

# 单 P 沟道 MOSFET

ELM53415EAA-S

<http://www.elm-tech.com>

## ■概要

ELM53415EAA-S 是 P 沟道低输入电容，低工作电压，低导通电阻的大电流 MOSFET。另外，此芯片还内藏 ESD 保护电路。

## ■特点

- $V_{ds} = -20V$
- $I_d = -4.5A$
- $R_{ds(on)} = 41m\Omega$  ( $V_{gs} = -4.5V$ )
- $R_{ds(on)} = 54m\Omega$  ( $V_{gs} = -2.5V$ )
- $R_{ds(on)} = 70m\Omega$  ( $V_{gs} = -1.8V$ )
- ESD 保护

## ■绝对最大额定值

如没有特别注明时,  $T_a = 25^\circ C$

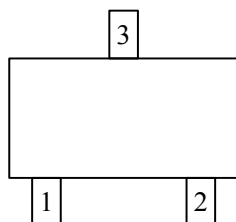
| 项目                                | 记号             | 规格范围               | 单位         |
|-----------------------------------|----------------|--------------------|------------|
| 漏极 - 源极电压                         | $V_{ds}$       | -20                | V          |
| 栅极 - 源极电压                         | $V_{gs}$       | $\pm 12$           | V          |
| 漏极电流 (定常) ( $T_j = 150^\circ C$ ) | $I_d$          | $T_a = 25^\circ C$ | -4.5       |
|                                   |                | $T_a = 70^\circ C$ | -3.9       |
| 漏极电流 (脉冲)                         | $I_{dm}$       | -10                | A          |
| 容许功耗                              | $P_d$          | $T_c = 25^\circ C$ | 1.25       |
|                                   |                | $T_c = 70^\circ C$ | 0.80       |
| 结合部温度及保存温度范围                      | $T_j, T_{stg}$ | -55 ~ 150          | $^\circ C$ |

## ■热特性

| 项目           | 记号              | 典型值 | 最大值 | 单位           |
|--------------|-----------------|-----|-----|--------------|
| 最大结合部 - 环境热阻 | $R_{\theta ja}$ |     | 120 | $^\circ C/W$ |

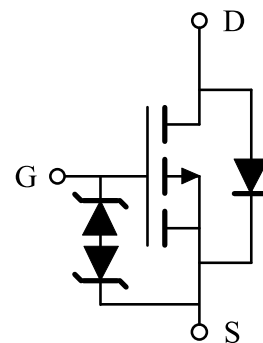
## ■引脚配置图

SOT-23(俯视图)



| 引脚编号 | 引脚名称   |
|------|--------|
| 1    | GATE   |
| 2    | SOURCE |
| 3    | DRAIN  |

