# Single P-channel MOSFET

## ELM5E401PA-S

## ■General description

ELM5E401PA-S uses advanced trench technology to provide excellent Rds(on), low gate charge and low gate resistance.

## ■Features

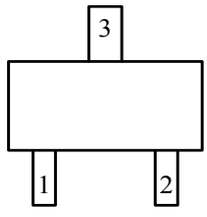
- Vds=-20V
- Id=-0.7A
- Rds(on) = 620mΩ (Vgs=-4.5V)
- Rds(on) = 860mΩ (Vgs=-2.5V)
- Rds(on) = 1450mΩ (Vgs=-1.8V)

## ■Maximum absolute ratings

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-source voltage | | Vdss | -20 | V |
| Gate-source voltage | | Vgs | ±12 | V |
| Continuous drain current | Ta=25°C | Id | -0.7 | A |
| | Ta=70°C | | -0.4 | |
| Pulsed drain current | | Idm | -1.0 | A |
| Power dissipation | Ta=25°C | Pd | 0.27 | W |
| | Ta=70°C | | 0.16 | |
| Junction and storage temperature range | | Tj, Tstg | - 55 to 150 | °C |

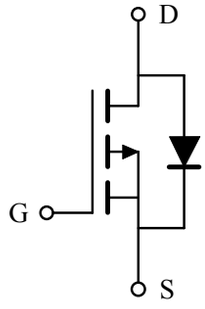
## ■Pin configuration

SOT-523(TOP VIEW)




