



60V P-Channel MOSFET

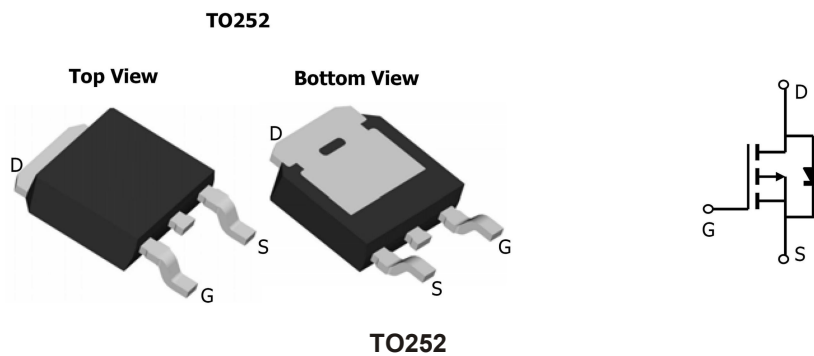
● Features

- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$

● Product Summary

| | | |
|-------|---------|------|
| BVDSS | RDS(ON) | ID |
| -60V | 9.0mΩ | -80A |

● Pin Configuration



● Absolute Maximum Ratings $T_J=25^{\circ}\text{C}$ unless otherwise noted

| Parameter | Symbol | Maximum | Units |
|--|----------------|---------------------------|--------------------|
| Drain-Source Voltage | V_{DS} | -60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | |
| Continuous Drain Current | I_D | $T_A=25^{\circ}\text{C}$ | -80 |
| | | $T_A=100^{\circ}\text{C}$ | -50 |
| Pulsed Drain Current | I_{DM}^1 | -320 | A |
| Single pulse avalanche energy | E_{AS}^2 | 450 | mJ |
| Power Dissipation | P_D | 110 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | 150, -55 to 150 | $^{\circ}\text{C}$ |
| Maximum Temperature for Soldering | T_L | 300 | $^{\circ}\text{C}$ |

| Thermal Characteristics | | | |
|---|-----------------|-------|----------------------|
| Parameter | Symbol | Value | Units |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 60 | $^{\circ}\text{C/W}$ |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 1.1 | |

Note:

1. Repetitive rating; pulse width limited by maximum junction temperature
2. $V_{DD} = 30\text{V}$, $L = 0.3\text{mH}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$



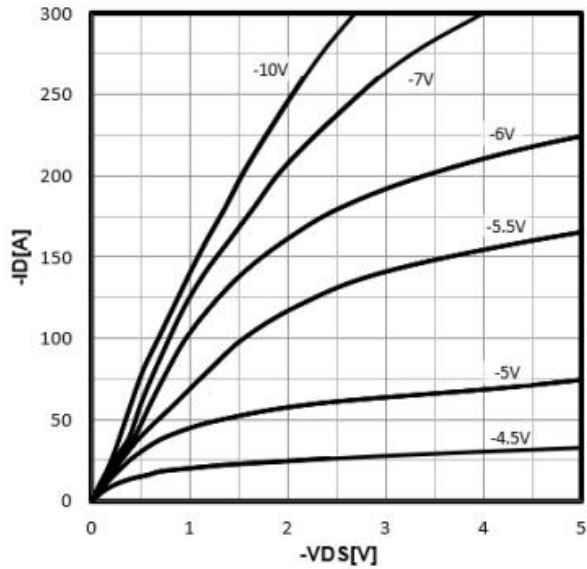
● Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|------------------------------------|---|------|------|-----------|------------|
| STATIC PARAMETERS | | | | | | |
| V_{DSS} | Drain-Source Breakdown Voltage | $I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$ | -60 | -- | -- | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=-60\text{V}$, $V_{GS}=0$ | -- | -- | 1 | uA |
| I_{GSS} | Gate-Body leakage current | $V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$ | | | ± 0.1 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$ | -1.3 | -1.8 | -2.3 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=-10\text{V}$, $I_D=-20\text{A}$ | -- | 9 | 11 | m Ω |
| | | $V_{GS}=-4.5\text{V}$, $I_D=-15\text{A}$ | -- | 12 | 16 | |
| g_{FS} | Forward Trans conductance | $V_{DS}=-5\text{V}$, $I_D=-20\text{A}$ | 50 | -- | -- | S |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}$, $V_{DS}=-30\text{V}$, $f=1\text{MHz}$ | -- | 3060 | -- | pF |
| C_{oss} | Output Capacitance | | -- | 620 | -- | |
| C_{rss} | Reverse Transfer Capacitance | | -- | 20 | -- | |
| R_g | Gate resistance | $V_{GS}=0\text{V}$, V_{DS} Open | -- | 2.0 | 10 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q_g | Total Gate Charge | $V_{GS}=-10\text{V}$, $V_{DS}=-30\text{V}$, $I_D=-20\text{A}$ | -- | 56 | -- | nC |
| Q_{gs} | Gate Source Charge | | -- | 11 | -- | |
| Q_{gd} | Gate Drain Charge | | -- | 9 | -- | |
| $t_{D(on)}$ | Turn-On Delay Time | $V_{GS}=-10\text{V}$, $V_{DS}=-30\text{V}$, $R_L=0.75\Omega$, $R_{GEN}=3\Omega$, $I_D=-20\text{A}$ | -- | 4.5 | -- | ns |
| t_r | Turn-On Rise Time | | -- | 2.5 | -- | |
| $t_{D(off)}$ | Turn-Off Delay Time | | -- | 14.5 | -- | |
| t_f | Turn-Off Fall Time | | -- | 3.5 | -- | |
| t_{rr} | Body Diode Reverse Recovery Time | $I_S=-20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$ | -- | 60 | -- | nC |
| Q_{rr} | Body Diode Reverse Recovery Charge | $V_{DD}=-30\text{V}$ | -- | 105 | -- | |
| I_S | Diode Forward Current | $T_C=25^\circ\text{C}$ | -- | -- | -80 | A |
| I_{SM} | Diode Pulse Current | | -- | -- | -320 | |
| V_{SD} | Diode Forward Voltage | $I_S=-6.0\text{A}$, $V_{GS}=0\text{V}$ | -- | -- | -1.2 | V |



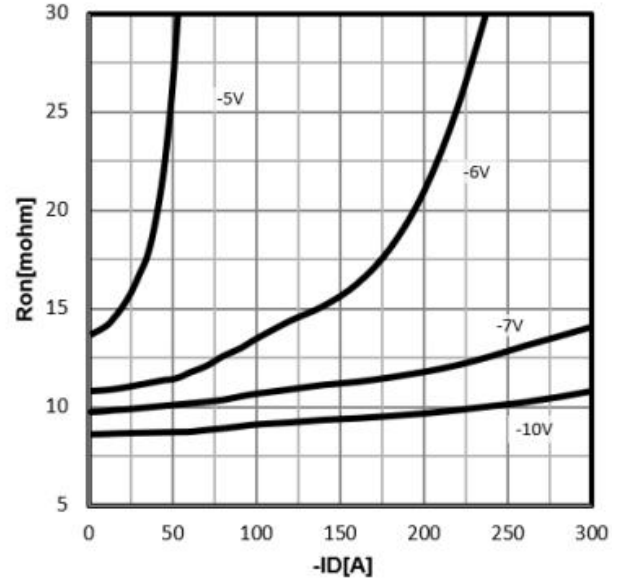
Typ. output characteristics

$$I_D = f(V_{DS})$$



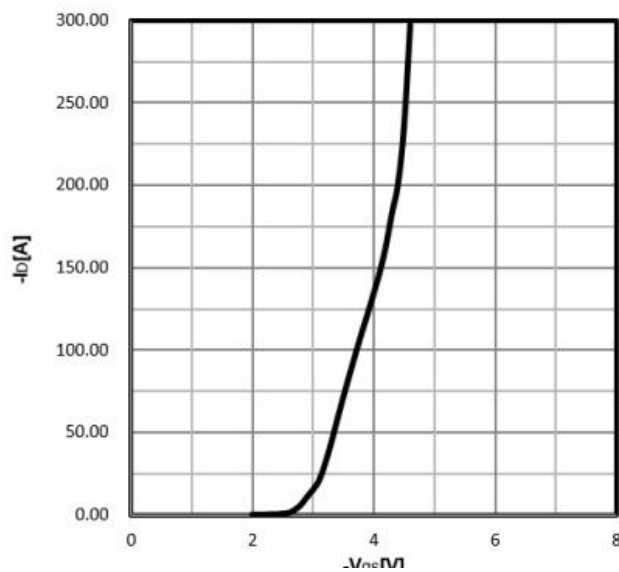
Typ. drain-source on resistance

$$R_{DS(on)} = f(I_D)$$



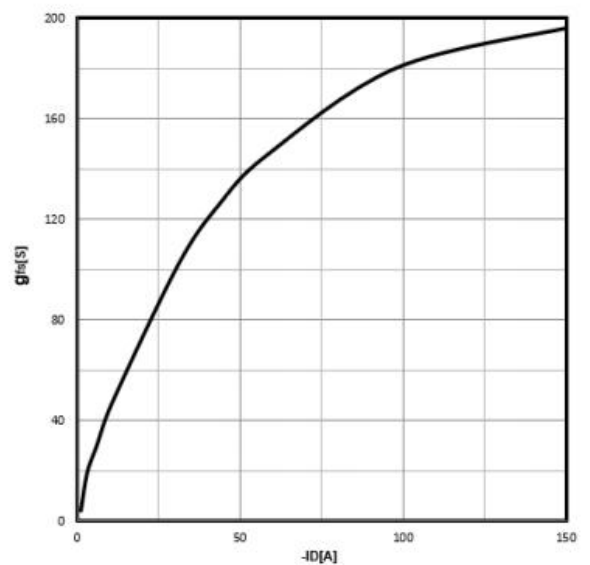
Typ. transfer characteristics

$$I_D = f(V_{GS})$$



Typ. forward transconductance

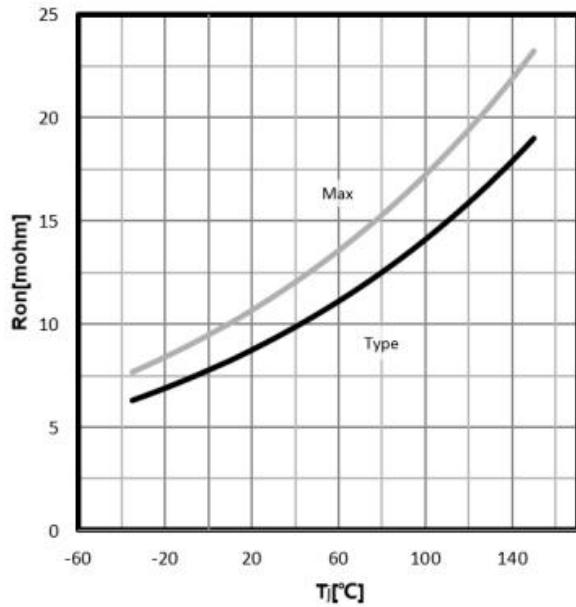
$$g_{fs} = f(I_D)$$





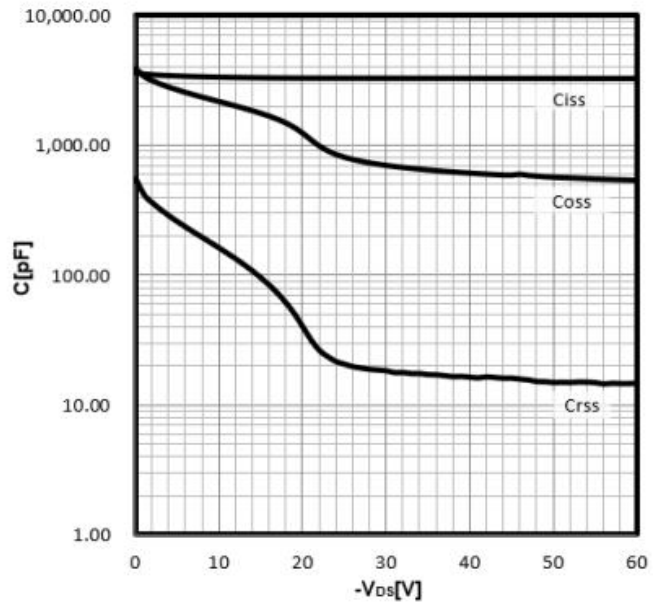
Drain-source on-state resistance

$$R_{DS(on)} = f(T_j); I_D = -20A; V_{GS} = -10V$$



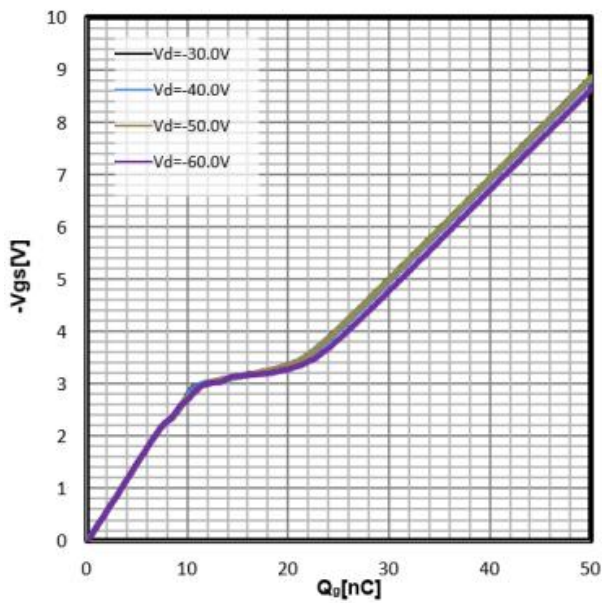
Typ. capacitances

$$C = f(V_{DS}); V_{GS} = 0V; f = 1MHz$$



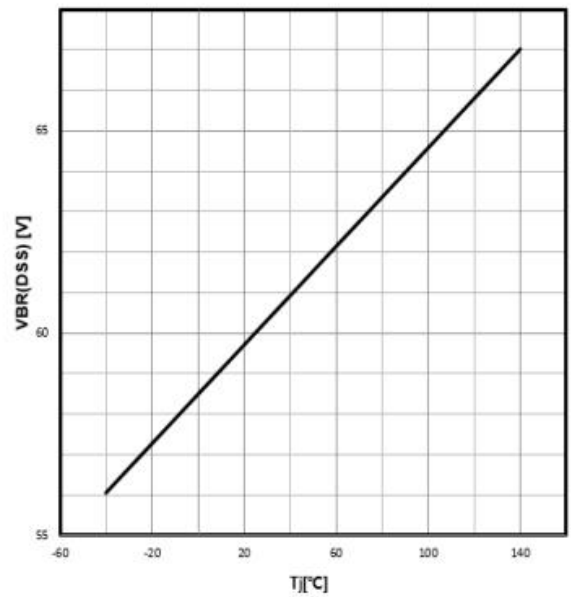
Typ. gate charge

$$V_{GS} = f(Q_{gate}); I_D = -20A$$



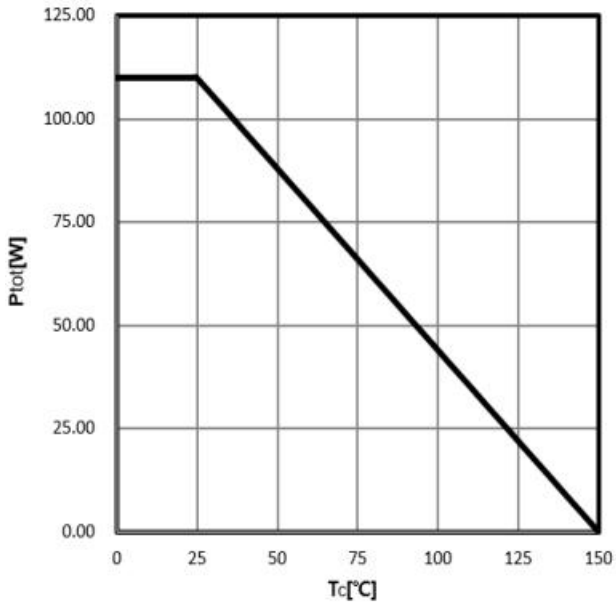
Drain-source breakdown voltage

$$V_{BR(DSS)} = f(T_j); I_D = -250\mu A$$

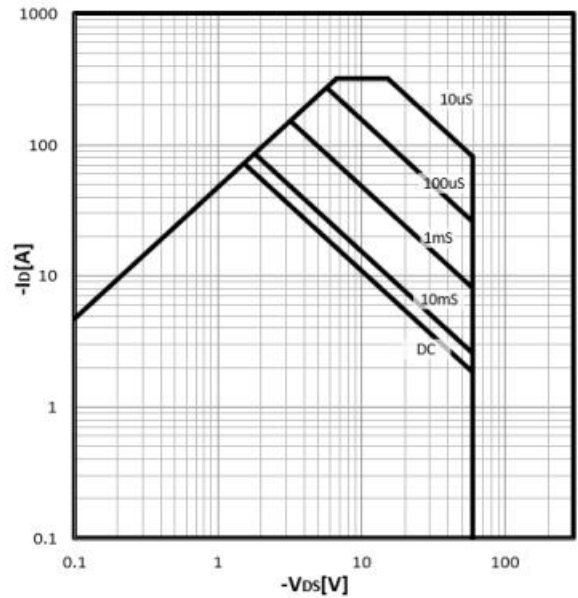




Power Dissipation
 $P_{tot}=f(T_C)$

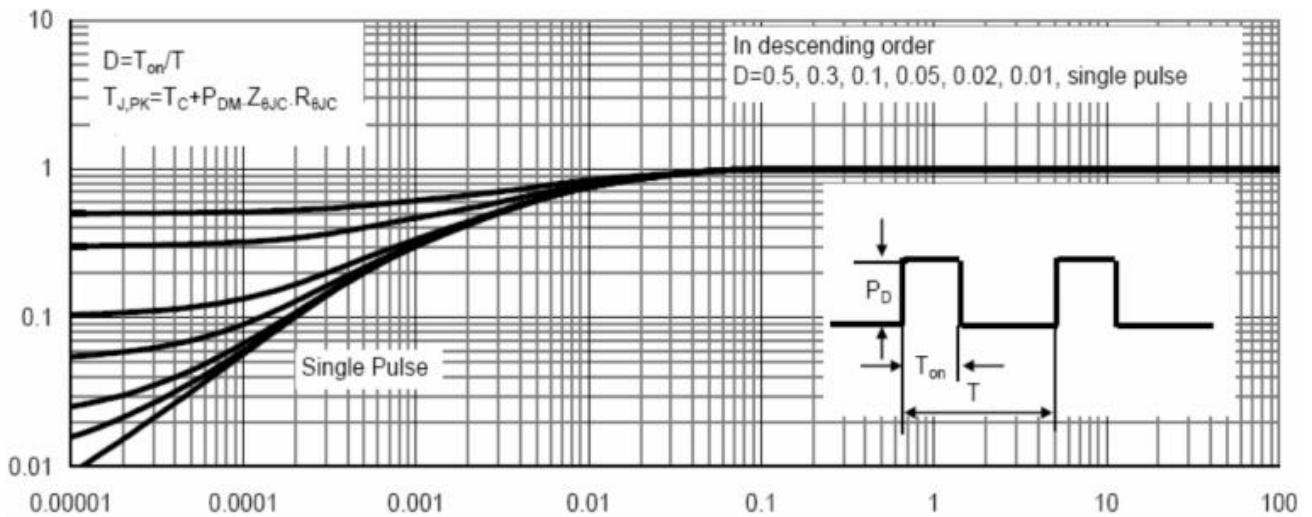


$I_D=f(V_{DS})$



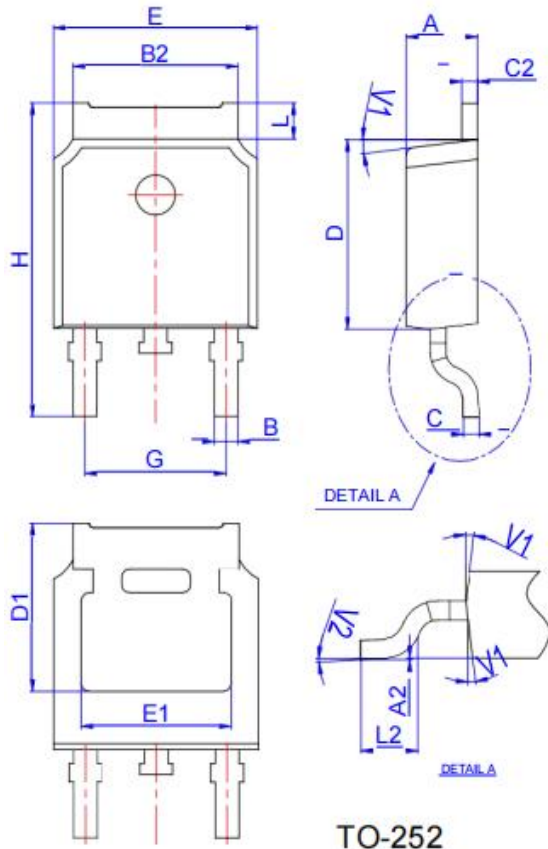
Max. transient thermal impedance

$$Z_{thJC}=f(t_p)$$





Package Mechanical Data-TO-252



| Ref. | Dimensions | | | | | |
|------|-------------|------|-------|----------|------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | | 2.50 | 0.083 | | 0.098 |
| A2 | 0 | | 0.10 | 0 | | 0.004 |
| B | 0.66 | | 0.86 | 0.026 | | 0.034 |
| B2 | 5.18 | | 5.48 | 0.202 | | 0.216 |
| C | 0.40 | | 0.60 | 0.016 | | 0.024 |
| C2 | 0.44 | | 0.58 | 0.017 | | 0.023 |
| D | 5.90 | | 6.30 | 0.232 | | 0.248 |
| D1 | 5.30REF | | | 0.209REF | | |
| E | 6.40 | | 6.80 | 0.252 | | 0.268 |
| E1 | 4.63 | | | 0.182 | | |
| G | 4.47 | | 4.67 | 0.176 | | 0.184 |
| H | 9.50 | | 10.70 | 0.374 | | 0.421 |
| L | 1.09 | | 1.21 | 0.043 | | 0.048 |
| L2 | 1.35 | | 1.65 | 0.053 | | 0.065 |
| V1 | | 7° | | | 7° | |
| V2 | 0° | | 6° | 0° | | 6° |