

100V P-Ch Power MOSFET

Feature

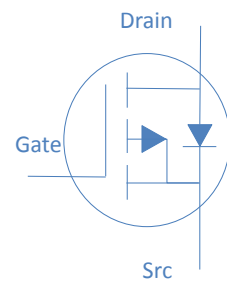
- ◇ High Speed Power Switching, Logic Level
- ◇ Enhanced Avalanche Ruggedness
- ◇ 100% UIS Tested, 100% Rg Tested
- ◇ Lead Free, Halogen Free

| | | | |
|-------------------------|--------------|------|----|
| V_{DS} | | -100 | V |
| $R_{DS(on),typ}$ | $V_{GS}=10V$ | 105 | mΩ |
| I_D (Silicon Limited) | | -22 | A |

Application

- ◇ Load Switches
- ◇ Hard Switching and High Speed Circuit
- ◇ BLDC Motor

TO-220F



| Part Number | Package | Marking |
|-------------|---------|----------|
| HTA1K2P10 | TO-220F | TA1K2P10 |

Absolute Maximum Ratings at $T_j=25^\circ\text{C}$ (unless otherwise specified)

| Parameter | Symbol | Conditions | Value | Unit |
|--|----------------|--|------------|------------------|
| Continuous Drain Current (Silicon Limited) | I_D | $T_C=25^\circ\text{C}$ | -22 | A |
| | | $T_C=100^\circ\text{C}$ | -15 | |
| Drain to Source Voltage | V_{DS} | - | -100 | V |
| Gate to Source Voltage | V_{GS} | - | ± 20 | V |
| Pulsed Drain Current | I_{DM} | - | -75 | A |
| Avalanche Energy, Single Pulse | E_{AS} | $L=0.1\text{mH}, T_C=25^\circ\text{C}$ | 22.5 | mJ |
| Power Dissipation | P_D | $T_C=25^\circ\text{C}$ | 38 | W |
| Operating and Storage Temperature | T_J, T_{stg} | - | -55 to 150 | $^\circ\text{C}$ |

Absolute Maximum Ratings

| Parameter | Symbol | Max | Unit |
|-------------------------------------|-----------------|------|--------------------|
| Thermal Resistance Junction-Ambient | $R_{\theta JA}$ | 62.5 | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-Case | $R_{\theta JC}$ | 3.3 | $^\circ\text{C/W}$ |

Electrical Characteristics at $T_j=25^\circ\text{C}$ (unless otherwise specified)
Static Characteristics

| Parameter | Symbol | Conditions | Value | | | Unit |
|-----------------------------------|---------------|---|-------|------|-----------|-----------|
| | | | min | typ | max | |
| Drain to Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=-250\mu A$ | -100 | - | - | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}=V_{DS}, I_D=-250\mu A$ | -1.5 | -2.5 | -4.0 | |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS}=0V, V_{DS}=-80V, T_j=25^\circ\text{C}$ | - | - | -1 | μA |
| | | $V_{GS}=0V, V_{DS}=-70V, T_j=125^\circ\text{C}$ | - | - | -25 | |
| Gate to Source Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| Drain to Source on Resistance | $R_{DS(on)}$ | $V_{GS}=-10V, I_D=-11A$ | - | 105 | 120 | $m\Omega$ |
| Transconductance | g_{fs} | $V_{DS}=-5V, I_D=-11A$ | - | 8 | - | S |
| Gate Resistance | R_G | $V_{GS}=15mV, V_{DS}=0V, f=1MHz$ | - | 4.5 | - | Ω |

Dynamic Characteristics

| | | | | | | |
|-------------------------------|--------------|---|---|------|---|----|
| Input Capacitance | C_{iss} | $V_{GS}=0V, V_{DS}=-25V, f=1MHz$ | - | 3522 | - | pF |
| Output Capacitance | C_{oss} | | - | 130 | - | |
| Reverse Transfer Capacitance | C_{rss} | | - | 114 | - | |
| Total Gate Charge | Q_g | $V_{DD}=-80V, I_D=-11A, V_{GS}=-10V$ | - | 58 | - | nC |
| Gate to Source Charge | Q_{gs} | | - | 13.8 | - | |
| Gate to Drain (Miller) Charge | Q_{gd} | | - | 10.5 | - | |
| Turn on Delay Time | $t_{d(on)}$ | $V_{DD}=-10V, I_D=-1A, V_{GS}=-10V, R_G=6\Omega,$ | - | 15 | - | ns |
| Rise time | t_r | | - | 67 | - | |
| Turn off Delay Time | $t_{d(off)}$ | | - | 50 | - | |
| Fall Time | t_f | | - | 50 | - | |

