

## P-Channel Enhancement Mode Power MOSFET

### Description

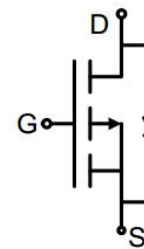
The G450P04K uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

### General Features

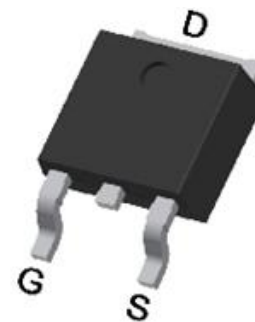
- $V_{DS}$  -40V
- $I_D$  (at  $V_{GS} = -10V$ ) -11A
- $R_{DS(ON)}$  (at  $V_{GS} = -10V$ ) < 40m $\Omega$
- $R_{DS(ON)}$  (at  $V_{GS} = -4.5V$ ) < 55m $\Omega$
- 100% Avalanche Tested
- RoHS Compliant

### Application

- Power switch
- DC/DC converters



Schematic diagram



TO-252

### Ordering Information

| Device   | Package | Marking | Packaging    |
|----------|---------|---------|--------------|
| G450P04K | TO-252  | G450P04 | 2500pcs/Reel |

### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted

| Parameter  | Symbol         | Value      | Unit             |
|--|----------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | -40        | V                |
| Continuous Drain Current                         | $I_D$          | -11        | A                |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | -44        | A                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$   | V                |
| Power Dissipation                                | $P_D$          | 48         | W                |
| Single pulse avalanche energy (note2)            | $E_{AS}$       | 12         | mJ               |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55 To 150 | $^\circ\text{C}$ |

### Thermal Resistance

| Parameter                               | Symbol     | Value | Unit               |
|---|------------|-------|--------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 50    | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case                | $R_{thJC}$ | 2.6   | $^\circ\text{C/W}$ |

| Specifications $T_J = 25^\circ\text{C}$ , unless otherwise noted |               |   |       |      |           |            |
|--|---------------|---|-------|------|-----------|------------|
| Parameter  | Symbol        | Test Conditions                                     | Value |      |           | Unit       |
|  |               |   | Min.  | Typ. | Max.      |            |
| <b>Static Parameters</b>   |               |   |       |      |           |            |
| Drain-Source Breakdown Voltage                                   | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = -250\mu A$                      | -40   | --   | --        | V          |
| Zero Gate Voltage Drain Current                                  | $I_{DSS}$     | $V_{DS} = -40V, V_{GS} = 0V$                        | --    | --   | -1        | $\mu A$    |
