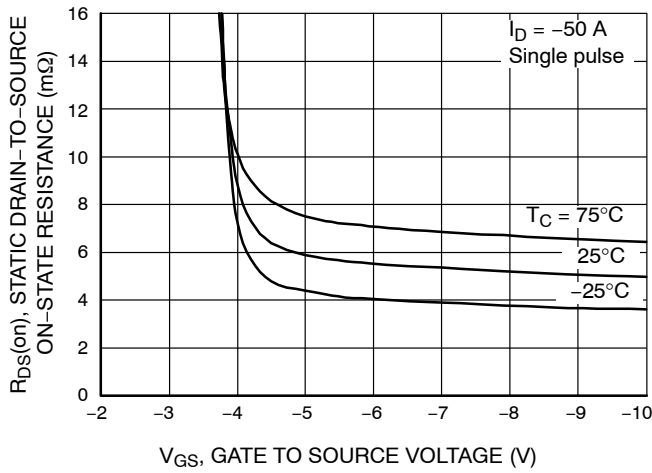


Figure 6.  $R_{DS(on)} - V_{GS}$

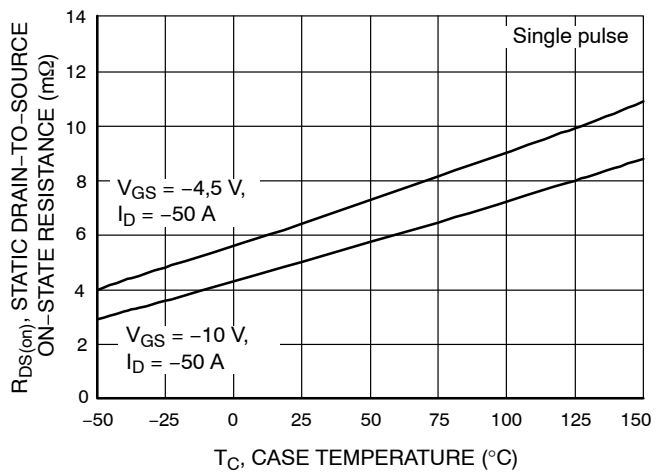


Figure 7.  $R_{DS(on)} - T_c$

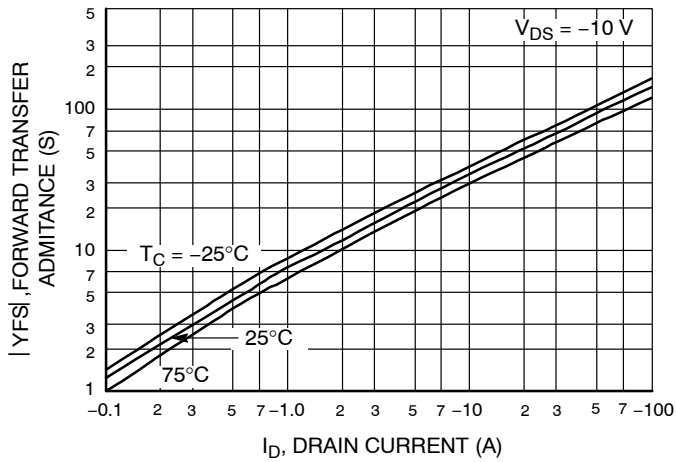


Figure 8.  $|y_{fs}| - I_D$

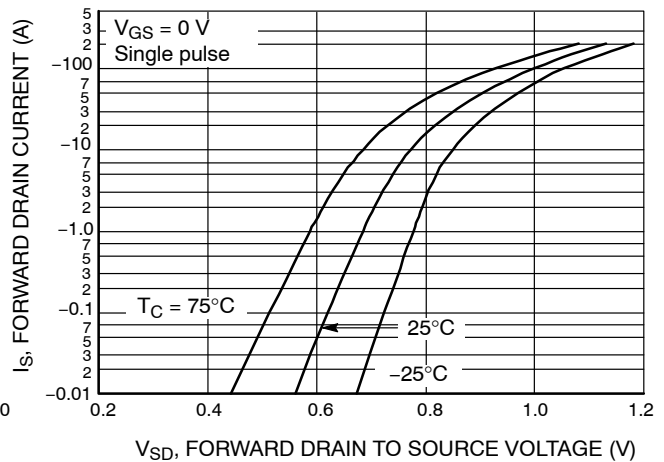


Figure 9.  $I_S - V_{SD}$

TYPICAL CHARACTERISTICS (CONTINUED)