Reverse Diode Characteristics

| | | | | | | |
|-------------------------|----------|-------------------------------|---|-----|-----|----|
| Diode Forward Voltage | V_{SD} | $V_{GS}=0V, I_F=-22A$ | - | | 1.3 | V |
| Reverse Recovery Time | t_{rr} | $I_F=-5A, dI_F/dt=100A/\mu s$ | - | 150 | - | ns |
| Reverse Recovery Charge | Q_{rr} | | - | 830 | - | nC |

Fig 1. Typical Output Characteristics

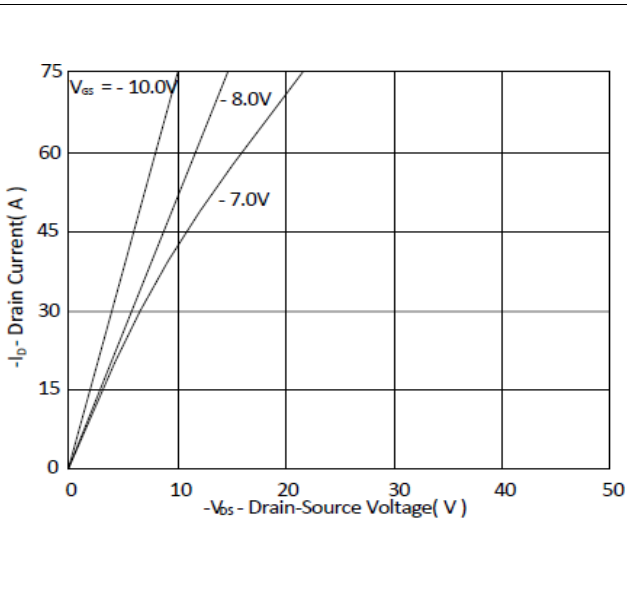


Figure 2. On-Resistance vs. Gate-Source Voltage

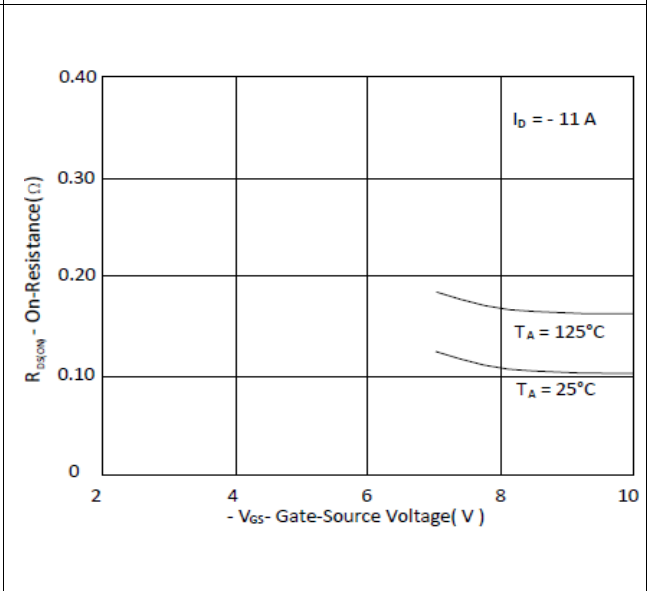


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

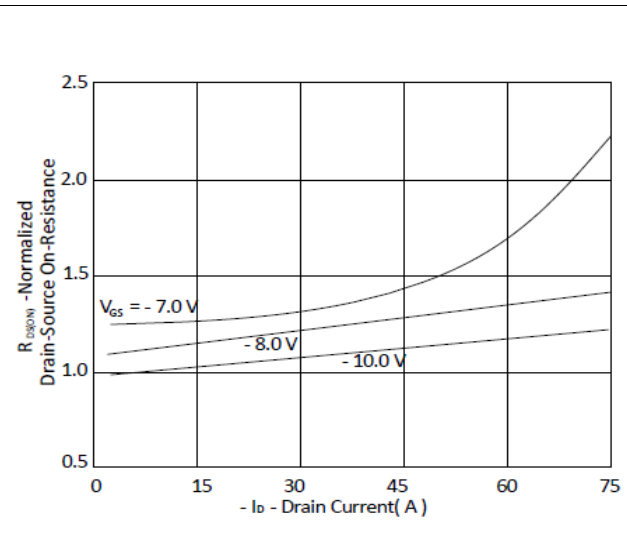


Figure 4. Normalized On-Resistance vs. Junction Temperature

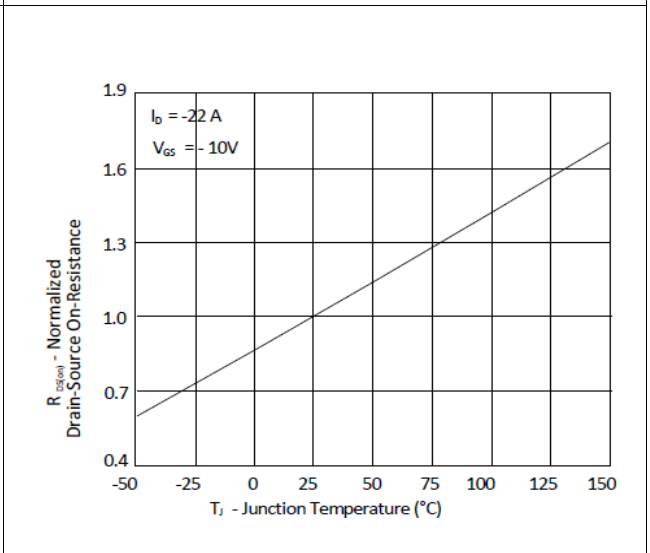


Figure 5. Typical Transfer Characteristics