## ■电路图



# 单 P 沟道 MOSFET

ELM53415EAA-S

<http://www.elm-tech.com>

## ■电特性

如没有特别注明时, Ta=25℃

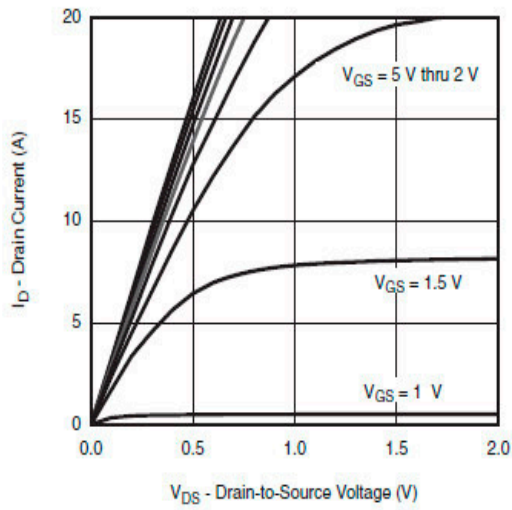
| 项目          | 记号      | 条件  | 最小值  | 典型值   | 最大值   | 单位 |
|-------------|---------|---|------|-------|-------|----|
| 静态特性        |         |   |      |       |       |    |
| 漏极 - 源极击穿电压 | BVdss   | Id=-250μA, Vgs=0V                                 | -20  |       |       | V  |
| 栅极接地时漏极电流   | Idss    | Vds=-16V, Vgs=0V                                  |      |       | -1    | μA |
|             |         | Vds=-16V, Vgs=0V, Ta=85℃                          |      |       | -10   |    |
| 栅极漏电流       | Igss    | Vds=0V, Vgs=±8V                                   |      |       | ±10   | μA |
| 栅极阈值电压      | Vgs(th) | Vds=Vgs, Id=-250μA                                | -0.4 | -0.6  | -0.9  | V  |
| 导通时漏极电流     | Id(on)  | Vgs=-4.5V, Vds≥-5V                                | -6   |       |       | A  |
|             |         | Vgs=-2.5V, Vds≥-5V                                | -4   |       |       |    |
| 漏极 - 源极导通电阻 | Rds(on) | Vgs=-4.5V, Id=-4.5A                               |      | 35    | 41    | mΩ |
|             |         | Vgs=-2.5V, Id=-3.4A                               |      | 45    | 54    |    |
|             |         | Vgs=-1.8V, Id=-2.2A                               |      | 60    | 70    |    |
| 正向跨导        | Gfs     | Vds=-5V, Id=-3.6A                                 |      | 10    |       | S  |
| 二极管正向压降     | Vsd     | Is=-1.25A, Vgs=0V                                 |      | -0.85 | -1.20 | V  |
| 寄生二极管最大连续电流 | Is      |   |      |       | -1.6  | A  |
| 动态特性        |         |   |      |       |       |    |
| 输入电容        | Ciss    | Vgs=0V, Vds=-10V, f=1MHz                          |      | 1050  |       | pF |
| 输出电容        | Coss    |   |      | 165   |       | pF |
| 反馈电容        | Crss    |   |      | 135   |       | pF |
| 开关特性        |         |   |      |       |       |    |
| 总栅极电荷       | Qg      | Vgs=-2.5V, Vds=-10V<br>Id=-4.0A                   |      | 10.0  | 18.0  | nC |
| 栅极 - 源极电荷   | Qgs     |   |      | 2.5   |       | nC |
| 栅极 - 漏极电荷   | Qgd     |   |      | 3.5   |       | nC |
| 导通延迟时间      | td(on)  | Vgs=-4.5V, Vds=-10V<br>Id=-3.7A, RL=2.7Ω, Rgen=1Ω |      | 15    | 25    | ns |
| 导通上升时间      | tr      |   |      | 25    | 40    | ns |
| 关闭延迟时间      | td(off) |   |      | 40    | 65    | ns |
| 关闭下降时间      | tf      |   |      | 15    | 25    | ns |

# 单 P 沟道 MOSFET

ELM53415EAA-S

<http://www.elm-tech.com>

## ■ 标准特性和热特性曲线



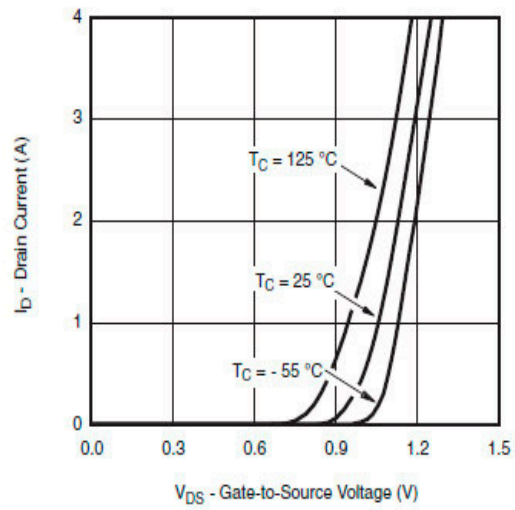
$V_{GS} = 5 \text{ V thru } 2 \text{ V}$

$V_{GS} = 1.5 \text{ V}$

$V_{GS} = 1 \text{ V}$

$V_{DS}$  - Drain-to-Source Voltage (V)

Output Characteristics



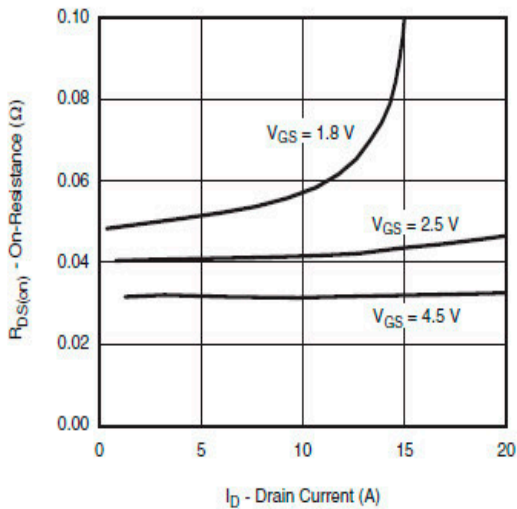
$T_C = 125 \text{ }^\circ\text{C}$

$T_C = 25 \text{ }^\circ\text{C}$

$T_C = -55 \text{ }^\circ\text{C}$

$V_{GS}$  - Gate-to-Source Voltage (V)