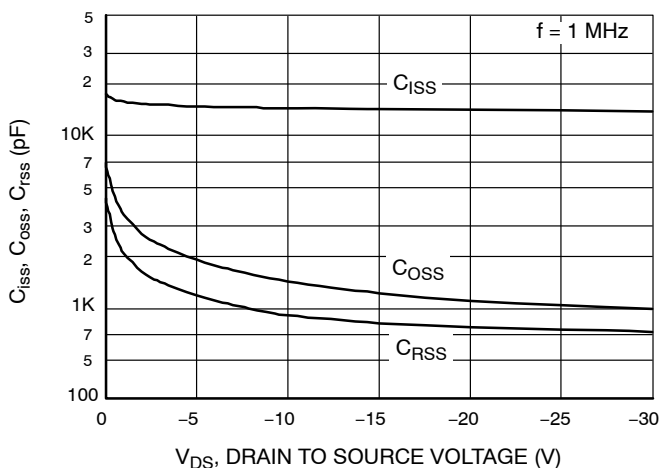


Figure 10.  $C_{iss}$ ,  $C_{oss}$ ,  $C_{rss}$  -  $V_{DS}$

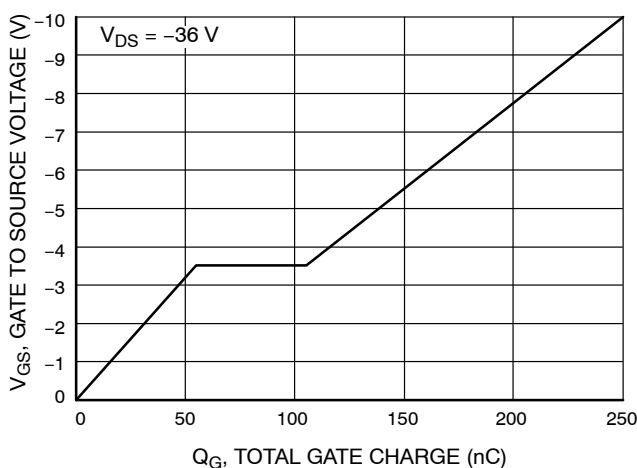


Figure 11.  $Q_g$  -  $V_{GS}$

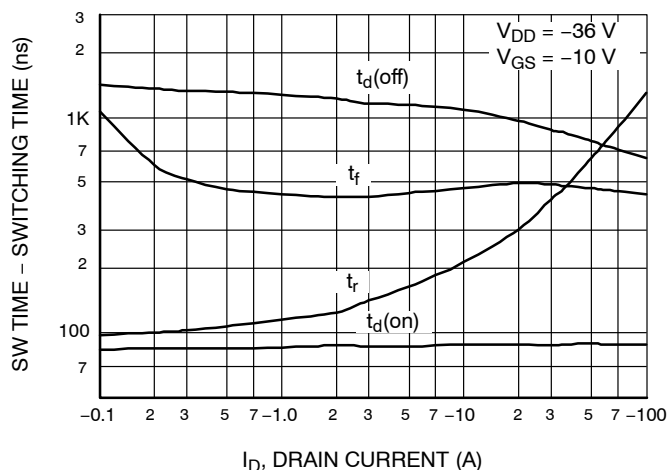


Figure 12. SW Time -  $I_D$

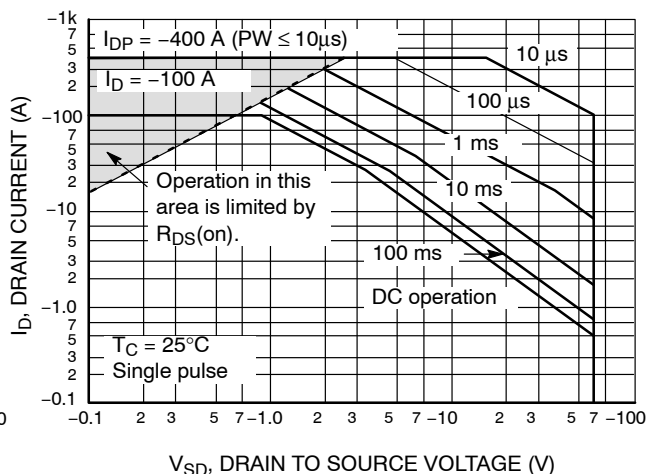


Figure 13. SOA

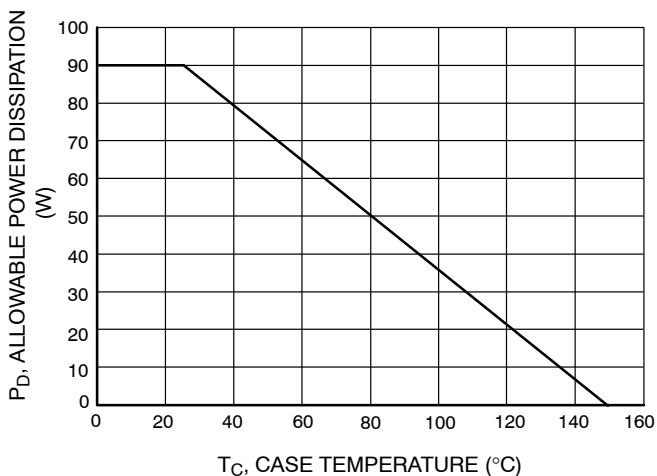


Figure 14.  $P_D$  -  $T_C$

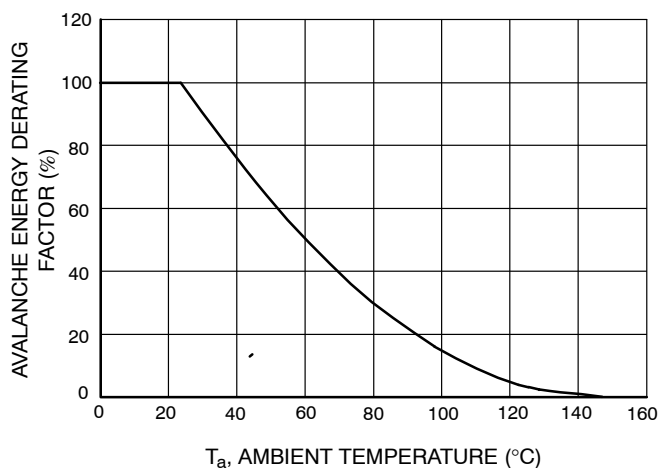


Figure 15.  $E_{AS}$  -  $T_a$