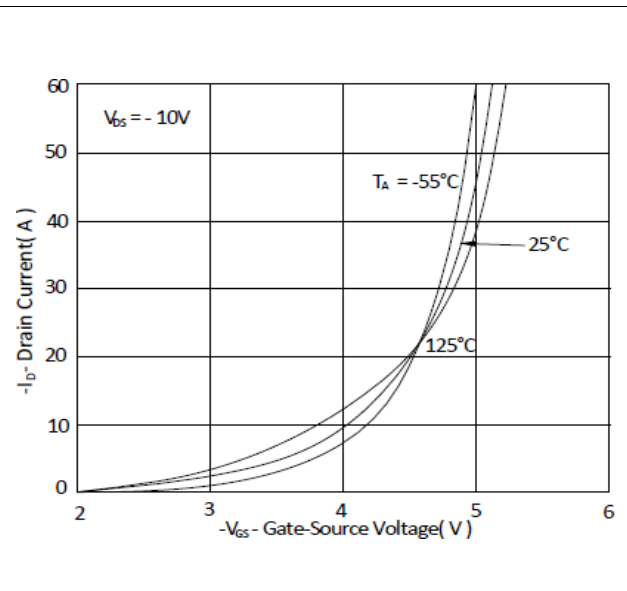


Figure 6. Typical Source-Drain Diode Forward Voltage

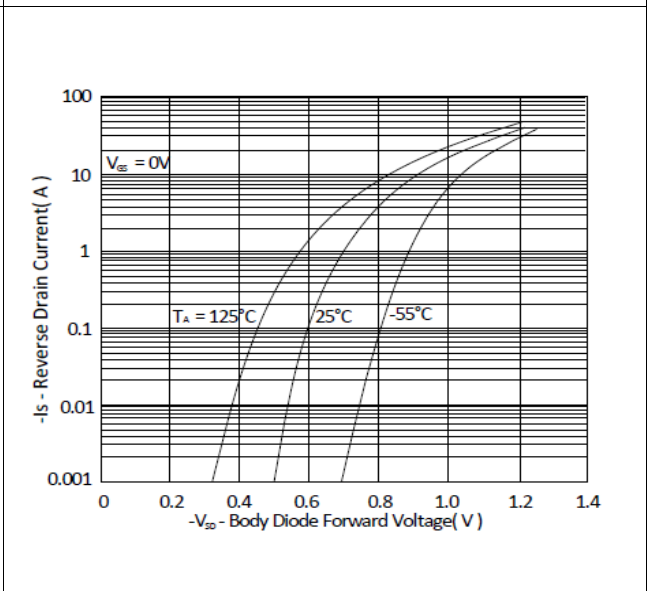


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

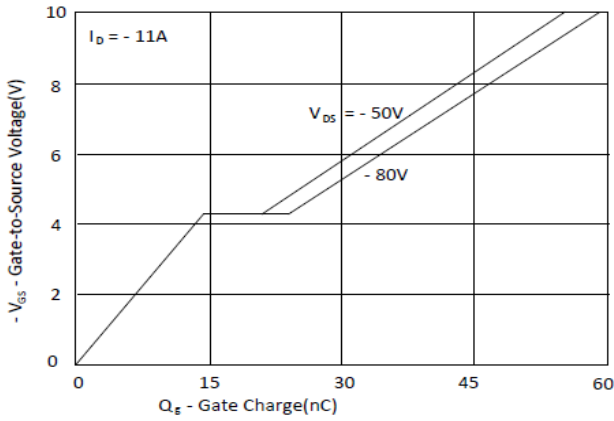


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

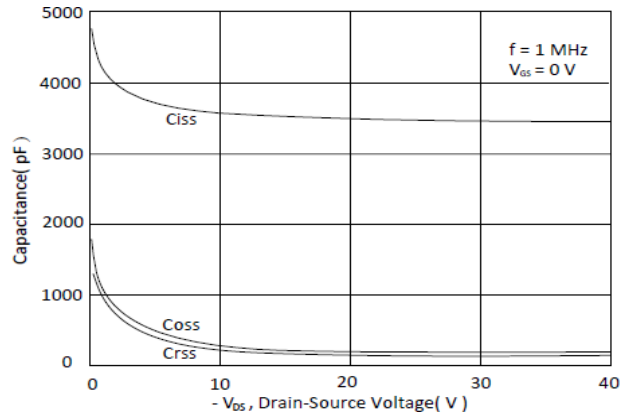


Figure 9. Maximum Safe Operating Area