| Pin No. | Pin name |
|---|---|
| 1 | GATE |
| 2 | SOURCE |
| 3 | DRAIN |

## ■Circuit

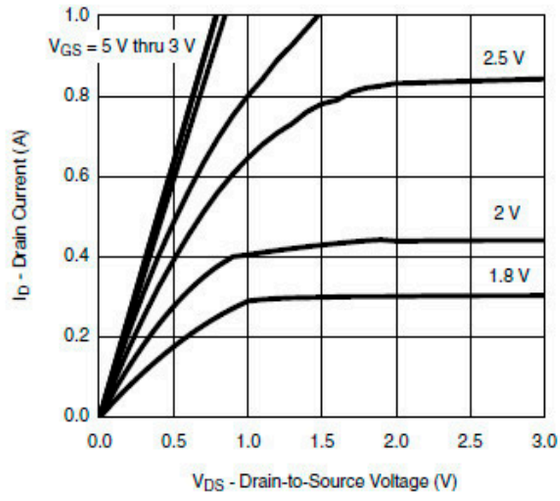


## ■Electrical characteristics

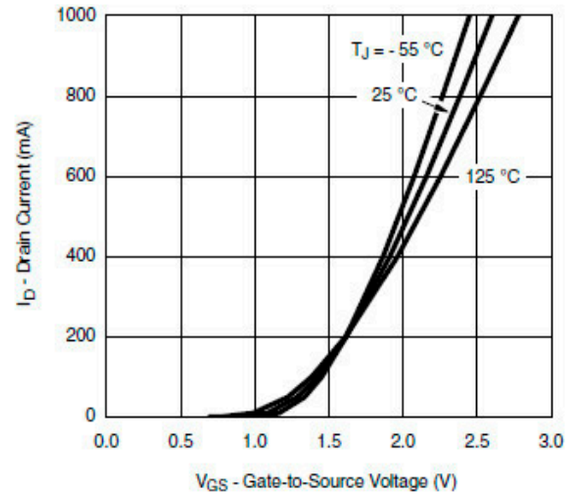
Ta=25°C

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| STATIC PARAMETERS | | | | | | |
| Drain-source breakdown voltage | BVdss | Vgs=0V, Id=-250μA | -20 | | | V |
| Zero gate voltage drain current | Idss | Vds=-20V, Vgs=0V | | | -1 | μA |
| | | Vds=-20V, Vgs=0V, Tj=85°C | | | -5 | |
| Gate-body leakage current | Igss | Vds=0V, Vgs=±12V | | | ±100 | nA |
| Gate threshold voltage | Vgs(th) | Vds=Vgs, Id=-250μA | -0.4 | | -1.0 | V |
| On state drain current | Id(on) | Vgs=-4.5V, Vds=-5V | -0.7 | | | A |
| Static drain-source on-resistance | Rds(on) | Vgs=-4.5V, Id=-0.6A | | 500 | 620 | mΩ |
| | | Vgs=-2.5V, Id=-0.5A | | 700 | 860 | |
| | | Vgs=-1.8V, Id=-0.4A | | 1000 | 1450 | |
| Forward transconductance | Gfs | Vds=-10V, Id=-0.4A | | 1 | | S |
| Diode forward voltage | Vsd | Is=-0.15A, Vgs=0V | | -0.65 | -1.20 | V |
| Max. body-diode continuous current | Is | | | | -0.3 | A |
| DYNAMIC PARAMETERS | | | | | | |
| Input capacitance | Ciss | Vgs=0V, Vds=-10V, f=1MHz | | 70 | 100 | pF |
| Output capacitance | Coss | | | 20 | | pF |
| Reverse transfer capacitance | Crss | | | 10 | | pF |
| SWITCHING PARAMETERS | | | | | | |
| Total gate charge | Qg | Vgs=-4.5V, Vds=-10V Id=-0.25A | | 1.0 | 1.3 | nC |
| Gate-source charge | Qgs | | | 0.1 | | nC |
| Gate-drain charge | Qgd | | | 0.3 | | nC |
| Turn-on delay time | td(on) | Vgs=-4.5V, Vds=-10V RL=30Ω, Id=-0.2A Rgen=10Ω | | 10 | 15 | ns |
| Turn-on rise time | tr | | | 10 | 15 | ns |
| Turn-off delay time | td(off) | | | 40 | 60 | ns |
| Turn-off fall time | tf | | | 30 | 50 | ns |

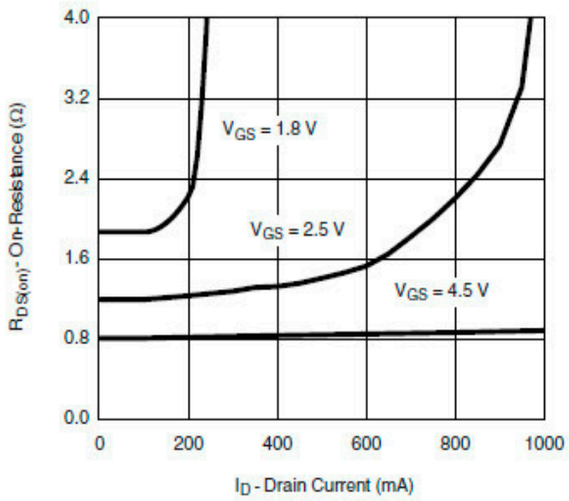
## ■Typical electrical and thermal characteristics