Transfer Characteristics



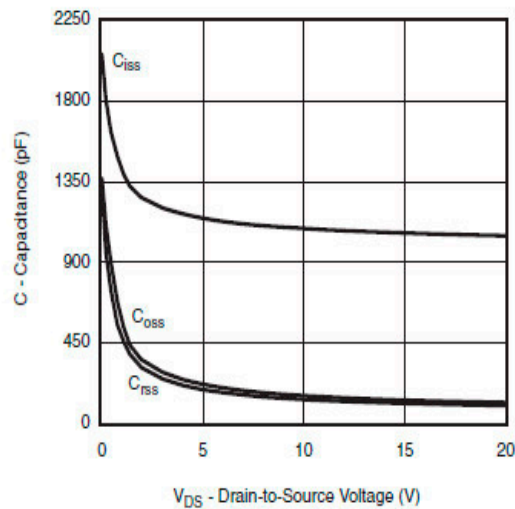
$V_{GS} = 1.8 \text{ V}$

$V_{GS} = 2.5 \text{ V}$

$V_{GS} = 4.5 \text{ V}$

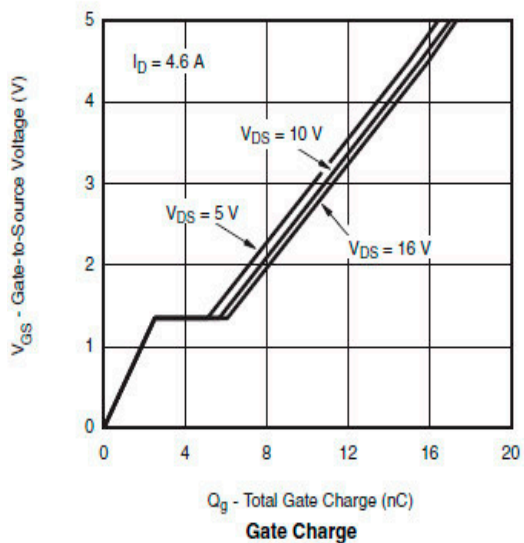
$I_D$  - Drain Current (A)

On-Resistance vs. Drain Current and Gate Voltage



$V_{DS}$  - Drain-to-Source Voltage (V)

Capacitance



$I_D = 4.6 \text{ A}$

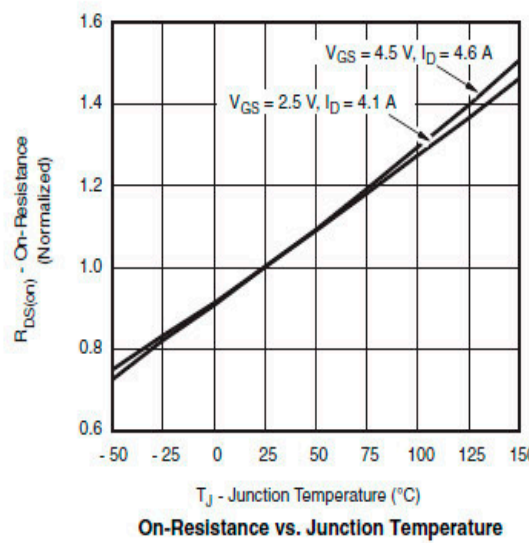
$V_{DS} = 10 \text{ V}$

$V_{DS} = 5 \text{ V}$

$V_{DS} = 16 \text{ V}$

$Q_g$  - Total Gate Charge (nC)

Gate Charge



$V_{GS} = 4.5 \text{ V}, I_D = 4.6 \text{ A}$

$V_{GS} = 2.5 \text{ V}, I_D = 4.1 \text{ A}$

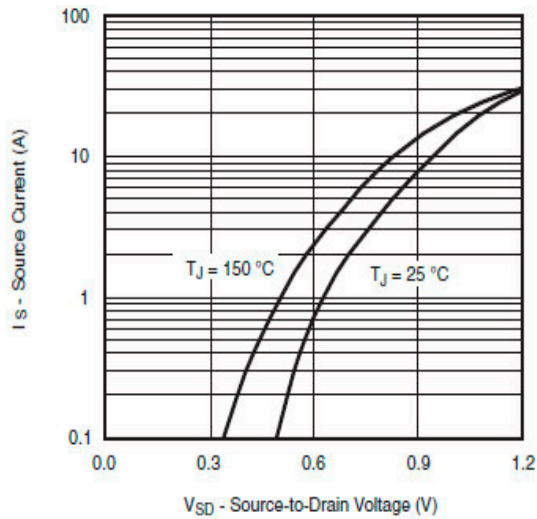
$T_J$  - Junction Temperature ( $^\circ\text{C}$ )