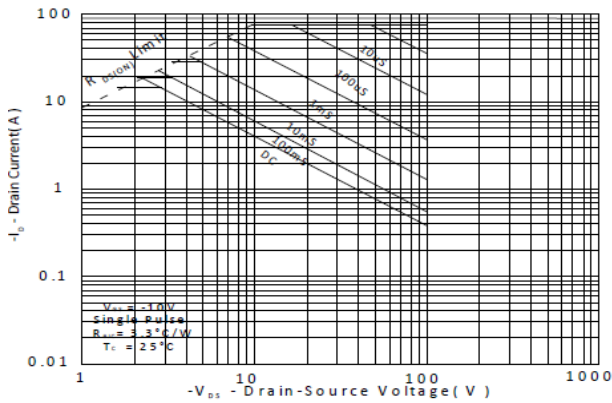


Figure 10. Single Pulse Maximum Power Dissipation

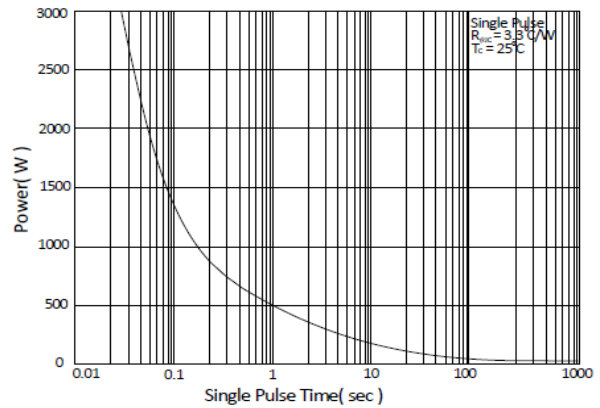
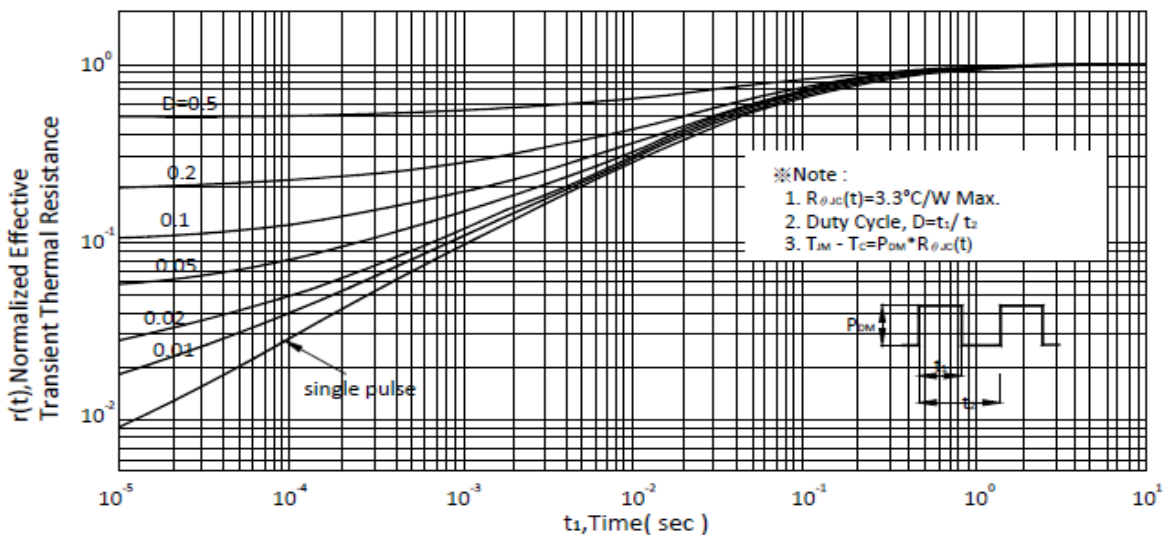
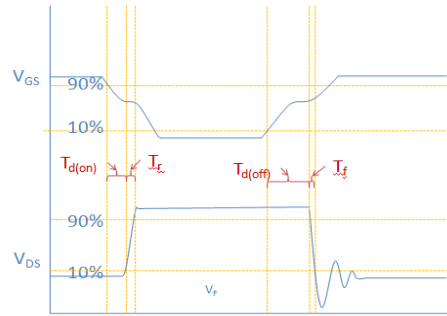
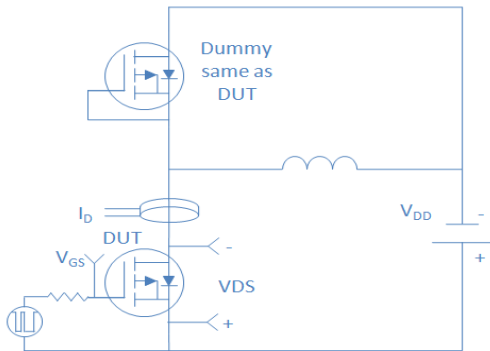


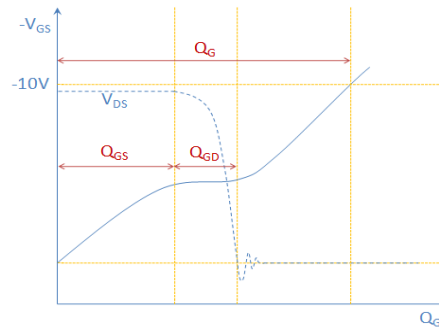
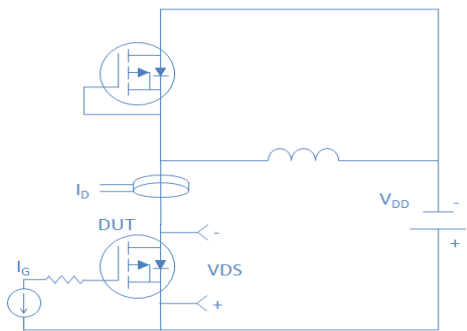
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient



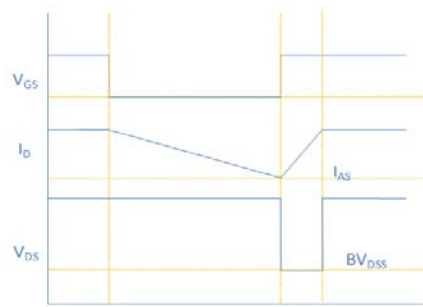
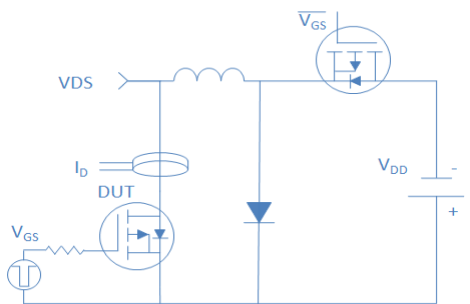
Inductive switching Test



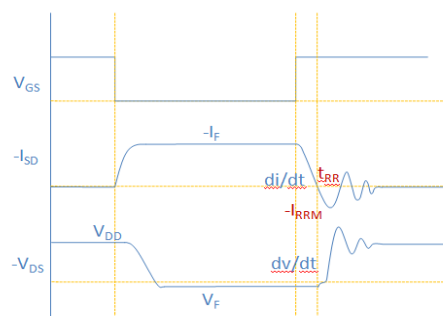
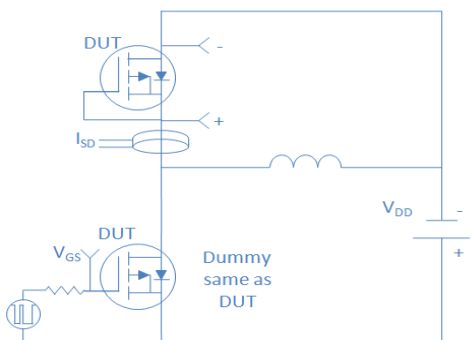
Gate Charge Test



Uclamped Inductive Switching (UIS) Test

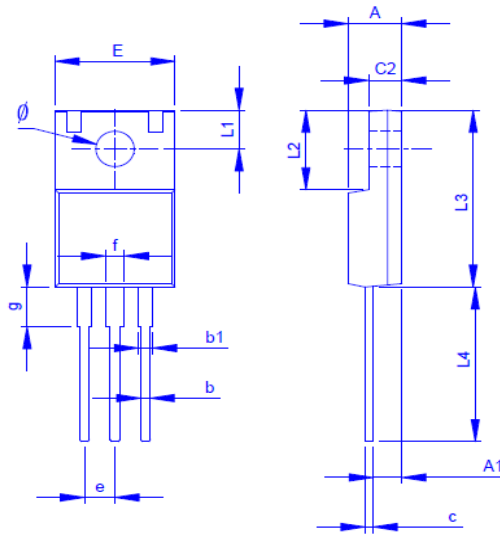


Diode Recovery Test



Package Outline

TO-220F, 3leads



Dimension in mm

| Dimension | A | A1 | b | b1 | c | c2 | E | L1 | L2 | L3 | L4 | φ | e | f | g |
|-----------|------|------|------|------|------|------|-------|------|------|-------|-------|------|------|------|------|
| Min. | 4.20 | 1.95 | 0.50 | 0.90 | 0.45 | 2.34 | 9.70 | 2.70 | 6.48 | 14.80 | 12.68 | 3.00 | 2.35 | 1.18 | 3.13 |
| Max. | 4.90 | 2.96 | 1.05 | 1.50 | 0.80 | 3.20 | 10.66 | 3.80 | 7.50 | 16.30 | 14.50 | 3.50 | 2.75 | 1.90 | 4.00 |