

General Description

The 12P04D uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as -4.5V. This device is suitable for use as a wide variety of applications.

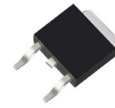
Features

$V_{DS} = -40V, I_D = -12A$
 $R_{DS(ON)} < 36m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 52m\Omega @ V_{GS} = -4.5V$

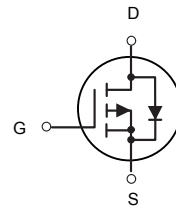
High Power and current handing capability
 Lead free product is acquired
 Surface Mount Package

Application

PWM applications
 Load switch
 Power management



TO252-2L



P-Channel MOSFET

Absolute Maximum Ratings ($T_A=25^\circ C$)

| Symbol | Parameter | Value | Unit |
|------------------|--|------------|------------|
| V_{DS} | Drain-Source Voltage ($V_{GS}=0V$) | -40 | V |
| V_{GS} | Gate-Source Voltage ($V_{DS}=0V$) | ± 20 | V |
| I_D | Drain Current-Continuous($T_c=25^\circ C$) | -12 | A |
| | Drain Current-Continuous($T_c=100^\circ C$) | -10 | A |
| $I_{DM (pluse)}$ | (Note 1) Drain Current-Continuous@ Current-Pulsed | -80 | A |
| P_D | Maximum Power Dissipation($T_c=25^\circ C$) | 37.5 | W |
| | Maximum Power Dissipation($T_c=100^\circ C$) | 19 | W |
| T_J, T_{STG} | Operating Junction and Storage Temperature Range | -55 To 175 | $^\circ C$ |

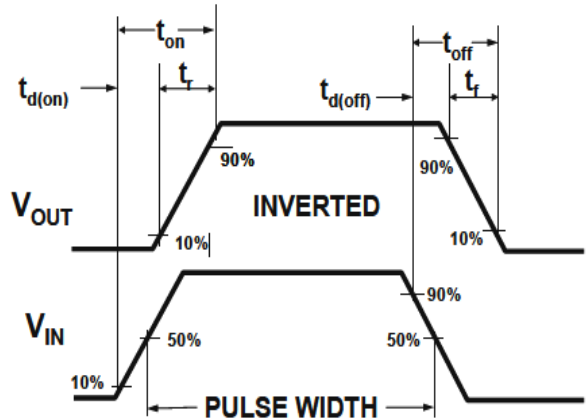
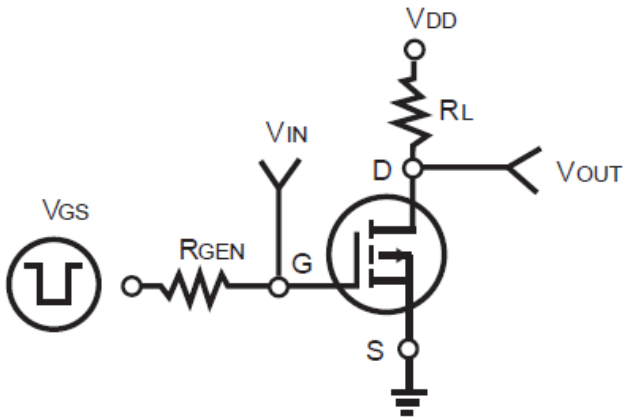
| | | | |
|----------|--------------------------------------|---|-----------------------------|
| R_{JC} | Thermal Resistance, Junction-to-Case | 4 | $^{\circ}\text{C}/\text{W}$ |
|----------|--------------------------------------|---|-----------------------------|