# ATP304

## TYPICAL CHARACTERISTICS (CONTINUED)

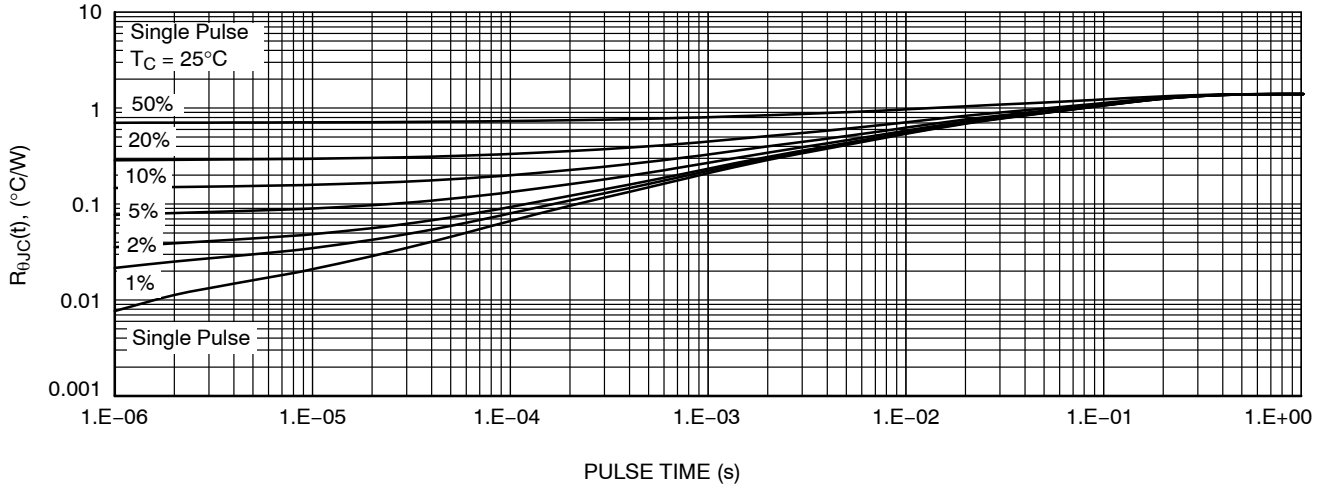


Figure 16. Thermal Response

### DEVICE ORDERING INFORMATION

| Device      | Marking | Package   | Shipping <sup>†</sup> |
|-------------|---------|---|-----------------------|
| ATP304-TL-H | ATP304  | DPAK (Single Gauge) / ATPAK<br>(Pb-Free / Halogen Free) | 3000/ Tape & Reel     |

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).



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