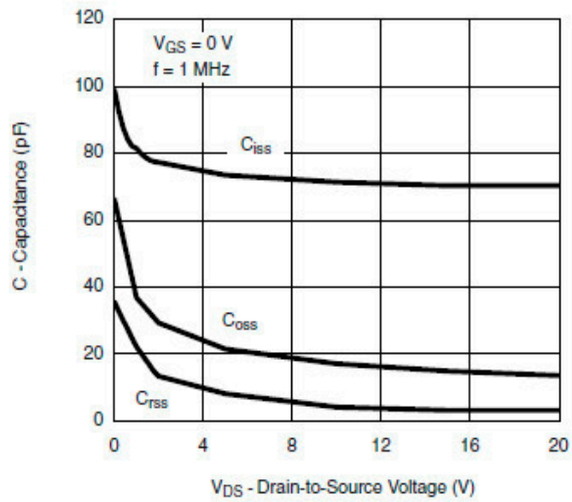

**Output Characteristics**



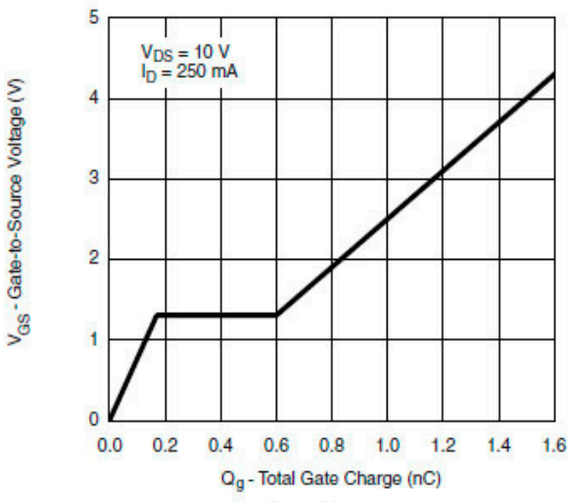

**Transfer Characteristics**



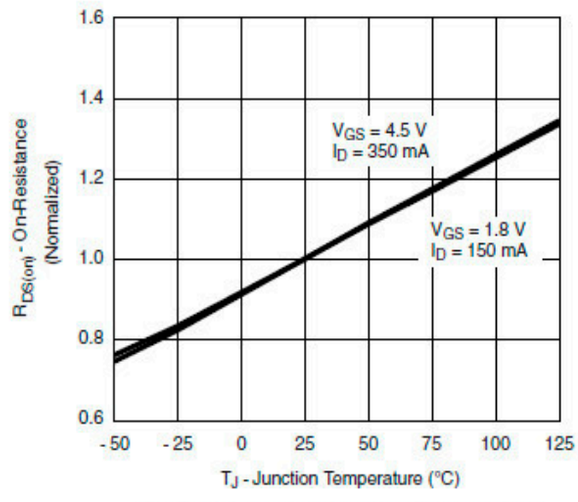

**On-Resistance vs. Drain Current**



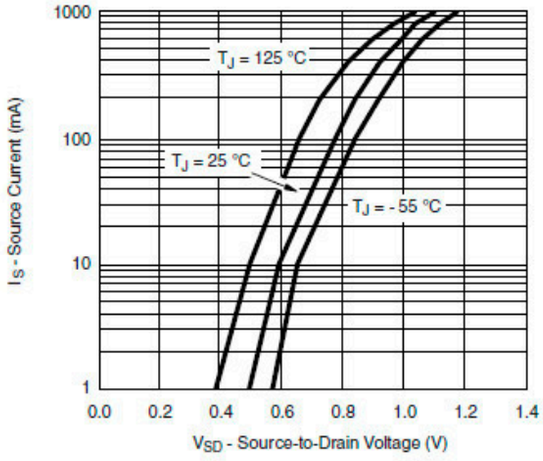

**Capacitance**



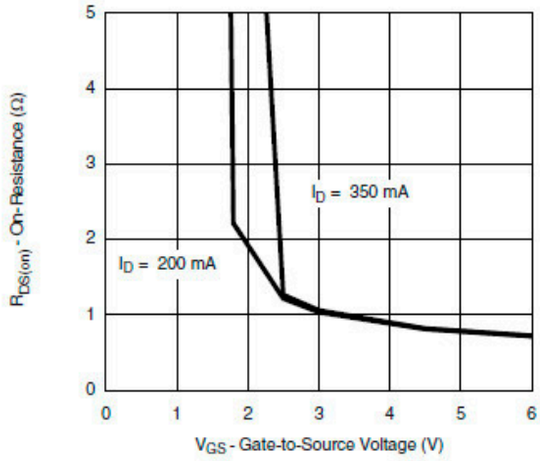

**Gate Charge**



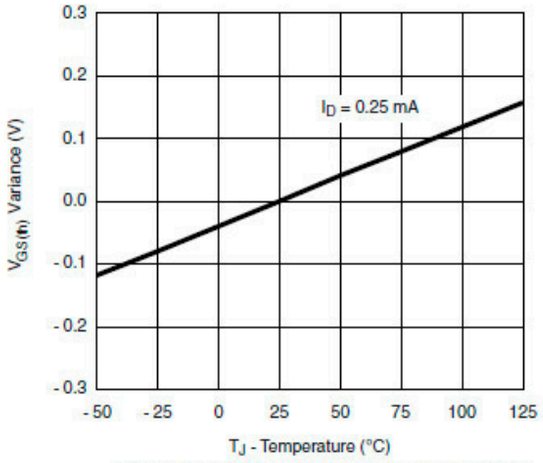

**On-Resistance vs. Junction Temperature**



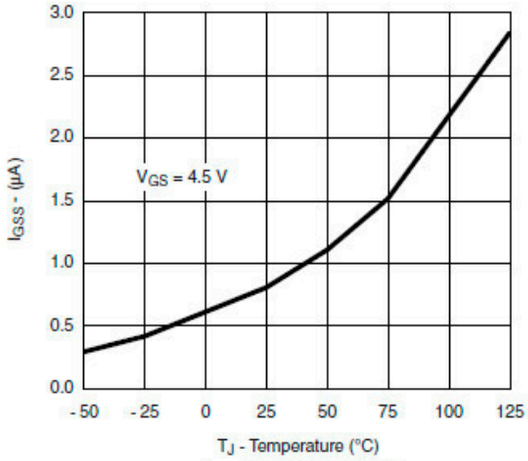