Electrical Characteristics (TA=25°C unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|-----------------------------------|---|-----|-----|-----------|------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=-250\mu A$ | -40 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=-32V, V_{GS}=0V$ | | | -1 | μA |
| I_{GSS} | Gate-Body Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -1 | -2 | -3 | V |
| g_{FS} | Forward Transconductance | $V_{DS}=-5V, I_D=-10A$ | | 25 | | S |
| $R_{DS(on)}$ | Drain-Source On-State Resistance | $V_{GS}=-10V, I_D=-20A$ | | 25 | 36 | m Ω |
| | | $V_{GS}=-4.5V, I_D=-10A$ | | 42 | 52 | m Ω |
| C_{iss} | Input Capacitance | $V_{DS}=-25V, V_{GS}=0V,$ $f=1.0\text{MHz}$ | | 840 | | pF |
| C_{oss} | Output Capacitance | | | 92 | | pF |
| C_{riss} | Reverse Transfer Capacitance | | | 60 | | pF |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{GS}=-10V, V_{DS}=-20V,$ $R_L=1.6\Omega, R_{GEN}=3\Omega$ | | 5 | | nS |
| t_r | Turn-on Rise Time | | | 12 | | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 20 | | nS |
| t_f | Turn-Off Fall Time | | | 4.5 | | nS |
| Q_g | Total Gate Charge | $V_{GS}=-10V, V_{DS}=-20V, I_D=-15A$ | | 20 | | nC |
| Q_{gs} | Gate-Source Charge | | | 2.5 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 4.5 | | nC |
| I_{SD} | Source-Drain Current (Body Diode) | | | | -20 | A |
| V_{SD} | Forward on Voltage | $V_{GS}=0V, I_S=-20A$ | | | -1.2 | V |

Notes 1. Repetitive Rating: Pulse width limited by maximum junction temperature

Switch Time Test Circuit and Switching Waveforms:



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

Figure1. Power Dissipation

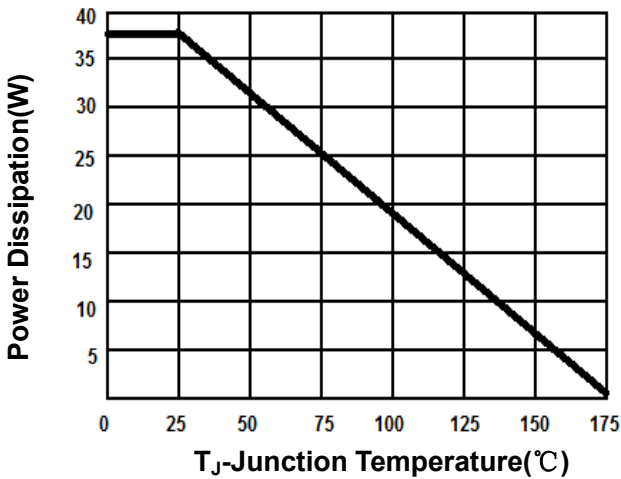


Figure2. Drain Current

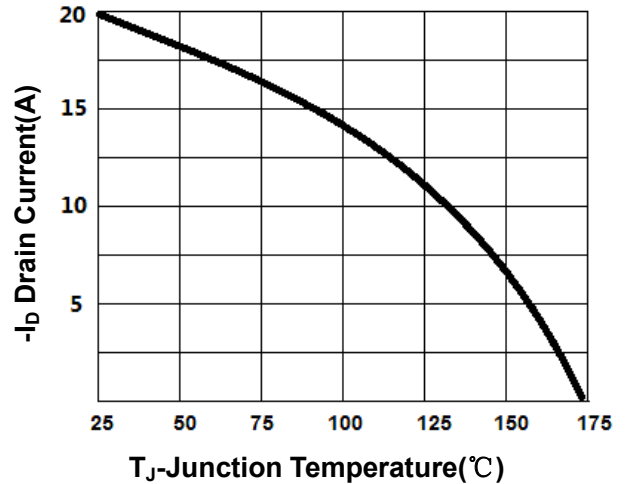


Figure3. Output Characteristics

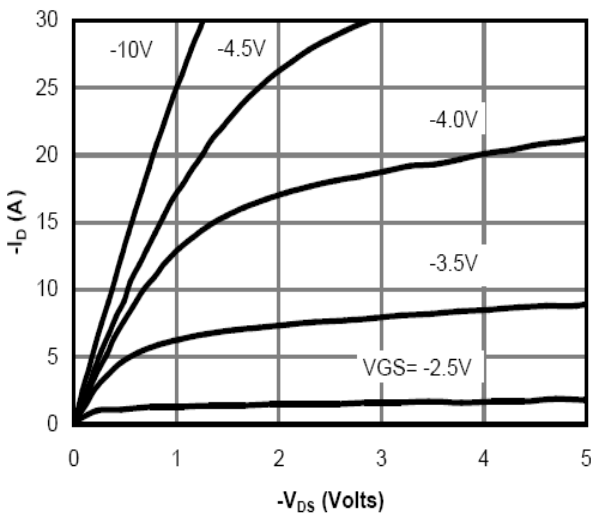


Figure4. Transfer Characteristics

