

### Description

The HSL6101 is the high cell density trenched P-ch MOSFETs, which provide excellent R<sub>DS(on)</sub> and gate charge for most of the synchronous buck converter applications.

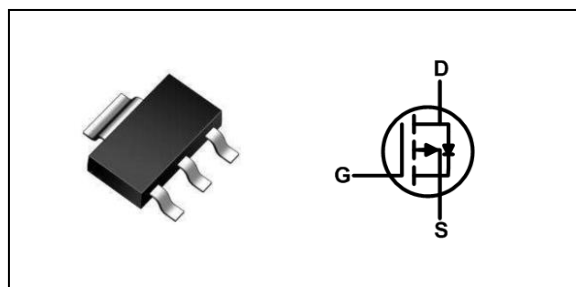
The HSL6101 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

- 100% EAS Guaranteed
- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

### Product Summary

|                         |      |    |
|-------------------------|------|----|
| V <sub>DS</sub>         | -60  | V  |
| R <sub>DS(ON),max</sub> | 130  | mΩ |
| I <sub>D</sub>          | -4.3 | A  |

### SOT223 Pin Configuration



### Absolute Maximum Ratings

| Symbol                               | Parameter   | Rating     | Units |
|--------------------------------------|---|------------|-------|
| V <sub>DS</sub>                      | Drain-Source Voltage  | -60        | V     |
| V <sub>GS</sub>                      | Gate-Source Voltage   | ±20        | V     |
| I <sub>D</sub> @T <sub>A</sub> =25°C | Continuous Drain Current, V <sub>GS</sub> @ -10V <sup>1</sup> | -4.3       | A     |
| I <sub>D</sub> @T <sub>A</sub> =70°C | Continuous Drain Current, V <sub>GS</sub> @ -10V <sup>1</sup> | -3.5       | A     |
| I <sub>DM</sub>                      | Pulsed Drain Current <sup>2</sup>                             | -14        | A     |
| P <sub>D</sub> @T <sub>A</sub> =25°C | Total Power Dissipation <sup>4</sup>                          | 2          | W     |
| T <sub>STG</sub>                     | Storage Temperature Range                                     | -55 to 150 | °C    |
| T <sub>J</sub>                       | Operating Junction Temperature Range                          | -55 to 150 | °C    |

### Thermal Data

| Symbol           | Parameter  | Typ. | Max. | Unit |
|------------------|--|------|------|------|
| R <sub>θJA</sub> | Thermal Resistance Junction-Ambient <sup>1</sup> | ---  | 62.5 | °C/W |
| R <sub>θJC</sub> | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 10   | °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  | -60  | ---    | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25°C, I <sub>D</sub> =-1mA  | ---  | -0.021 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-2A   | ---  | 110    | 130  | mΩ    |
|                                     |  | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-1.5A  | ---  | 140    | 190  |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                                  | -1.0 | ---    | -2.5 | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |  | ---  | 4.08   | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                           | ---  | ---    | 1    | uA    |
|                                     |  | V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                           | ---  | ---    | 5    |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V   | ---  | ---    | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =-10V, I <sub>D</sub> =-2A   | ---  | 5.8    | ---  | S     |
| Q <sub>g</sub>                      | Total Gate Charge (-4.5V)                      | V <sub>DS</sub> =-20V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A                         | ---  | 5.9    | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |  | ---  | 2.9    | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |  | ---  | 1.8    | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3Ω,<br>I <sub>D</sub> =-1A | ---  | 10     | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      |  | ---  | 17     | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |  | ---  | 22     | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |  | ---  | 21     | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz   | ---  | 715    | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |  | ---  | 51     | ---  |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |  | ---  | 34     | ---  |       |

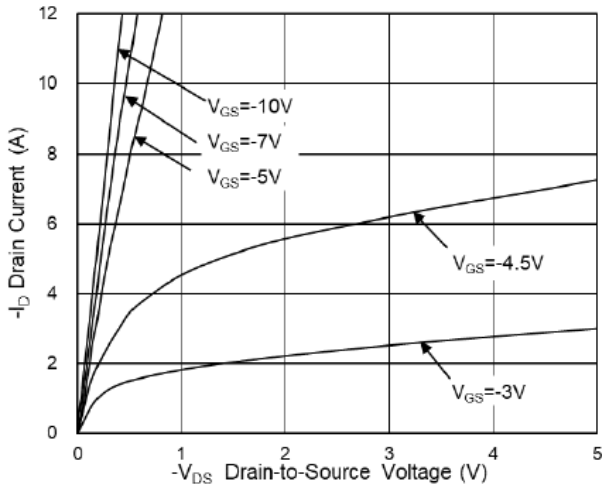
**Diode Characteristics**

| Symbol          | Parameter                                | Conditions   | Min. | Typ. | Max. | Unit |
|-----------------|--|--|------|------|------|------|
| I <sub>s</sub>  | Continuous Source Current <sup>1,5</sup> | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current              | ---  | ---  | -4   | 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    |