**Source-Drain Diode Forward Voltage**



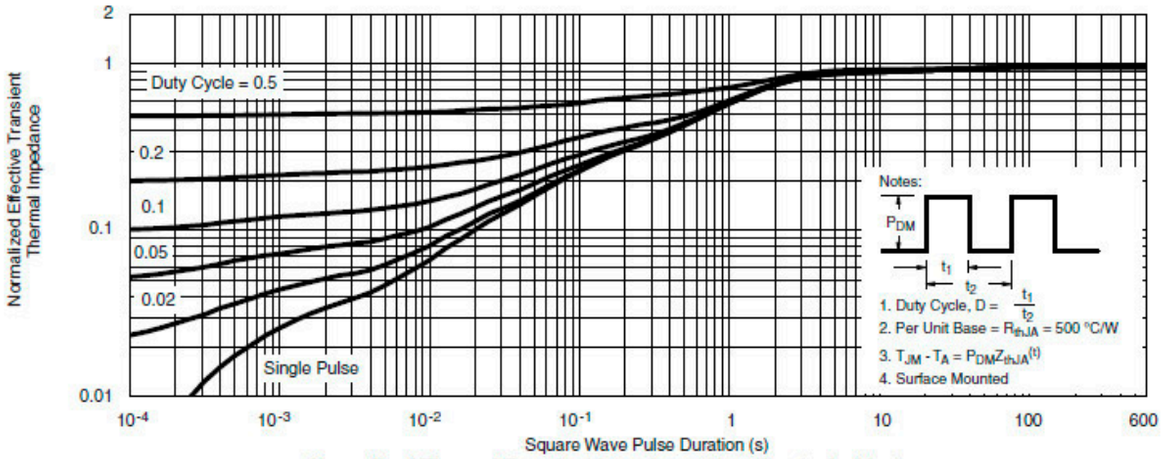

**On-Resistance vs. Gate-to-Source Voltage**




**Threshold Voltage Variance vs. Temperature**



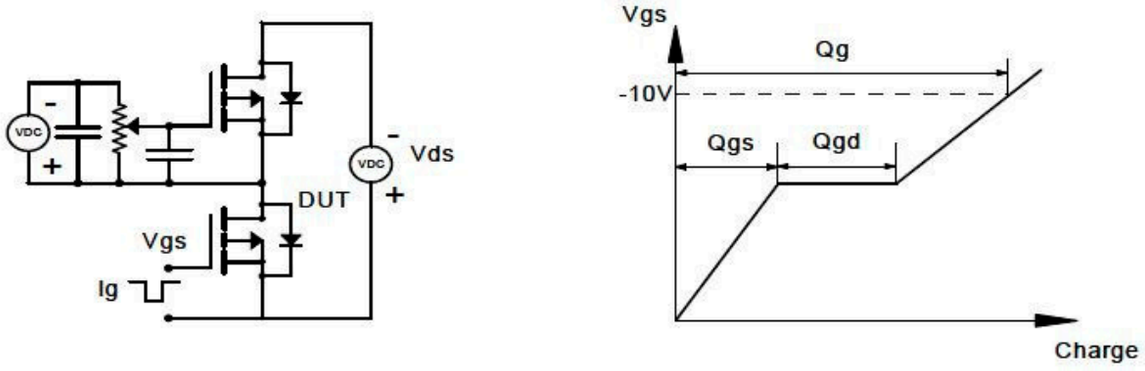

**$I_{GSS}$ vs. Temperature**



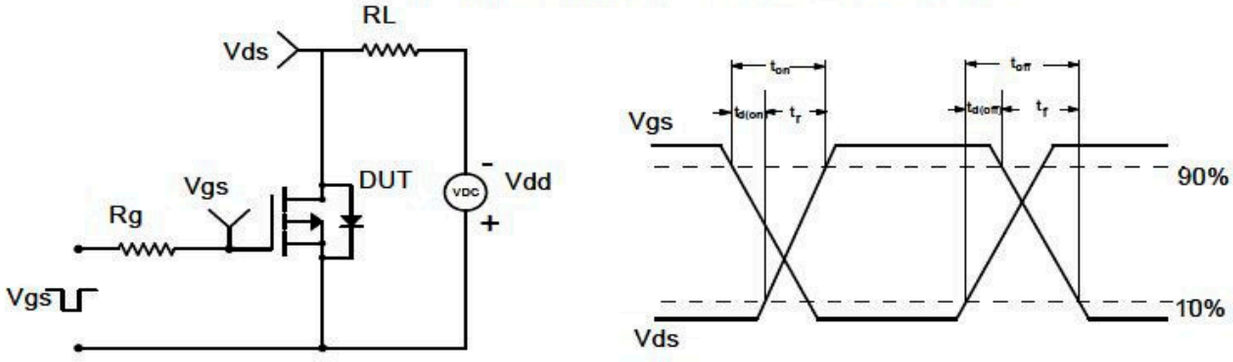

**Normalized Thermal Transient Impedance, Junction-to-Ambient**

## ■Test circuit and waveform

Gate Charge Test Circuit & Waveform




Resistive Switching Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms