



P-Channel 60-V (D-S) MOSFET

| PRODUCT SUMMARY | | | | |
|-----------------|-----------------------|-------------------------------|------------------|-----------|
| Part Number | $V_{(BR)DSS}$ Min (V) | $r_{DS(on)}$ Max (Ω) | $V_{GS(th)}$ (V) | I_D (A) |
| TP0610L | -60 | 10 @ $V_{GS} = -10$ V | -1 to -2.4 | -0.18 |
| TP0610T | -60 | 10 @ $V_{GS} = -10$ V | -1 to -2.4 | -0.12 |
| VP0610L | -60 | 10 @ $V_{GS} = -10$ V | -1 to -3.5 | -0.18 |
| VP0610T | -60 | 10 @ $V_{GS} = -10$ V | -1 to -3.5 | -0.12 |
| BS250 | -45 | 14 @ $V_{GS} = -10$ V | -1 to -3.5 | -0.18 |

FEATURES

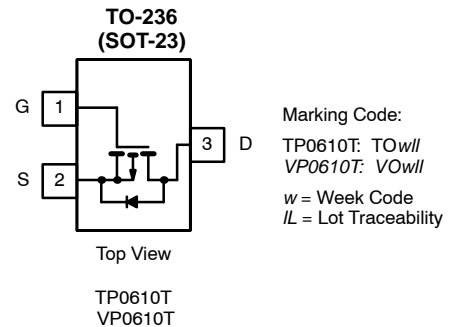
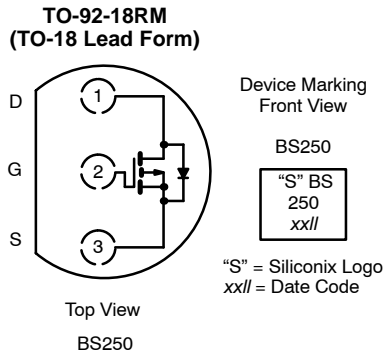
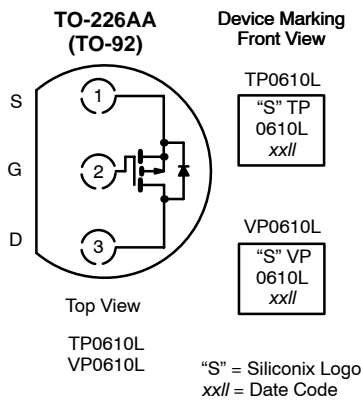
- High-Side Switching
- Low On-Resistance: 8 Ω
- Low Threshold: -1.9 V
- Fast Switching Speed: 16 ns
- Low Input Capacitance: 15 pF

BENEFITS

- Ease in Driving Switches
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Switching
- Easily Driven Without Buffer

APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems
- Power Supply, Converter Circuits
- Motor Control



| ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) | | | | | | | | |
|-----------------------------------------------------------------------------|---------------------------|------------|----------|----------|----------|----------|---------------------------|------------------|
| Parameter | Symbol | TP0610L | TP0610T | VP0610L | VP0610T | BS250 | Unit | |
| Drain-Source Voltage | V_{DS} | -60 | -60 | -60 | -60 | -45 | V | |
| Gate-Source Voltage | V_{GS} | ± 30 | ± 30 | ± 30 | ± 30 | ± 25 | V | |
| Continuous Drain Current ($T_J = 150^\circ\text{C}$) | $T_A = 25^\circ\text{C}$ | -0.18 | -0.12 | -0.18 | -0.12 | -0.18 | A | |
| | $T_A = 100^\circ\text{C}$ | -0.11 | -0.07 | -0.11 | -0.07 | | | |
| Pulsed Drain Current ^a | I_{DM} | -0.8 | -0.4 | -0.8 | -0.4 | | A | |
| Power Dissipation | $T_A = 25^\circ\text{C}$ | 0.8 | 0.36 | 0.8 | 0.36 | 0.83 | W | |
| | $T_A = 100^\circ\text{C}$ | 0.32 | 0.14 | 0.32 | 0.14 | | | |
| Thermal Resistance, Junction-to-Ambient | R_{thJA} | 156 | 350 | 156 | 350 | 150 | $^\circ\text{C}/\text{W}$ | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to 150 | | | | | | $^\circ\text{C}$ |

Notes

a. Pulse width limited by maximum junction temperature.