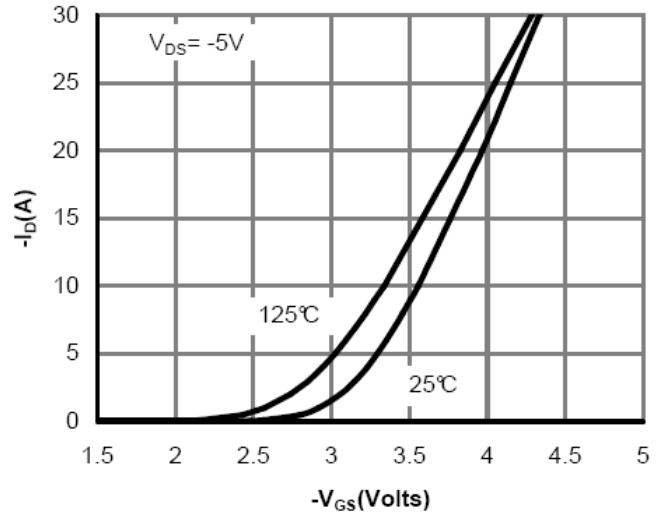
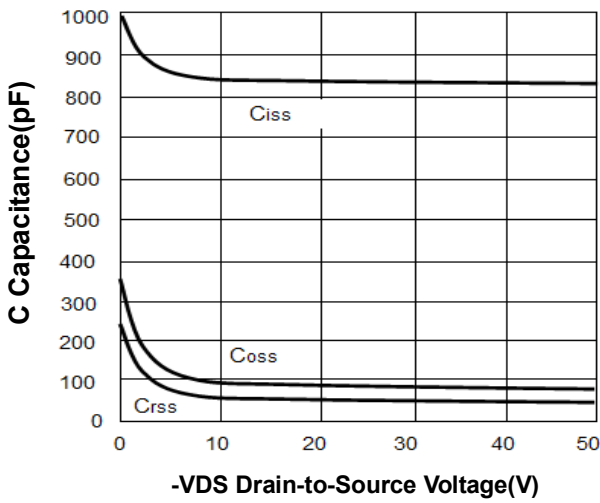
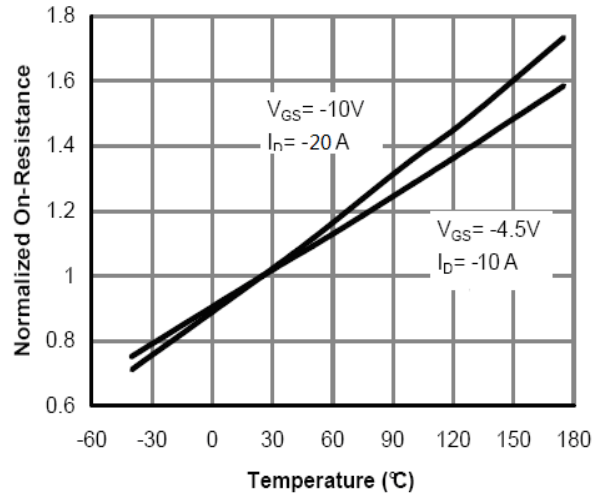
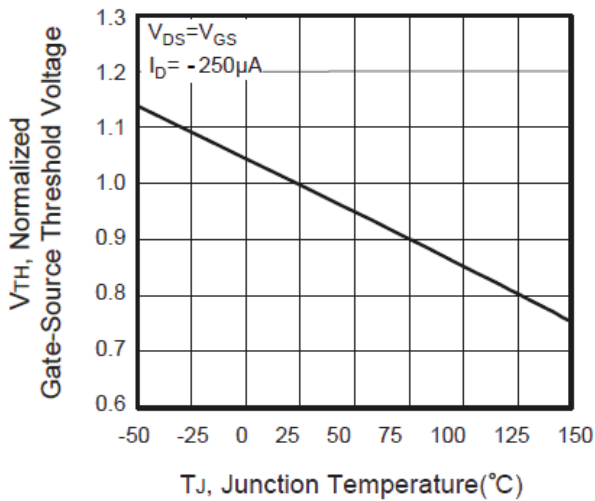
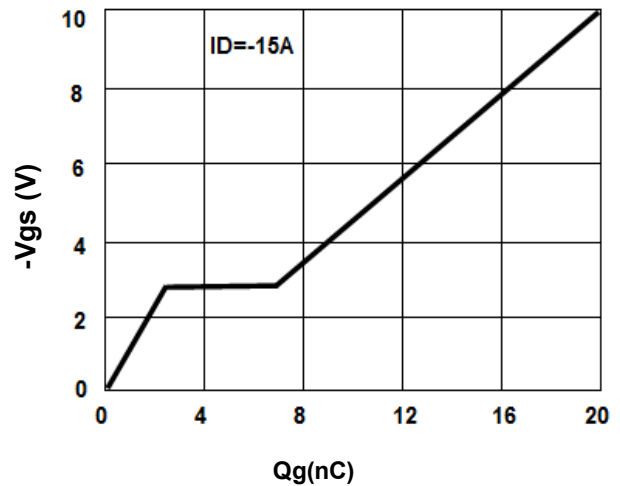
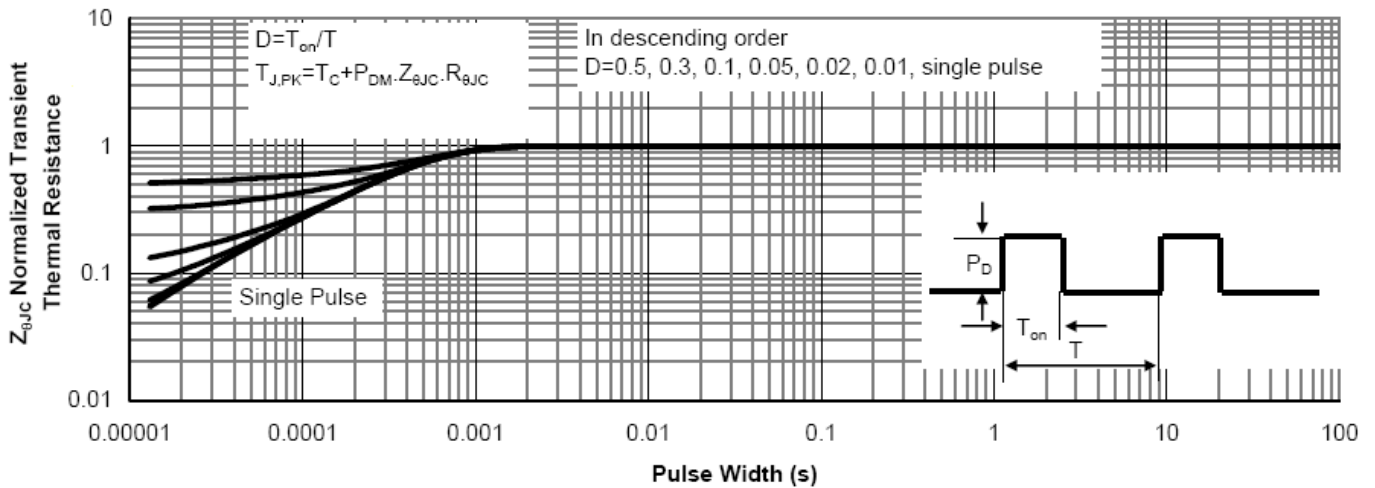
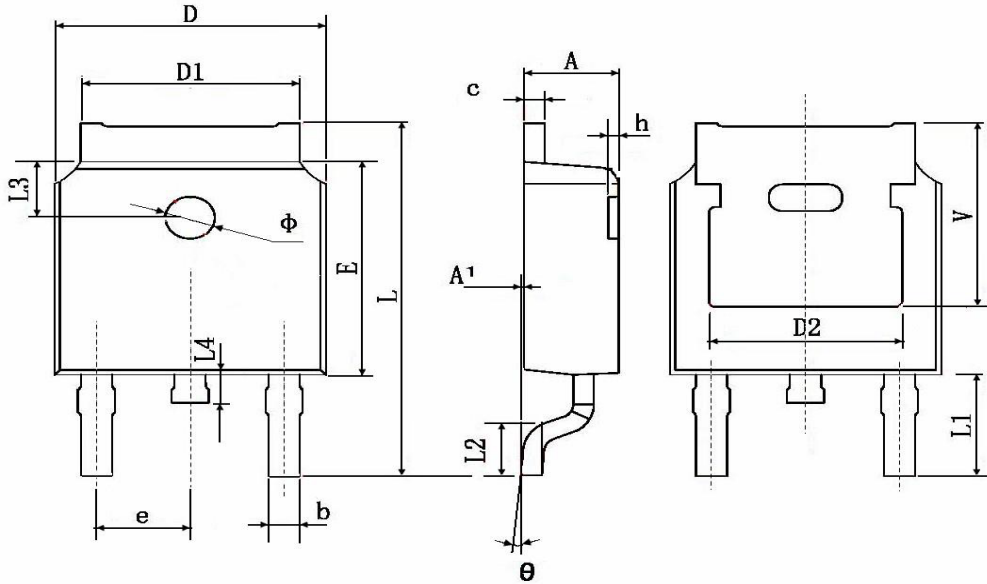