On-Resistance vs. Junction Temperature

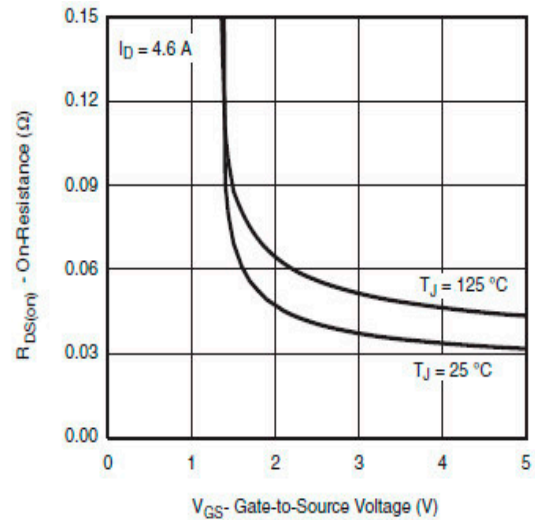
# 单 P 沟道 MOSFET

ELM53415EAA-S

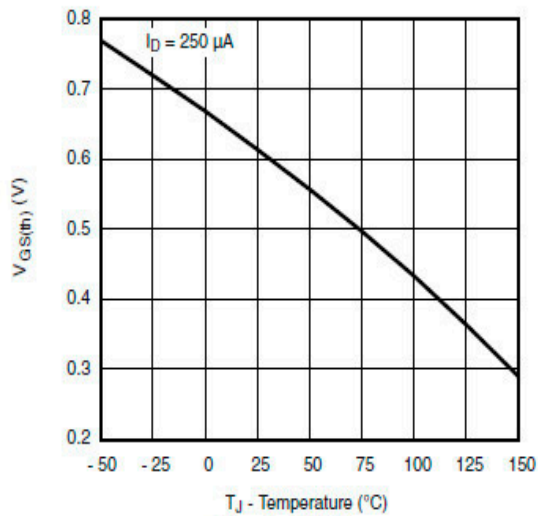
<http://www.elm-tech.com>



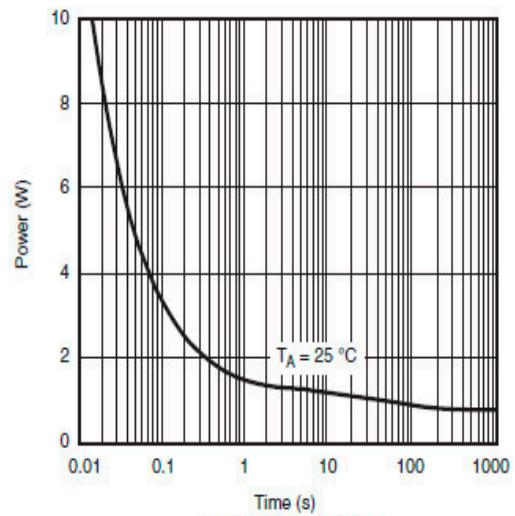
Source-Drain Diode Forward Voltage



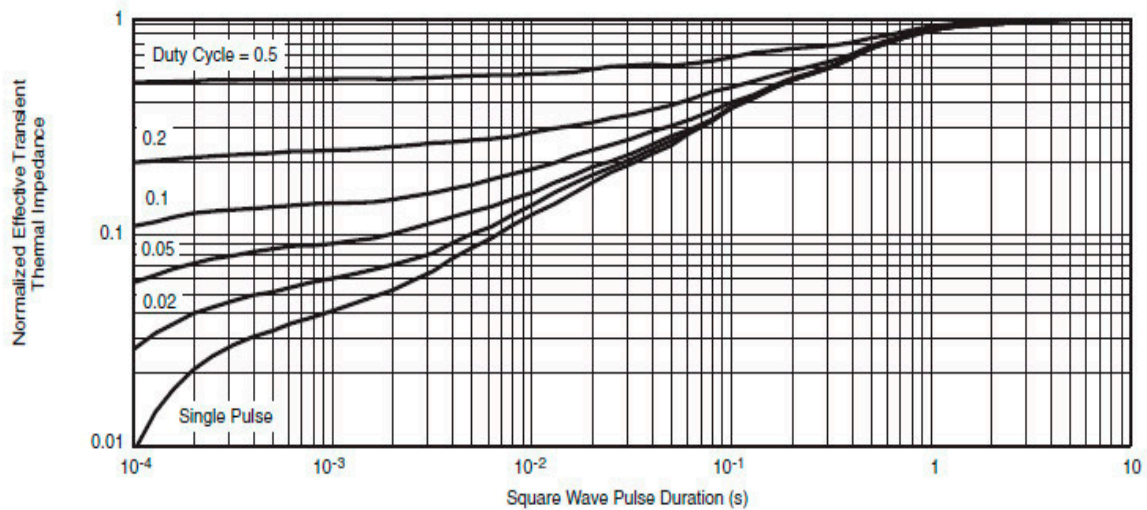
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power



