

## Single P-Channel MOSFET

### DESCRIPTION

SMC5225 is the P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior, fast switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

### PART NUMBER INFORMATION

#### SMC 5225 H - TR G

a b c d e

a : Company name.  
 b : Product Serial number.  
 c : Package code H:TO-252  
 d : Handling code TR:Tape&Reel  
 e : Green produce code G:RoHS Compliant

### FEATURES

$V_{DS} = -30V$ ,  $I_D = -22A$

$R_{DS(ON)} = 38m\Omega (Typ.) @ V_{GS} = -10V$

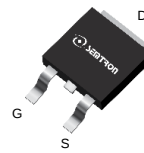
$R_{DS(ON)} = 50m\Omega (Typ.) @ V_{GS} = -4.5V$

◆ High power and current handling capability

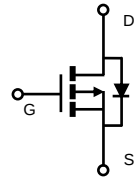
### APPLICATIONS

◆ LED Application

◆ Power Management



TO-252



### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ Unless otherwise noted)

| Symbol    | Parameter                                               | Rating              | Units      |
|-----------|---------------------------------------------------------|---------------------|------------|
| $V_{DS}$  | Drain-Source Voltage                                    | -30                 | V          |
| $V_{GS}$  | Gate-Source Voltage                                     | $\pm 20$            | V          |
| $I_D$     | Continuous Drain Current                                | $T_C = 25^\circ C$  | -22        |
|           |                                                         | $T_C = 100^\circ C$ | -14        |
| $I_{DM}$  | Pulsed Drain Current <sup>A</sup>                       | -80                 | A          |
| $I_D$     | Continuous Drain Current                                | $T_A = 25^\circ C$  | -9.2       |
|           |                                                         | $T_A = 70^\circ C$  | -7.3       |
| $P_D$     | Power Dissipation <sup>B</sup>                          | $T_A = 25^\circ C$  | 2.5        |
|           |                                                         | $T_A = 70^\circ C$  | 1.6        |
| $I_{AS}$  | Avalanche Current <sup>A</sup>                          | -15                 | A          |
| $E_{AS}$  | Single Pulse Avalanche energy $L = 0.3mH$ <sup>AF</sup> | 33.5                | mJ         |
| $P_D$     | Power Dissipation <sup>C</sup>                          | $T_C = 25^\circ C$  | 35         |
|           |                                                         | $T_C = 100^\circ C$ | 14         |
| $T_J$     | Operation Junction Temperature                          | -55/150             | $^\circ C$ |
| $T_{STG}$ | Storage Temperature Range                               | -55/150             | $^\circ C$ |

### THERMAL RESISTANCE

| Symbol          | Parameter                                            | Typ          | Max | Units        |
|-----------------|------------------------------------------------------|--------------|-----|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient <sup>B</sup>  | $t \leq 10s$ | 20  | $^\circ C/W$ |
|                 | Thermal Resistance Junction to Ambient <sup>BD</sup> | Steady-State | 50  |              |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case                  |              | 3.5 |              |

## ■ ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ Unless otherwise noted )

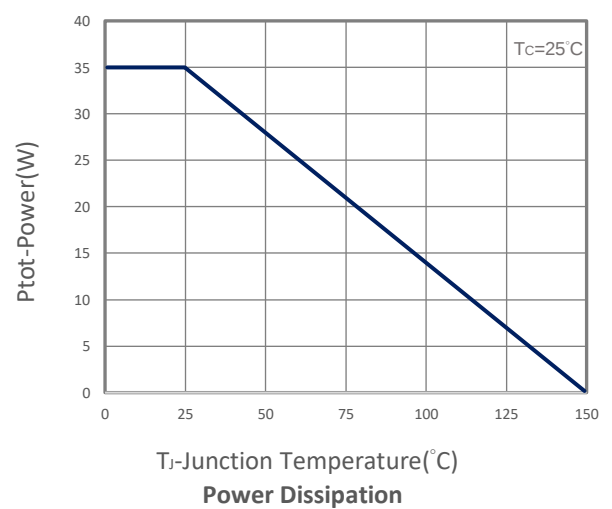
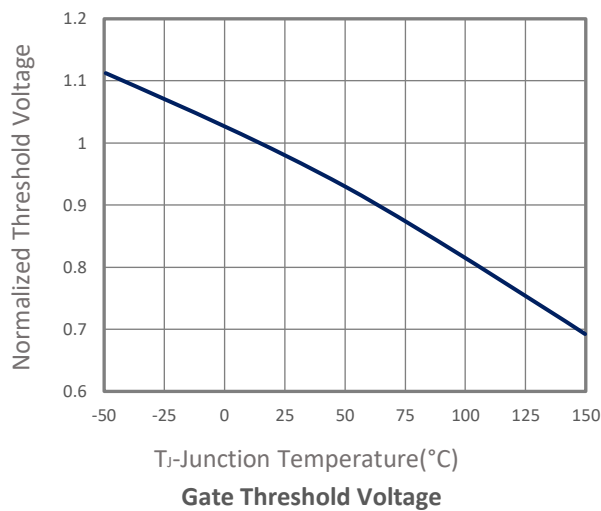
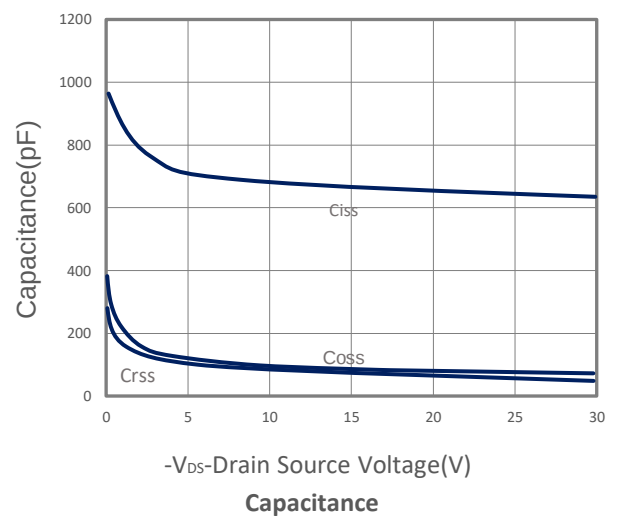
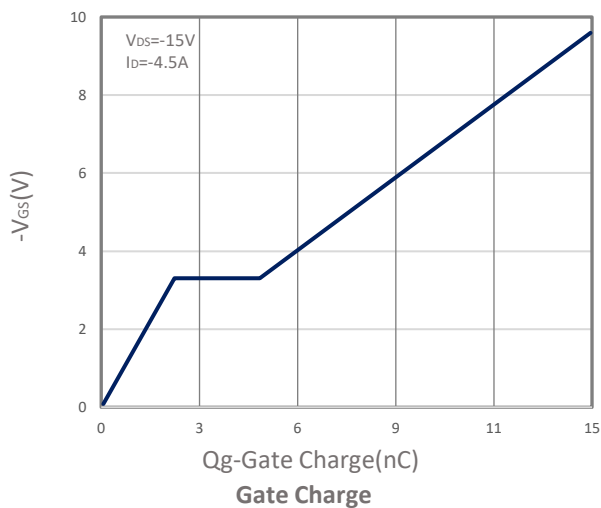
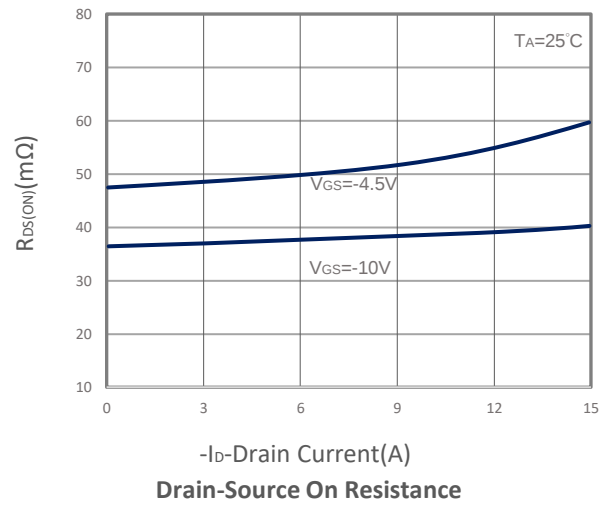
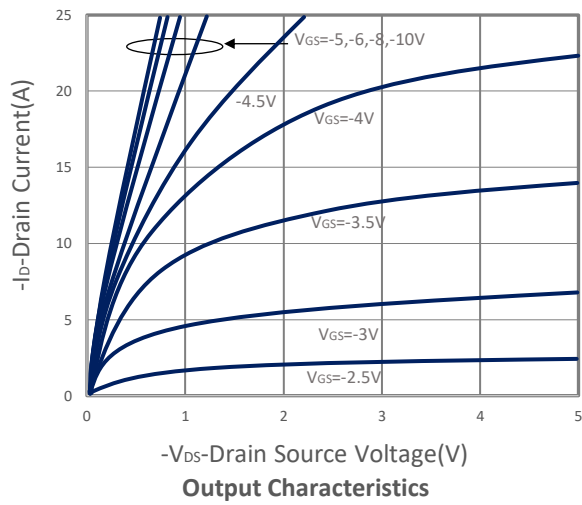
| Symbol                           | Parameter                               | Condition                                                                                   | Min | Typ      | Max      | Unit |
|----------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------|-----|----------|----------|------|
| Static Parameters                |                                         |                                                                                             |     |          |          |      |
| BV <sub>DSS</sub>                | Drain-Source Breakdown Voltage          | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                                                 | -30 |          |          | V    |
| V <sub>GS(th)</sub>              | Gate Threshold Voltage                  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                   | -1  | -1.5     | -2.5     | V    |
| I <sub>GSS</sub>                 | Gate Leakage Current                    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                                  |     |          | ±100     | nA   |
| I <sub>DSS</sub>                 | Zero Gate Voltage Drain Current         | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                            |     |          | -1       | μA   |
|                                  |                                         | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =75°C                            |     |          | -10      |      |
| R <sub>DS(ON)</sub>              | Drain-source On-Resistance <sup>E</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-9.2A<br>V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-7A |     | 38<br>50 | 45<br>60 | mΩ   |
| G <sub>fs</sub>                  | Forward Transconductance                | V <sub>DS</sub> =-10V, I <sub>D</sub> =-6.6A                                                |     | 22       |          | S    |
| Diode Characteristics            |                                         |                                                                                             |     |          |          |      |
| V <sub>SD</sub>                  | Diode Forward Voltage <sup>E</sup>      | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                    |     | -0.7     | -1       | V    |
| I <sub>S</sub>                   | Continuous Source Current               |                                                                                             |     |          | -4.6     | A    |
| Dynamic and Switching Parameters |                                         |                                                                                             |     |          |          |      |
| Q <sub>g</sub>                   | Total Gate Charge (10V)                 | V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V,<br>I <sub>D</sub> =-4.5A                      |     | 15.8     | 22.1     | nC   |
| Q <sub>g</sub>                   | Total Gate Charge (4.5V)                |                                                                                             |     | 7.7      | 10.8     |      |
| Q <sub>gs</sub>                  | Gate-Source Charge                      |                                                                                             |     | 2.3      | 3.2      |      |
| Q <sub>gd</sub>                  | Gate-Drain Charge                       |                                                                                             |     | 2.6      | 3.6      |      |
| C <sub>iss</sub>                 | Input Capacitance                       | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz                                          |     | 645      |          | pF   |
| C <sub>oss</sub>                 | Output Capacitance                      |                                                                                             |     | 63       |          |      |
| C <sub>rss</sub>                 | Reverse Transfer Capacitance            |                                                                                             |     | 52       |          |      |
| t <sub>d(on)</sub>               | Turn-On Time                            | V <sub>DD</sub> =-15V, V <sub>GEN</sub> =-10V,<br>R <sub>G</sub> =3.3Ω, I <sub>D</sub> =-1A |     | 6        | 11       | nS   |
| t <sub>r</sub>                   |                                         |                                                                                             |     | 12       | 23       |      |
| t <sub>d(off)</sub>              | Turn-Off Time                           |                                                                                             |     | 25.5     | 48       |      |
| t <sub>f</sub>                   |                                         |                                                                                             |     | 7        | 13       |      |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

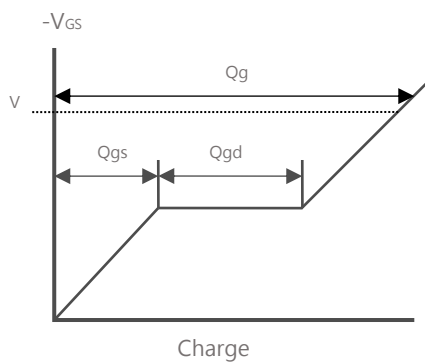
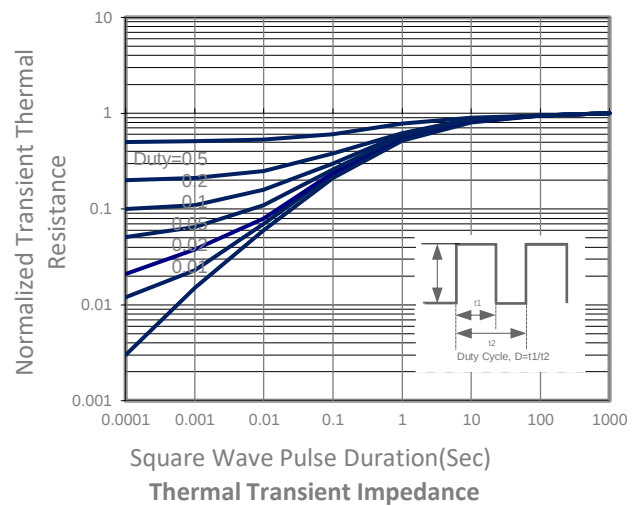
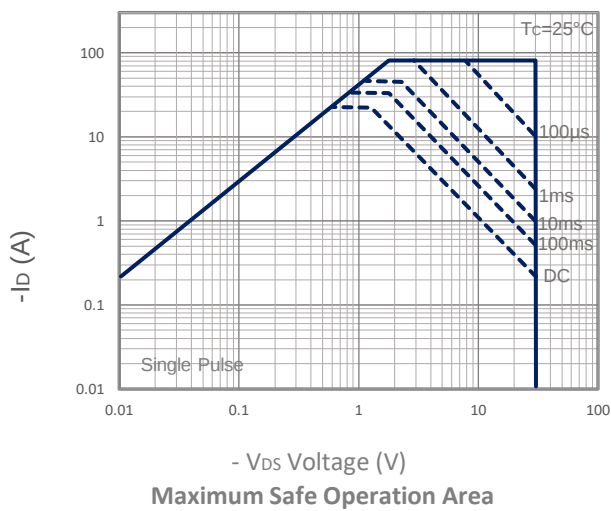
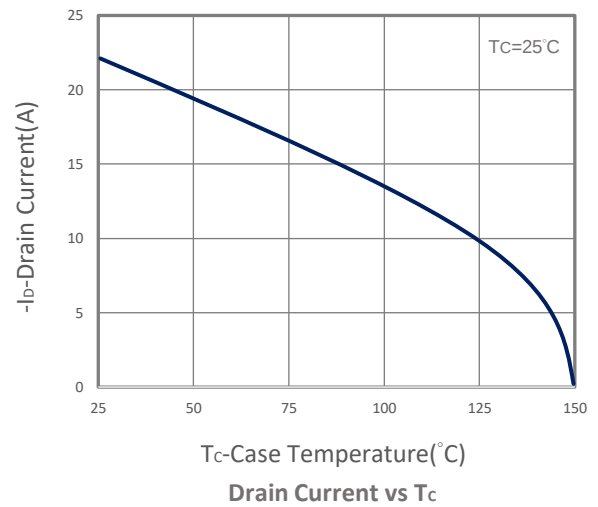
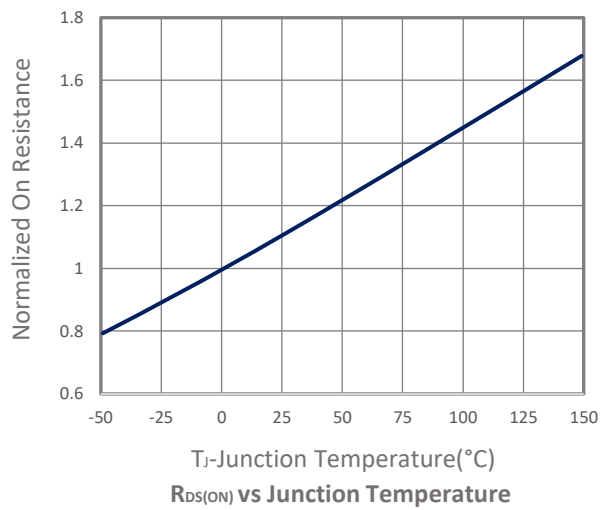
- A. Pulsed width limited by maximum junction temperature,  $T_{J(MAX)}=150^\circ\text{C}$ .
- B. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in2 FR-4 board in a still air environment with maximum junction temperature  $T_{J(MAX)}=150^\circ\text{C}$  (initial temperature  $T_A=25^\circ\text{C}$ ).
- C.  $T_{J(MAX)}=150^\circ\text{C}$ , using junction-to-ambient thermal resistance,  $t \leq 10\text{sec}$ .
- D.  $T_{J(MAX)}=150^\circ\text{C}$ , using junction-to-case thermal resistance ( $R_{\theta JC}$ ) is more useful in additional heat sinking is used.
- E. The data tested by pulsed, pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- F. The EAS data shows Max, tested and pulse width limited by  $T_{J(MAX)}=150^\circ\text{C}$  (initial temperature  $T_J=25^\circ\text{C}$ ).

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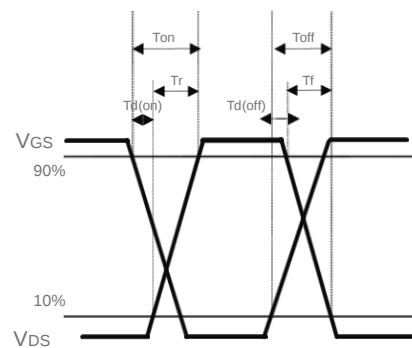
## TYPICAL CHARACTERISTICS



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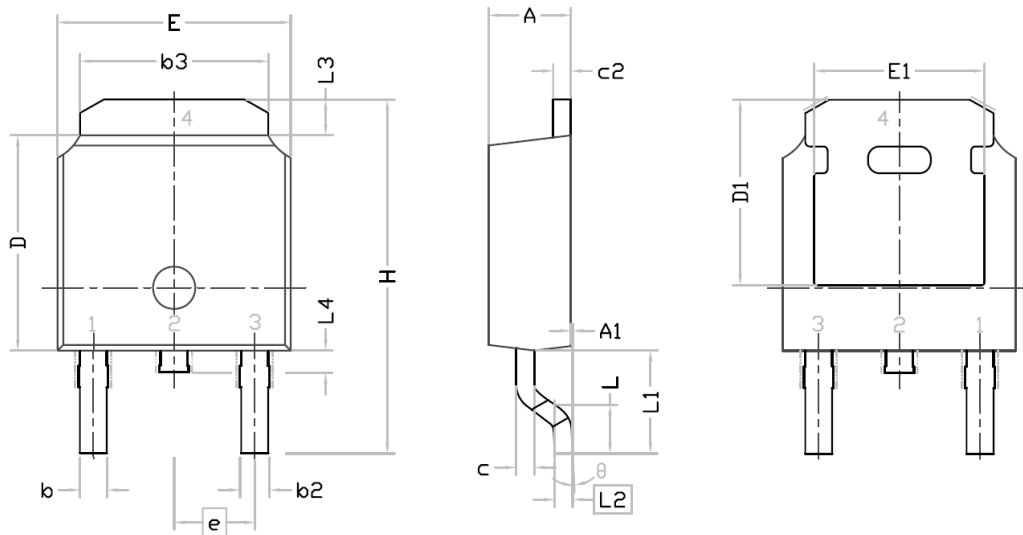


**Gate Chrg Waveform**



**Switching Time Waveform**

## TO-252 PACKAGE DIMENSIONS



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 2.200                     | 2.380 | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127 | 0.000                | 0.005 |
| b      | 0.640                     | 0.880 | 0.025                | 0.035 |
| b2     | 0.770                     | 1.140 | 0.030                | 0.045 |
| b3     | 5.210                     | 5.460 | 0.205                | 0.215 |
| c      | 0.460                     | 0.600 | 0.018                | 0.024 |
| c2     | 0.460                     | 0.580 | 0.018                | 0.023 |
| D      | 6.000                     | 6.223 | 0.236                | 0.245 |
| D1     | 5.210                     | -     | 0.205                | -     |
| E      | 6.400                     | 6.731 | 0.252                | 0.265 |
| E1     | 4.400                     | -     | 0.173                | -     |
| e      | 2.286 BSC.                |       | 0.090 BSC.           |       |
| H      | 9.400                     | 10.40 | 0.370                | 0.409 |
| L      | 1.400                     | 1.770 | 0.055                | 0.070 |
| L1     | 2.743 REF.                |       | 0.108 REF.           |       |
| L2     | 0.508 BSC.                |       | 0.020 BSC.           |       |
| L3     | 0.890                     | 1.270 | 0.035                | 0.050 |
| L4     | 0.640                     | 1.010 | 0.025                | 0.040 |
| θ      | 0°                        | 10°   | 0°                   | 10°   |

Recommended Land Pattern