Figure5. Capacitance

Figure6. $R_{DS(ON)}$ vs Junction Temperature

Figure7. $V_{GS(th)}$ vs Junction Temperature

Figure8. Gate Charge Waveforms

Figure9. Normalized Maximum Transient Thermal Impedance


TO252-2L Package Information


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| b | 0.660 | 0.860 | 0.026 | 0.034 |
| c | 0.460 | 0.580 | 0.018 | 0.023 |
| D | 6.500 | 6.700 | 0.256 | 0.264 |
| D1 | 5.100 | 5.460 | 0.201 | 0.215 |
| D2 | 4.830 TYP. | | 0.190 TYP. | |
| E | 6.000 | 6.200 | 0.236 | 0.244 |
| e | 2.186 | 2.386 | 0.086 | 0.094 |
| L | 9.800 | 10.400 | 0.386 | 0.409 |
| L1 | 2.900 TYP. | | 0.114 TYP. | |
| L2 | 1.400 | 1.700 | 0.055 | 0.067 |
| L3 | 1.600 TYP. | | 0.063 TYP. | |
| L4 | 0.600 | 1.000 | 0.024 | 0.039 |
| Φ | 1.100 | 1.300 | 0.043 | 0.051 |
| θ | 0° | 8° | 0° | 8° |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| V | 5.350 TYP. | | 0.211 TYP. | |