For applications information see AN804.



| SPECIFICATIONS (T _A = 25 °C UNLESS OTHERWISE NOTED) | | | | | | | | | | |
|----------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------|------------------|-----------|------|-----------|------|-------|------|------|
| Parameter | Symbol | Test Conditions | Typ ^a | Limits | | | | | | Unit |
| | | | | TP0610L/T | | VP0610L/T | | BS250 | | |
| | | | | Min | Max | Min | Max | Min | Max | |
| Static | | | | | | | | | | |
| Drain-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V, I _D = -10 μA | -70 | -60 | | -60 | | | | V |
| | | V _{GS} = 0 V, I _D = -100 μA | | | | | -45 | | | |
| Gate-Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = -1 mA | -1.9 | -1 | -2.4 | -1 | -3.5 | -1 | -3.5 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±20 V | | | ±10 | | ±10 | | | nA |
| | | V _{DS} = 0 V, V _{GS} = ±20 V, T _J = 125 °C | | | ±50 | | | | | |
| | | V _{DS} = 0 V, V _{GS} = ±15 V | | | | | | | ±20 | |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = -48 V, V _{GS} = 0 V | | | -1 | | -1 | | | μA |
| | | V _{DS} = -48 V, V _{GS} = 0 V, T _J = 125 °C | | | -200 | | -200 | | | |
| | | V _{DS} = -25 V, V _{GS} = 0 V | | | | | | | -0.5 | |
| On-State Drain Current ^b | I _{D(on)} | V _{DS} = -10 V, V _{GS} = -4.5 V | -180 | -50 | | | | | | mA |
| | | V _{DS} = -10 V, V _{GS} = -10 V | L Suffix | -750 | | | -600 | | | |
| | | | T Suffix | | | | -220 | | | |
| Drain-Source On-Resistance ^b | r _{DS(on)} | V _{GS} = -4.5 V, I _D = -25 mA | 11 | | 25 | | | | | Ω |
| | | V _{GS} = -10 V, I _D = -0.5 A | L Suffix | 8 | | 10 | | 10 | | |
| | | | L Suffix | 15 | | 20 | | 20 | | |
| | | V _{GS} = -10 V, I _D = -0.2 A | T Suffix | 6.5 | | 10 | | 10 | 14 | |
| Forward Transconductance ^b | g _{fs} | V _{DS} = -10 V, I _D = -0.5 A | 20 | 80 | | | | | | mS |
| | | V _{DS} = -10 V, I _D = -0.1 A | 90 | 60 | | 70 | | | | |
| Diode Forward Voltage | V _{SD} | I _S = -0.5 A, V _{GS} = 0 V | -1.1 | | | | | | | V |
| Dynamic | | | | | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} = -25 V, V _{GS} = 0 V f = 1 MHz | 15 | | 60 | | 60 | | | pF |
| Output Capacitance | C _{oss} | | 10 | | 25 | | 25 | | | |
| Reverse Transfer Capacitance | C _{rss} | | 3 | | 5 | | 5 | | | |
| Switching^c | | | | | | | | | | |
| Turn-On Time | t _{ON} | V _{DD} = -25 V, R _L = 133 Ω I _D ≅ -0.18 A, V _{GEN} = -10 V, R _g = 25 Ω | 8 | | | | | | 10 | ns |
| Turn-Off Time | t _{OFF} | | 8 | | | | | | 10 | |

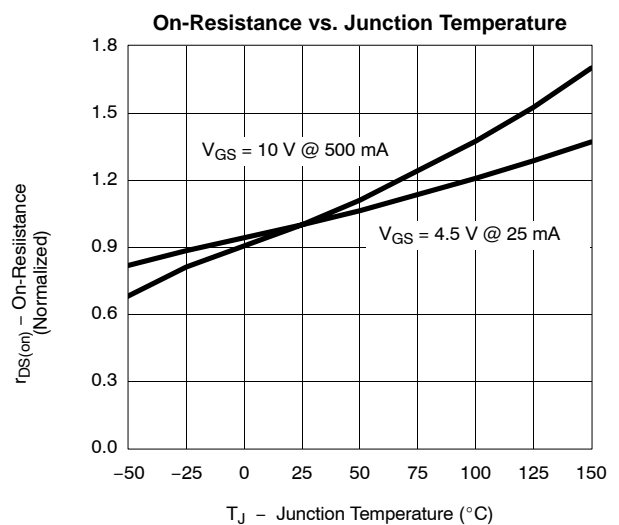
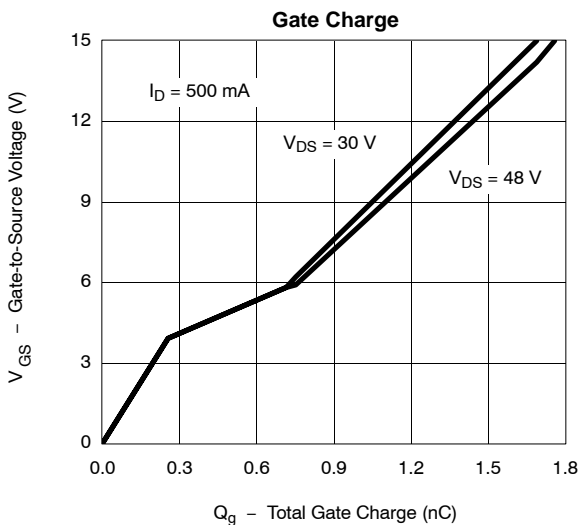
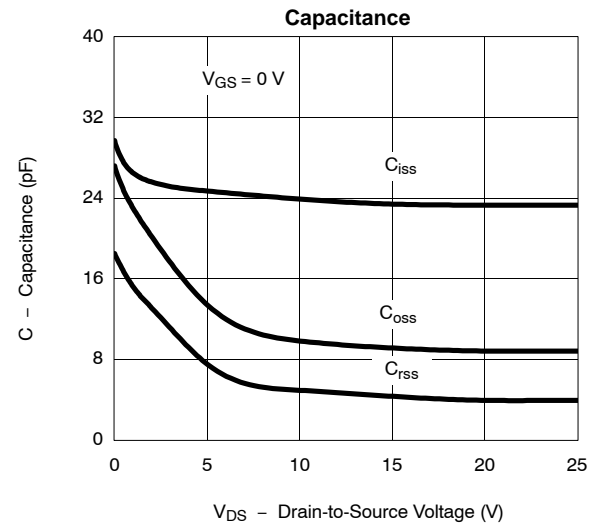
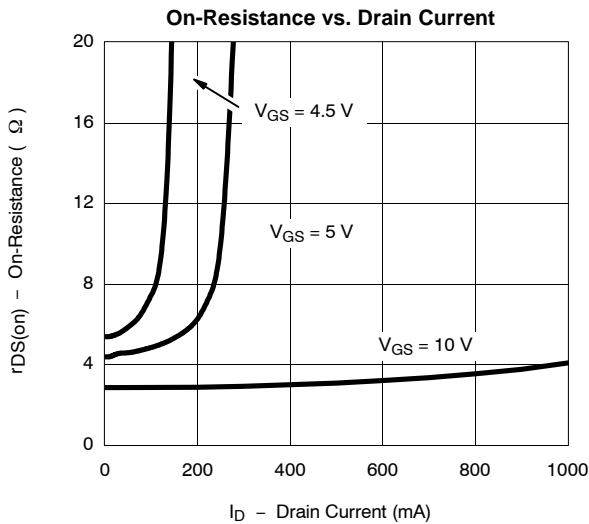
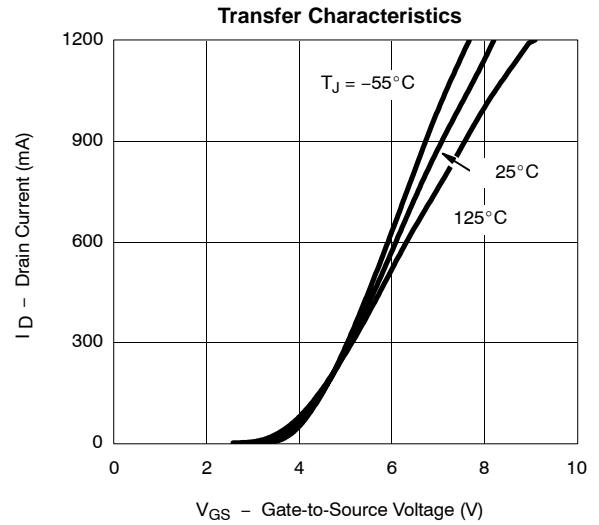
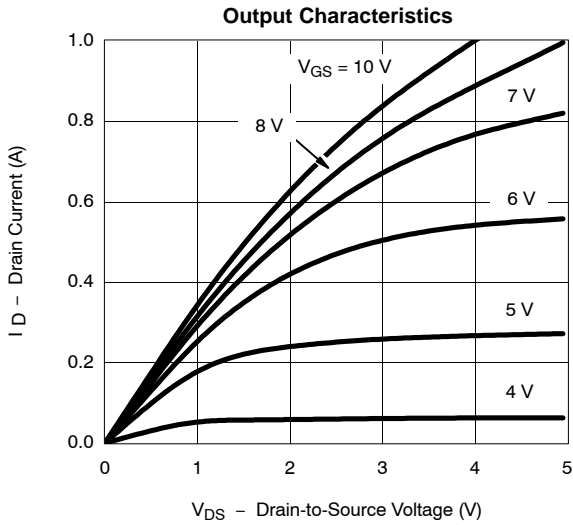
Notes

- a. For DESIGN AID ONLY, not subject to production testing.
- b. Pulse test: PW ≤ 300 μs duty cycle ≤ 2%.
- c. Switching time is essentially independent of operating temperature.

VPDS06



TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



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