Normalized Thermal Transient Impedance, Junction-to-Foot

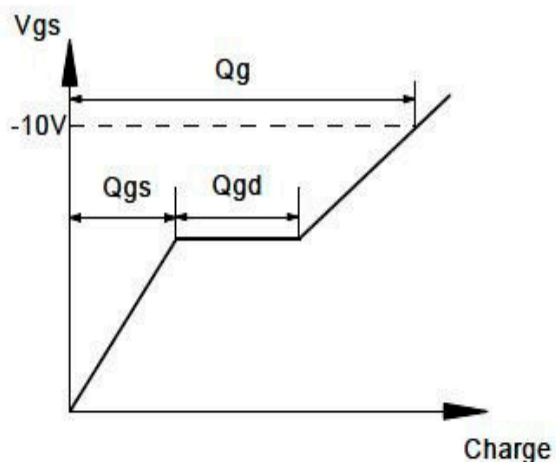
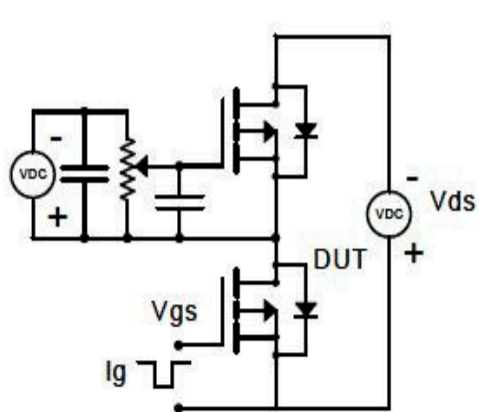
# 单 P 沟道 MOSFET

ELM53415EAA-S

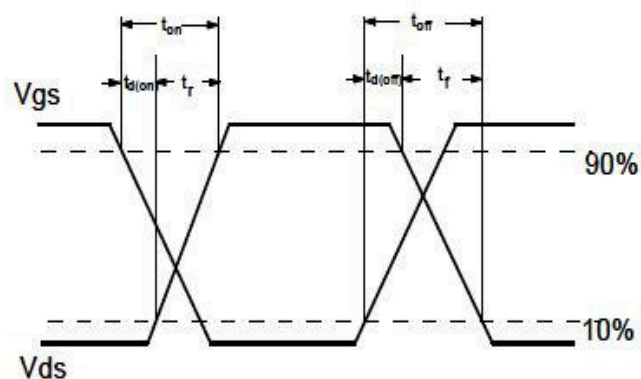
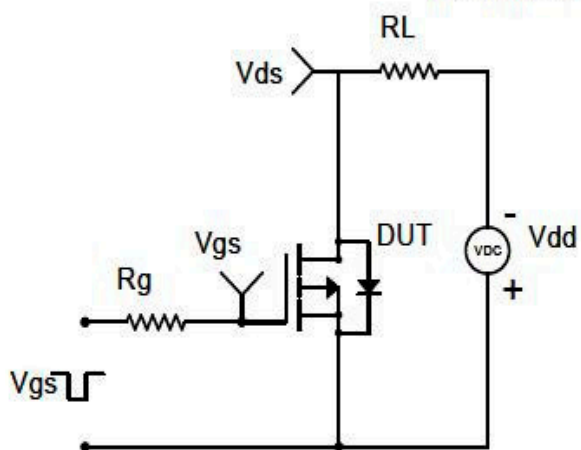
<http://www.elm-tech.com>

## ■ 试验电路图和测试波形图

### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