| Gate-Source Leakage  | $I_{GSS}$     | $V_{GS} = \pm 20V$                                  | --    | --   | $\pm 100$ | nA         |
| Gate-Source Threshold Voltage                                    | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = -250\mu A$                  | -1    | -1.6 | -2.5      | V          |
| Drain-Source On-Resistance                                       | $R_{DS(on)}$  | $V_{GS} = -10V, I_D = -6A$                          | --    | 32   | 40        | m $\Omega$ |
|  |               | $V_{GS} = -4.5V, I_D = -6A$                         | --    | 45   | 55        |            |
| Forward Transconductance   | $g_{FS}$      | $V_{DS} = -5V, I_D = -6A$                           | --    | 11   | --        | S          |
| <b>Dynamic Parameters</b>  |               |   |       |      |           |            |
| Input Capacitance  | $C_{iss}$     | $V_{GS} = 0V,$<br>$V_{DS} = -20V,$<br>$f = 1.0MHz$  | --    | 983  | --        | pF         |
| Output Capacitance   | $C_{oss}$     |   | --    | 87   | --        |            |
| Reverse Transfer Capacitance                                     | $C_{rss}$     |   | --    | 80   | --        |            |
| Total Gate Charge  | $Q_g$         | $V_{DD} = -20V,$<br>$I_D = -6A,$<br>$V_{GS} = -10V$ | --    | 25   | --        | nC         |
| Gate-Source Charge   | $Q_{gs}$      |   | --    | 3    | --        |            |
| Gate-Drain Charge  | $Q_{gd}$      |   | --    | 7    | --        |            |
| Turn-on Delay Time   | $t_{d(on)}$   | $V_{DD} = -20V,$<br>$I_D = -6A,$<br>$R_G = 3\Omega$ | --    | 8    | --        | ns         |
| Turn-on Rise Time  | $t_r$         |   | --    | 4    | --        |            |
| Turn-off Delay Time  | $t_{d(off)}$  |   | --    | 32   | --        |            |
| Turn-off Fall Time   | $t_f$         |   | --    | 7    | --        |            |
| <b>Drain-Source Body Diode Characteristics</b>                   |               |   |       |      |           |            |
| Continuous Body Diode Current                                    | $I_S$         | $T_C = 25^\circ\text{C}$                            | --    | --   | -11       | A          |
| Body Diode Voltage   | $V_{SD}$      | $T_J = 25^\circ\text{C}, I_{SD} = -6A, V_{GS} = 0V$ | --    | --   | -1.2      | V          |
| Reverse Recovery Charge  | $Q_{rr}$      | $I_F = -6A, V_{GS} = 0V$<br>$di/dt = -100A/\mu s$   | --    | 31   | --        | nC         |
| Reverse Recovery Time  | $T_{rr}$      |   | --    | 25   | --        | ns         |

### Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition :  $T_J = 25^\circ\text{C}, V_{DD} = -40V, V_{GS} = -10V, L = 0.5mH, R_G = 25\Omega$
3. Identical low side and high side switch with identical  $R_G$

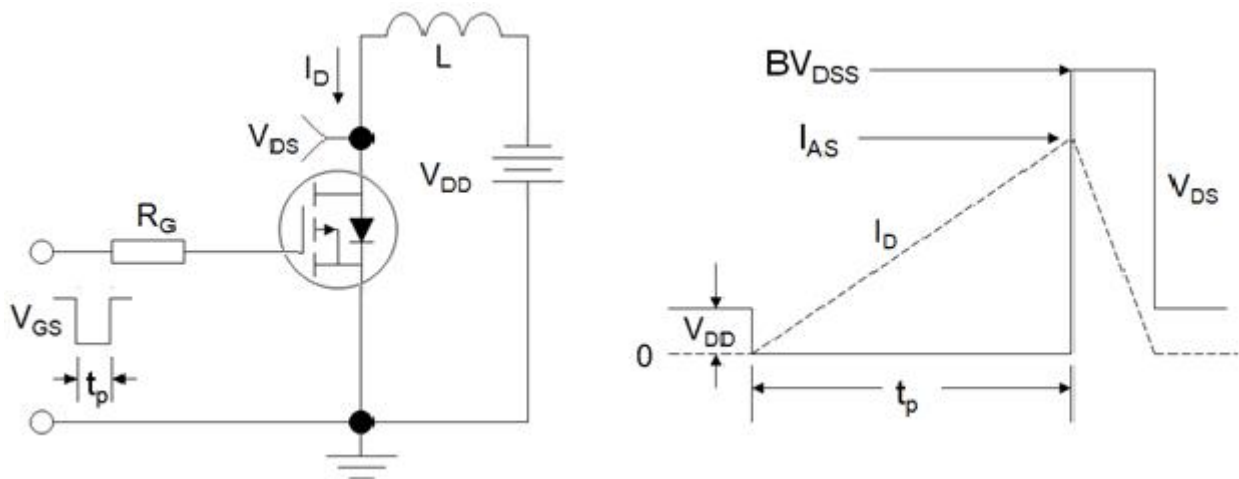
### Gate Charge Test Circuit



### Switch Time Test Circuit



### EAS Test Circuit



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 1. Output Characteristics

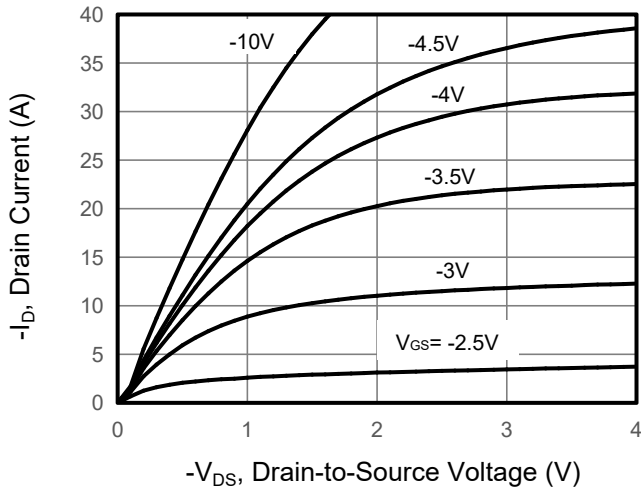


Figure 2. Transfer Characteristics

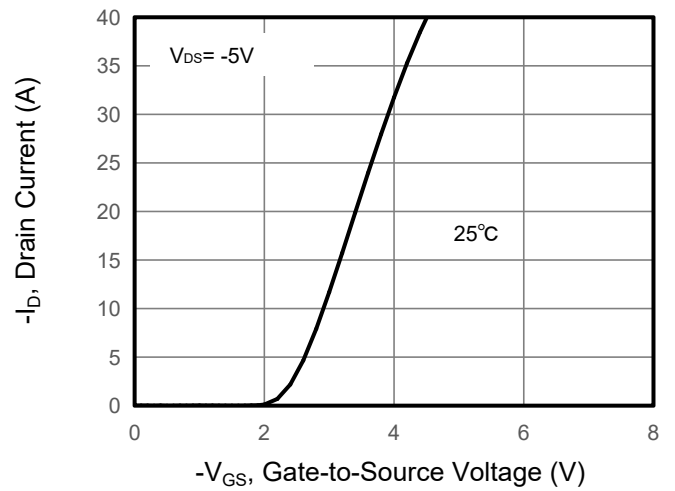


Figure 3. Drain Source On Resistance

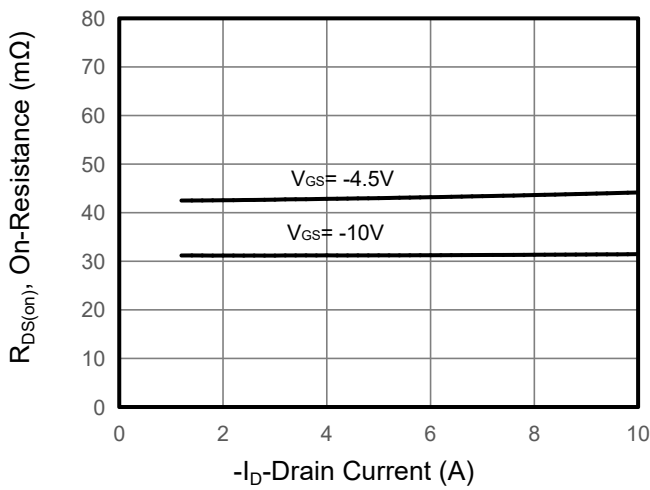


Figure 4. Gate Charge

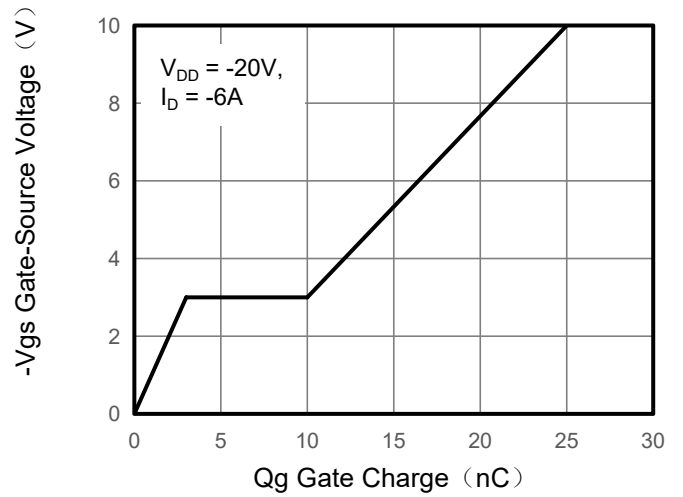


Figure 5. Capacitance

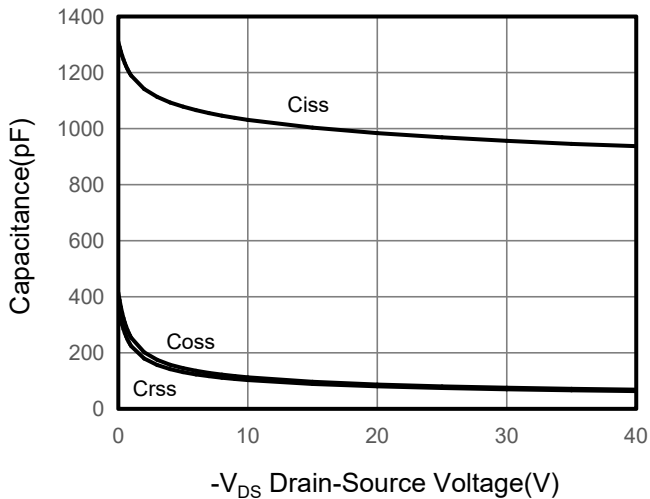
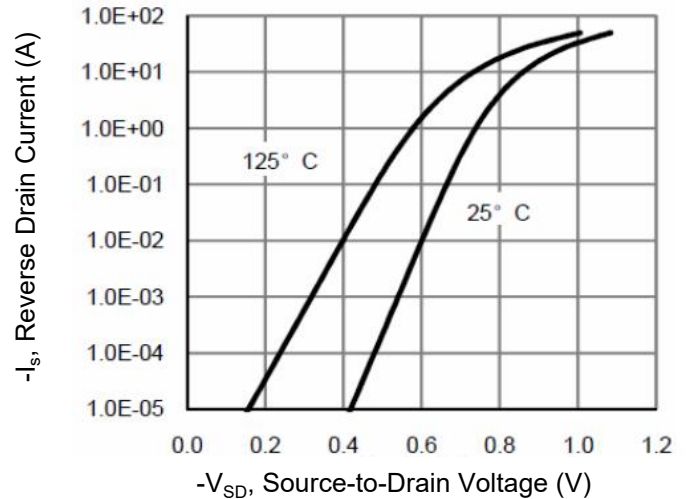


Figure 6. Source-Drain Diode Forward



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 7. Drain-Source On-Resistance

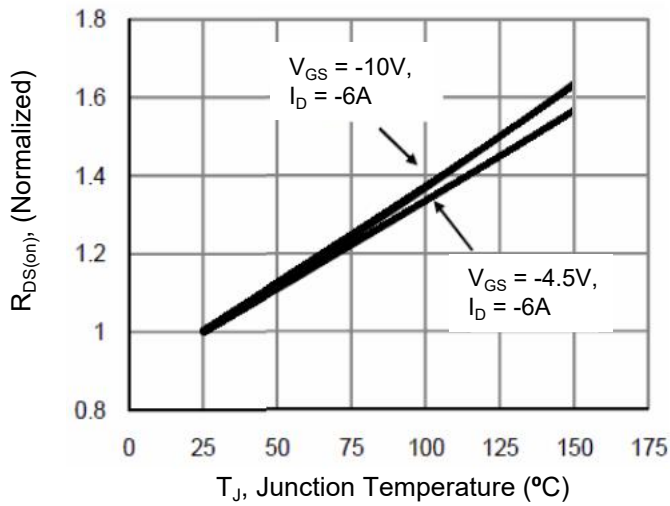


Figure 10. Safe Operation Area

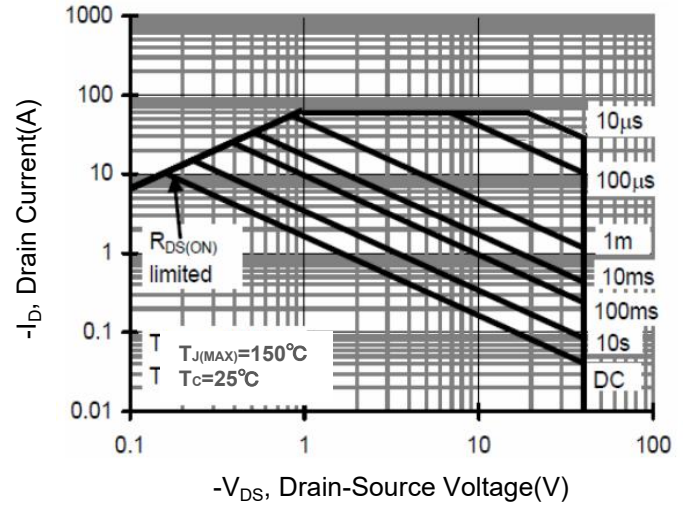
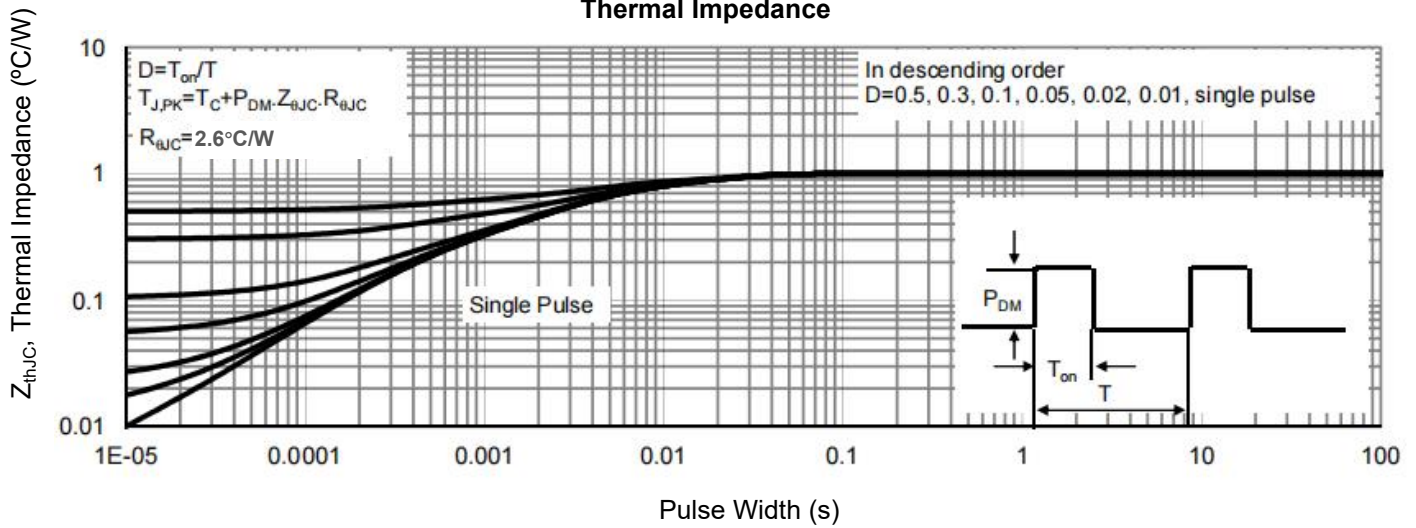
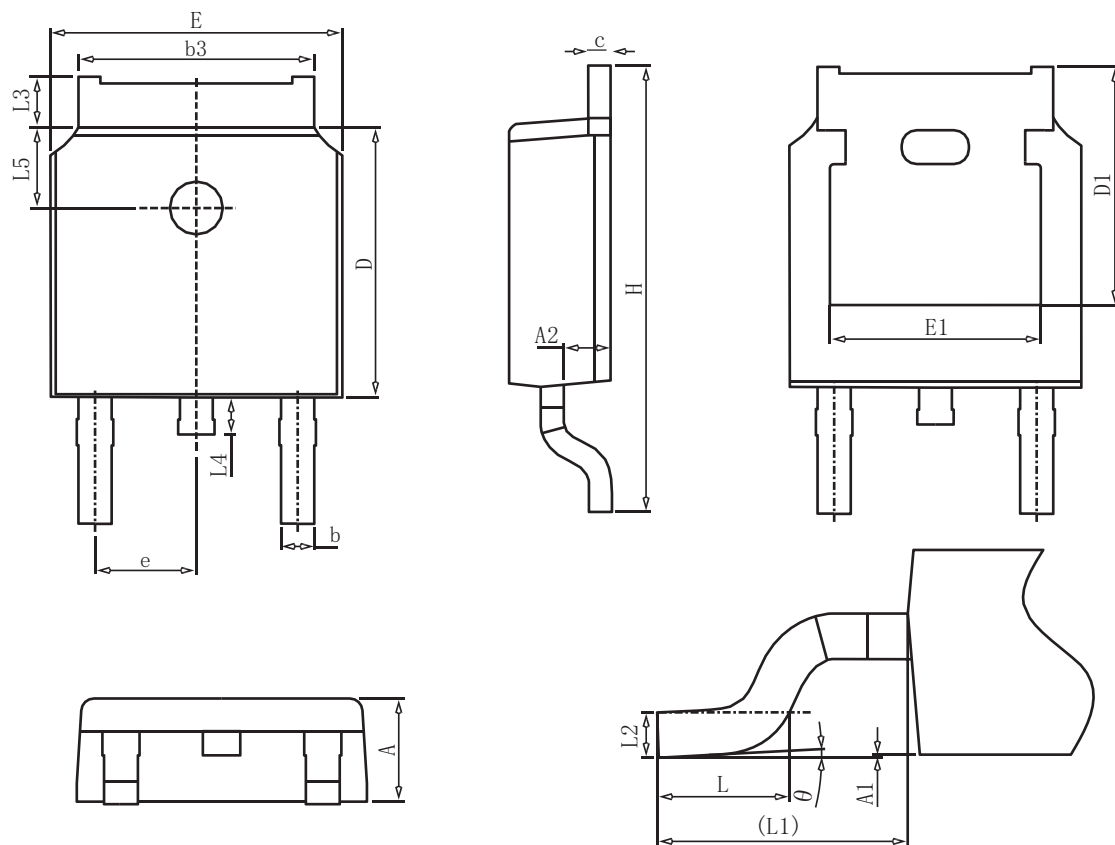


Figure 9. Normalized Maximum Transient Thermal Impedance



## TO-252 Package Information



### COMMON DIMENSIONS

| SYMBOL | mm       |       |       |
|--------|----------|-------|-------|
|        | MIN      | NOM   | MAX   |
| A      | 2.20     | 2.30  | 2.40  |
| A1     | 0.00     | -     | 0.20  |
| A2     | 0.97     | 1.07  | 1.17  |
| b      | 0.68     | 0.78  | 0.90  |
| b3     | 5.20     | 5.33  | 5.50  |
| c      | 0.43     | 0.53  | 0.63  |
| D      | 5.98     | 6.10  | 6.22  |
| D1     | 5.30REF  |       |       |
| E      | 6.40     | 6.60  | 6.80  |
| E1     | 4.63     | -     | -     |
| e      | 2.286BSC |       |       |
| H      | 9.40     | 10.10 | 10.50 |
| L      | 1.38     | 1.50  | 1.75  |
| L1     | 2.90REF  |       |       |
| L2     | 0.51BSC  |       |       |
| L3     | 0.88     | -     | 1.28  |
| L4     | 0.50     | -     | 1.00  |
| L5     | 1.65     | 1.80  | 1.95  |
| θ      | 0°       | -     | 8°    |

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