

## General Description

The HSS3401 is the high cell density trenched P-ch MOSFETs, which provides excellent RDSON and efficiency for most of the small power switching and load switch applications.

The HSS3401 meet the RoHS and Green Product requirement with full function reliability approved.

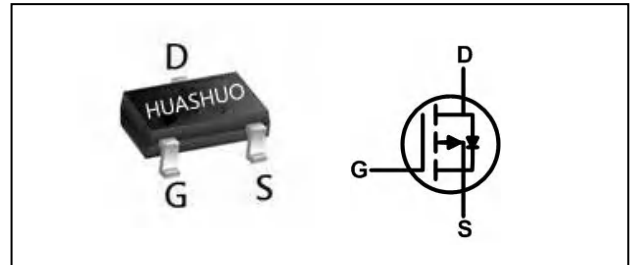
## Product Summary

|                  |      |            |
|------------------|------|------------|
| $V_{DS}$         | -30  | V          |
| $R_{DS(ON),typ}$ | 46   | m $\Omega$ |
| $I_D$            | -4.2 | A          |

## Features

- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench Technology

## SOT-23L Pin Configurations



## Absolute Maximum Ratings

| Symbol                | Parameter                            | Rating     | Units       |
|-----------------------|--------------------------------------|------------|-------------|
| $V_{DS}$              | Drain-Source Voltage                 | -30        | V           |
| $V_{GS}$              | Gate-Source Voltage                  | $\pm 12$   | V           |
| $I_D@T_A=25^{\circ}C$ | Continuous Drain Current             | -4.2       | A           |
| $I_D@T_A=70^{\circ}C$ | Continuous Drain Current             | -3.7       | A           |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>    | -16        | A           |
| $P_D@T_A=25^{\circ}C$ | Total Power Dissipation <sup>3</sup> | 1.4        | W           |
| $P_D@T_A=70^{\circ}C$ | Total Power Dissipation <sup>3</sup> | 0.95       | W           |
| $T_{STG}$             | Storage Temperature Range            | -55 to 150 | $^{\circ}C$ |
| $T_J$                 | Operating Junction Temperature Range | -55 to 150 | $^{\circ}C$ |

## Thermal Data

| Symbol          | Parameter                                                  | Typ. | Max. | Unit          |
|-----------------|------------------------------------------------------------|------|------|---------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup>           | ---  | 100  | $^{\circ}C/W$ |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup> (t ≤ 10s) | ---  | 70   | $^{\circ}C/W$ |



### Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)

| Symbol                              | Parameter                                      | Conditions                                                                               | Min. | Typ.   | Max. | Unit  |
|-------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------|------|--------|------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                                              | -30  | ---    | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25°C, I <sub>D</sub> =-1mA                                                  | ---  | -0.014 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.2A                                            | ---  | 46     | 60   | mΩ    |
|                                     |                                                | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3A                                              | ---  | 62     | 80   |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                                | -0.5 | -0.9   | -1.3 | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |                                                                                          | ---  | 2.6    | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                         | ---  | ---    | -1   | uA    |
|                                     |                                                | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                         | ---  | ---    | -5   |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                                               | ---  | ---    | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A                                                | ---  | 11     | ---  | S     |
| Q <sub>g</sub>                      | Total Gate Charge (-4.5V)                      | V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A                       | ---  | 8.5    | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |                                                                                          | ---  | 1.8    | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |                                                                                          | ---  | 3      | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>DD</sub> =-15V, V <sub>GS</sub> =-4.5V, R <sub>G</sub> =3.3Ω, I <sub>D</sub> =-3A | ---  | 6.6    | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      |                                                                                          | ---  | 3      | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |                                                                                          | ---  | 30     | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |                                                                                          | ---  | 12     | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz                                       | ---  | 880    | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |                                                                                          | ---  | 105    | ---  |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |                                                                                          | ---  | 71     | ---  |       |

### Diode Characteristics

| Symbol          | Parameter                                | Conditions                                                     | Min. | Typ. | Max. | Unit |
|-----------------|------------------------------------------|----------------------------------------------------------------|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current <sup>1,4</sup> | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current              | ---  | ---  | -4.2 | A    |
| V <sub>SD</sub> | Diode Forward Voltage <sup>2</sup>       | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C | ---  | ---  | -1.2 | V    |

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup>FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.



### Typical Characteristics

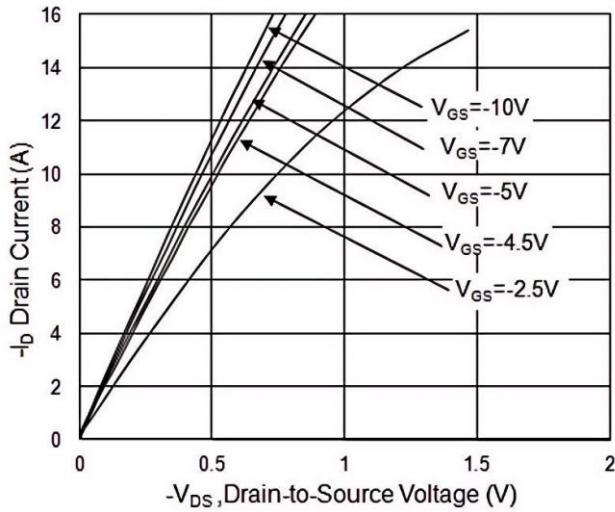


Fig.1 Typical Output Characteristics

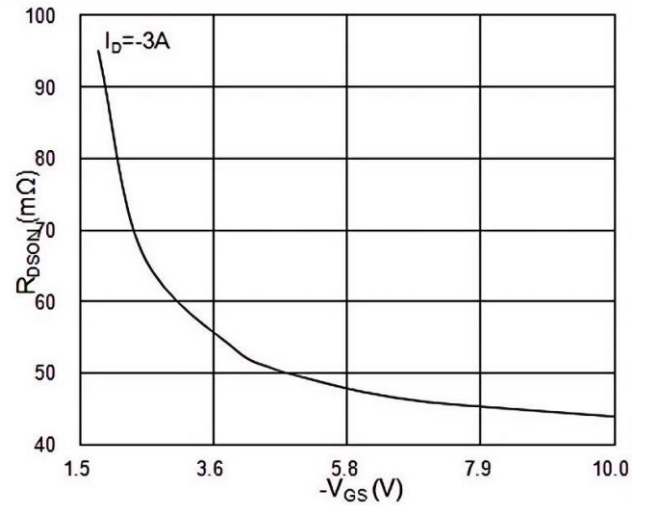


Fig.2 On-Resistance vs. G-S Voltage

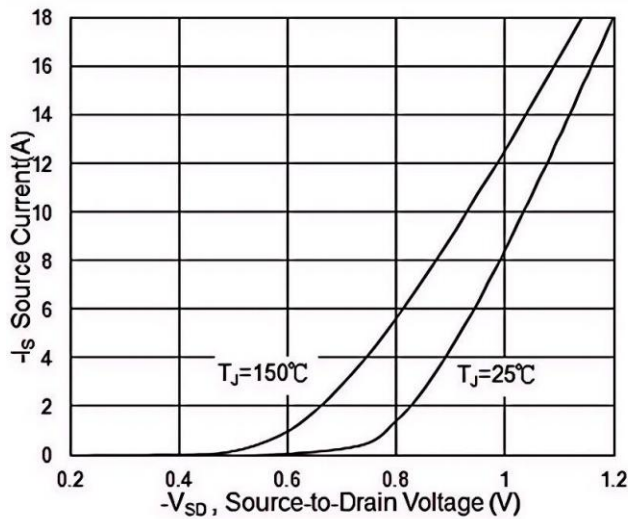


Fig.3 Forward Characteristics Of Reverse

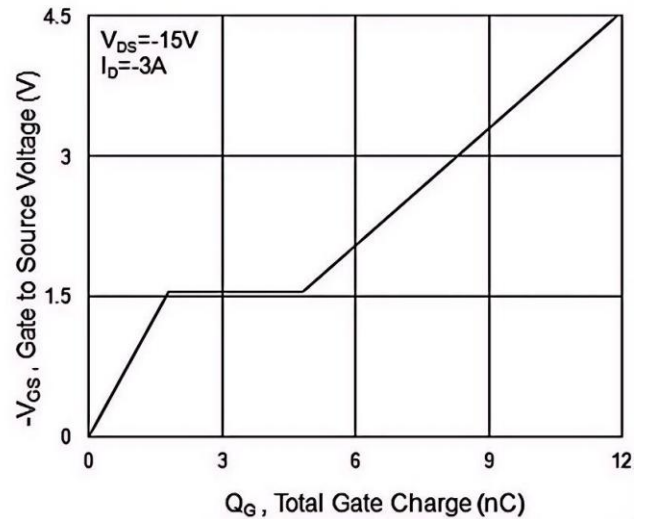


Fig.4 Gate-Charge Characteristics

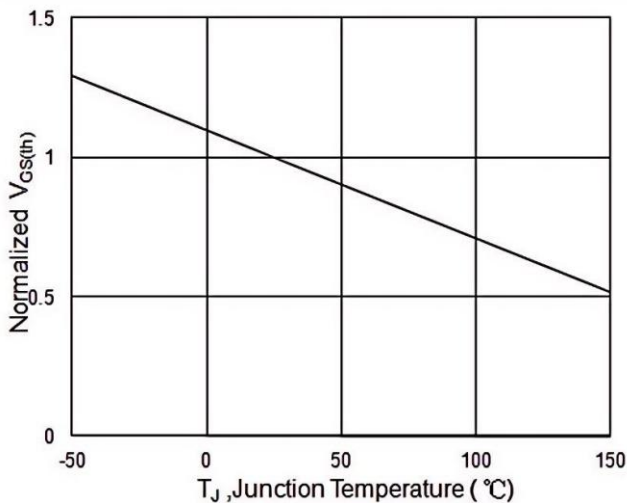


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

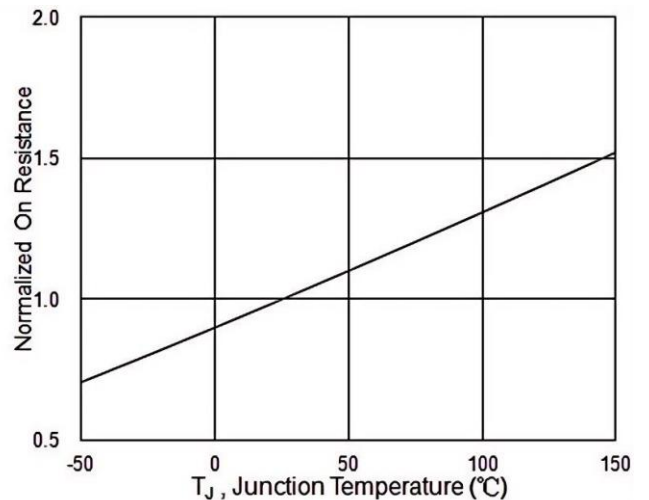
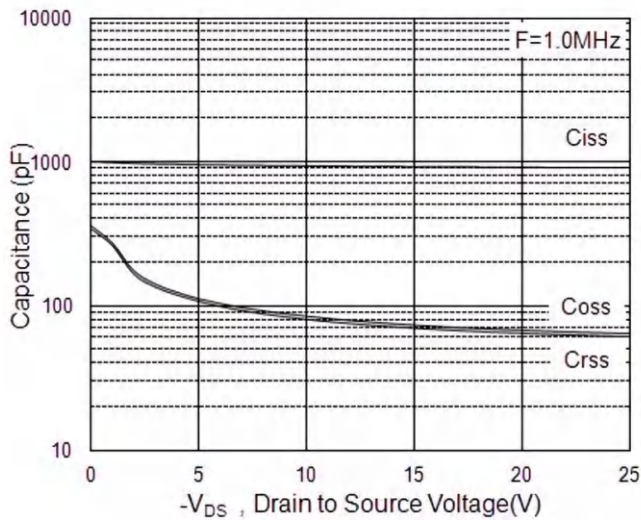
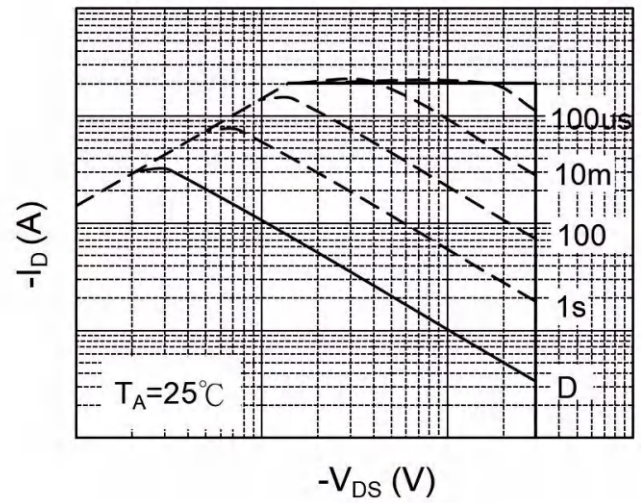


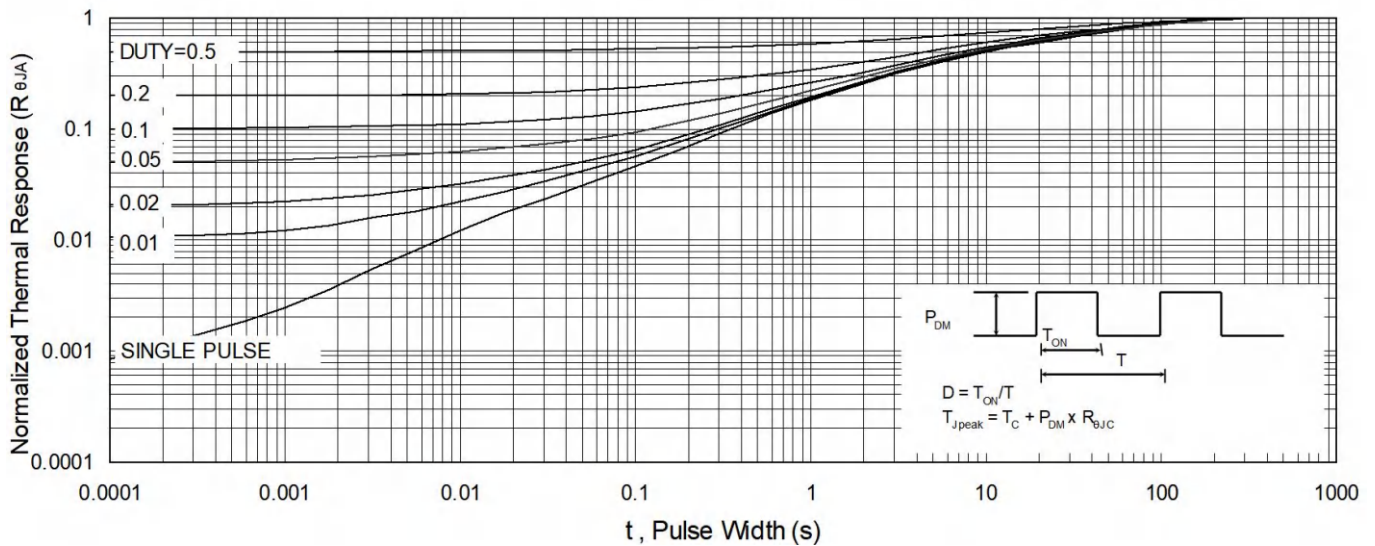
Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$



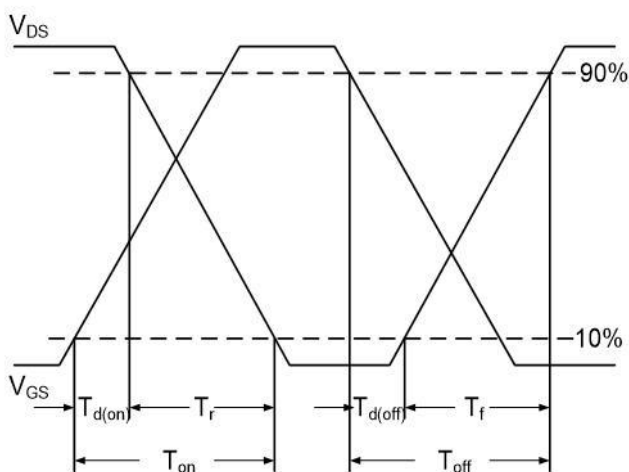
**Fig.7 Capacitance**



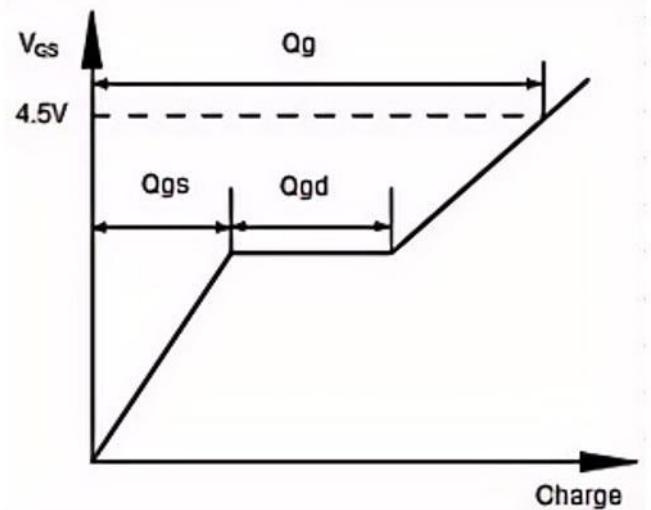
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



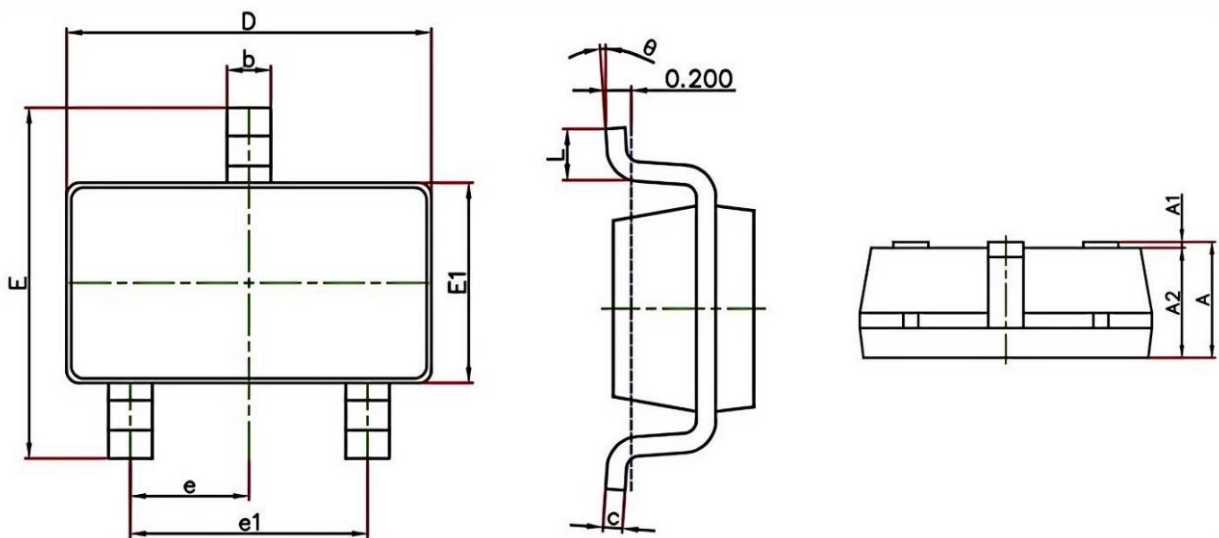
**Fig.11 Gate Charge Waveform**



## Ordering Information

| Part Number | Package code | Packaging      |
|-------------|--------------|----------------|
| HSS3401     | SOT-23L      | 3000/Tape&Reel |

### SOT-23L Package Outline



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 1.050                     | 1.250 | 0.041                | 0.049 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.050                     | 1.150 | 0.041                | 0.045 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| C      | 0.100                     | 0.200 | 0.004                | 0.008 |
| D      | 2.820                     | 3.020 | 0.111                | 0.119 |
| E1     | 1.500                     | 1.700 | 0.059                | 0.067 |
| E      | 2.650                     | 2.950 | 0.104                | 0.116 |
| e      | 0.950(BSC)                |       | 0.037(BSC)           |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.300                     | 0.600 | 0.012                | 0.024 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |



## HSS3401 TOP Marking