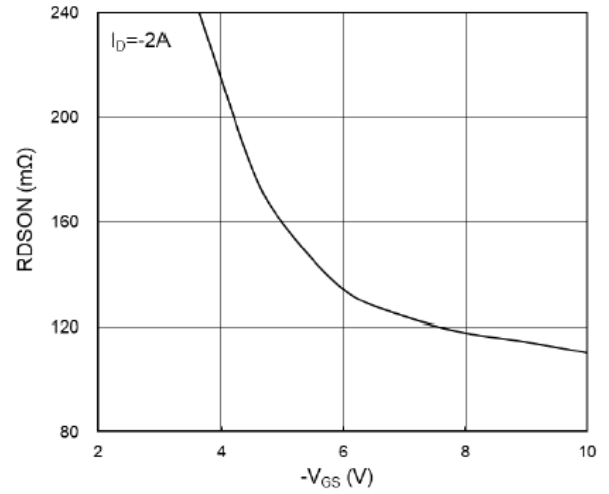
Note :

- 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.

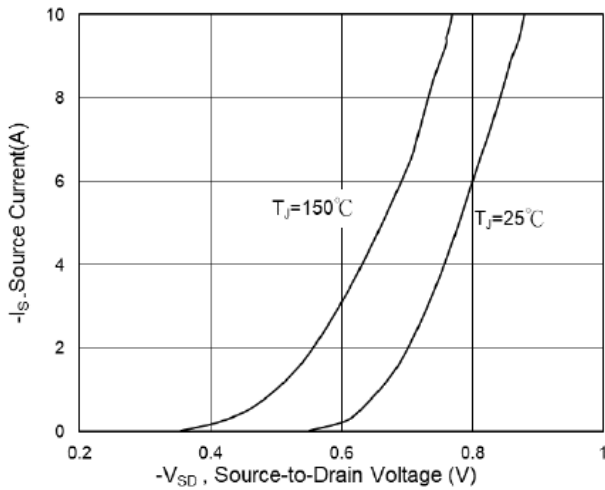
**Typical Characteristics**



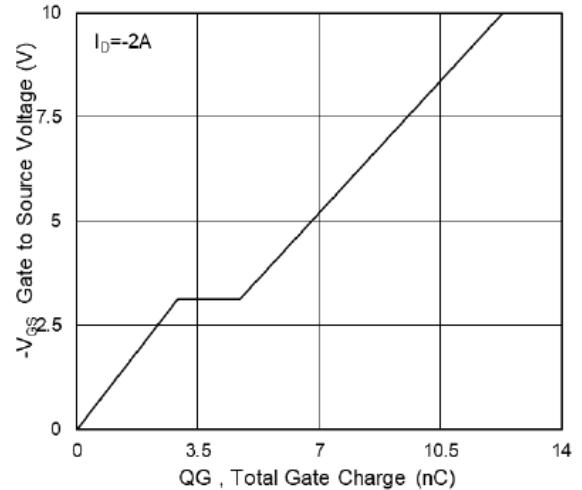
**Fig.1 Typical Output Characteristics**



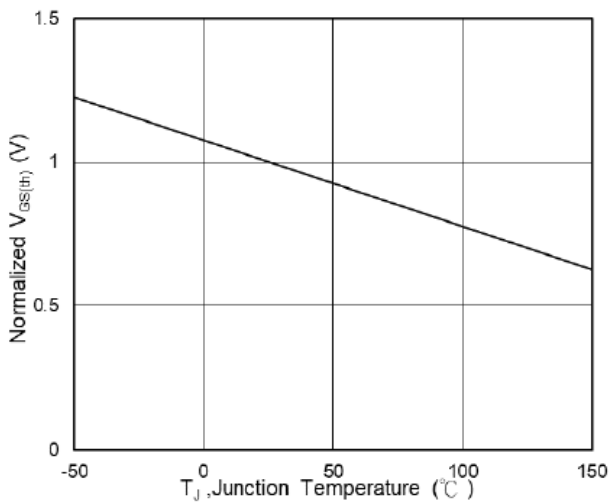
**Fig.2 On-Resistance v.s Gate-Source**



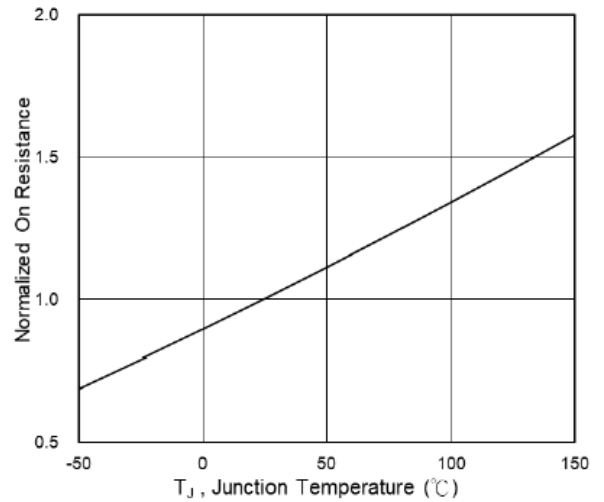
**Fig.3 Forward characteristics of reverse**



**Fig.4 Gate-charge characteristics**



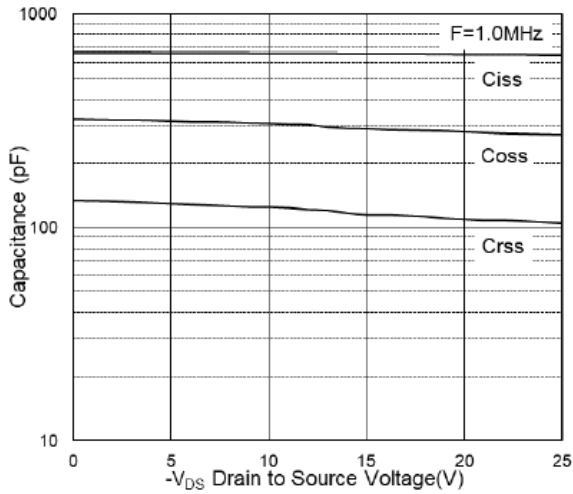
**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



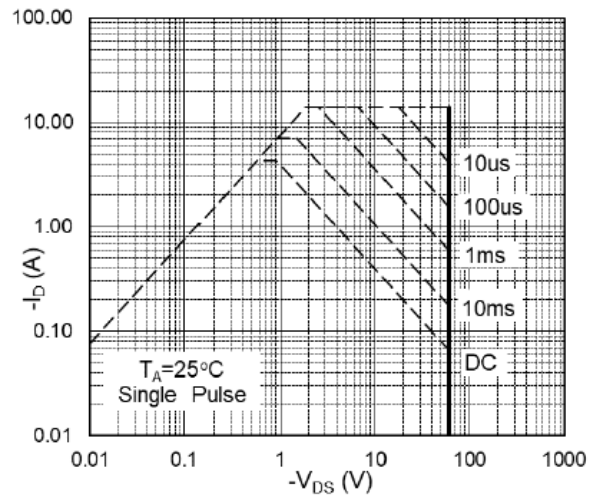
**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**



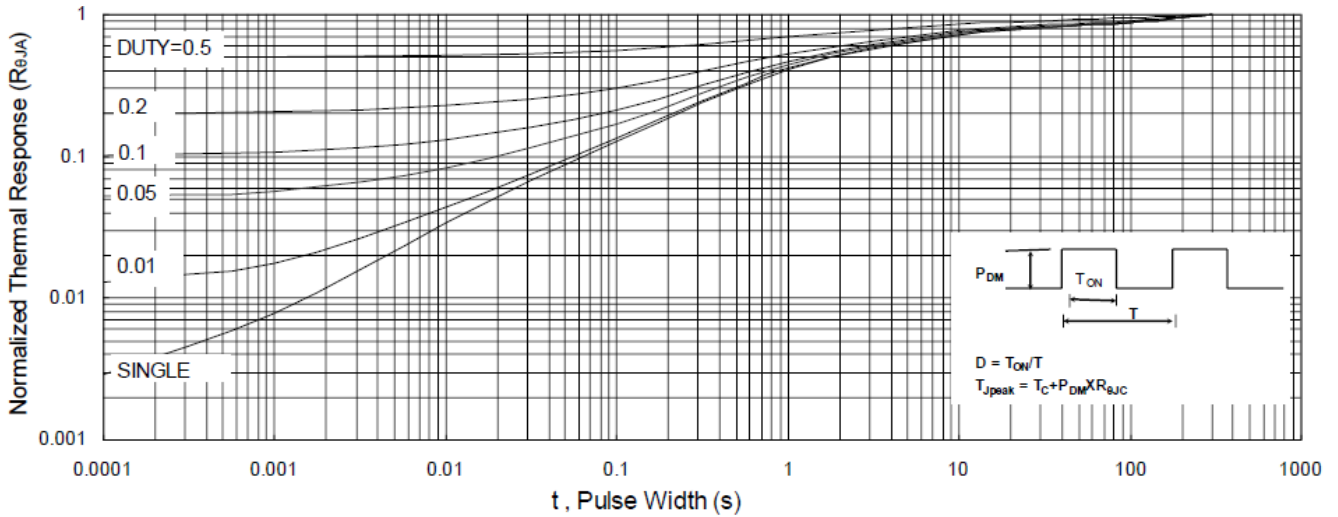
**P-Ch 60V Fast Switching MOSFETs**



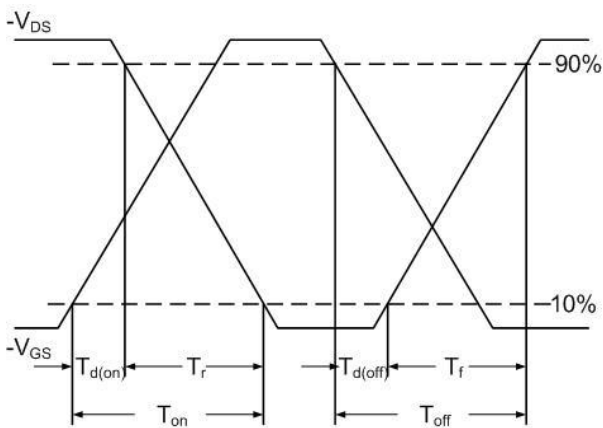
**Fig.7 Capacitance**



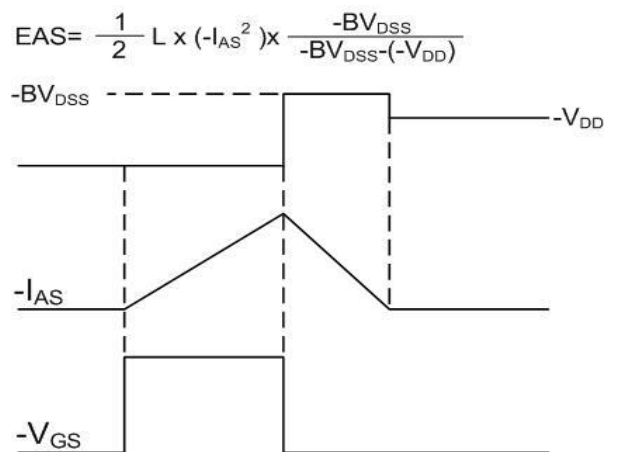
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**

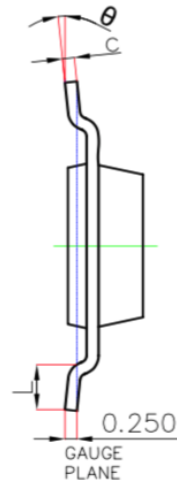
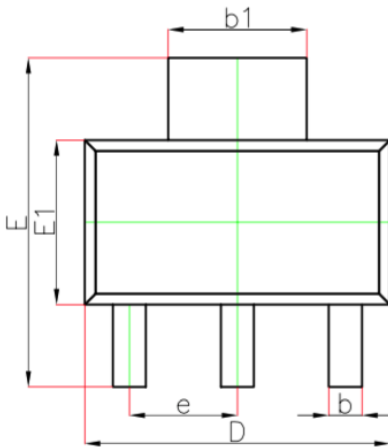


**Fig.11 Unclamped Inductive Switching**

$$EAS = \frac{1}{2} L \times (-I_{AS}^2) \times \frac{-BV_{DSS}}{-BV_{DSS} - (-V_{DD})}$$

## Ordering Information

| Part Number | Package code | Packaging      |
|-------------|--------------|----------------|
| HSL6101     | SOT-223      | 3000/Tape&Reel |



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | —                         | 1.800 | —                    | 0.071 |
| A1     | 0.020                     | 0.100 | 0.001                | 0.004 |
| A2     | 1.500                     | 1.700 | 0.059                | 0.067 |
| b      | 0.660                     | 0.840 | 0.026                | 0.033 |
| b1     | 2.900                     | 3.100 | 0.114                | 0.122 |
| c      | 0.230                     | 0.350 | 0.009                | 0.014 |
| D      | 6.300                     | 6.700 | 0.248                | 0.264 |
| E      | 6.700                     | 7.300 | 0.264                | 0.287 |
| E1     | 3.300                     | 3.700 | 0.130                | 0.146 |
| e      | 2.300(BSC)                |       | 0.091(BSC)           |       |
| L      | 0.750                     | —     | 0.030                | —     |
| θ      | 0°                        | 10°   | 0°                   | 10°   |