HUASHUO SEMICONDUCTOR

# HSH4119

## P-Ch 30V Fast Switching MOSFETs

### Description

The HSH4119 is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

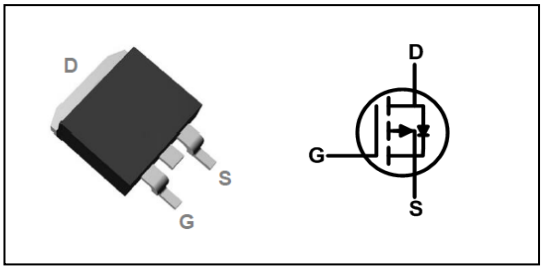
The HSH4119 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

### Product Summary

| | | |
|---|---|---|
| $V_{DS}$ | -40 | V |
| $R_{DS(ON),typ}$ | 3.9 | mΩ |
| $I_D$ | -150 | A |

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

### TO-263 Pin Configuration




### Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | -40 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1,6] | -150 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1,6] | -103 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | -580 | A |
| EAS | Single Pulse Avalanche Energy[3] | 1250 | mJ |
| $I_{AS}$ | Avalanche Current | -70 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 200 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |

### Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient [1](Steady State) | --- | 62 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-case [1] | --- | 0.95 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=-250uA | -40 | --- | --- | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=-10V , $I_D$=-30A | --- | 3.9 | 4.5 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-20A | --- | 4.9 | 5.6 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | -1.0 | --- | -2.5 | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=-40V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | -1 | uA |
| | | $V_{DS}$=-40V , $V_{GS}$=0V , $T_J$=125℃ | --- | --- | -100 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| Rg | Gate resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | | 1.7 | | Ω |
| $Q_g$ | Total Gate Charge (-10V) | $V_{DS}$=-20V , $V_{GS}$=-10V , $I_D$=-20A | --- | 190 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 24 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 38 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=-20V , $V_{GS}$=-10V , $R_G$=3Ω, $I_D$=-10A | --- | 18 | --- | ns |
| $T_r$ | Rise Time | | --- | 3.6 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 21 | --- | |
| $T_f$ | Fall Time | | --- | 39 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-20V , $V_{GS}$=0V , f=1MHz | --- | 10700 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 780 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 660 | --- | |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | -150 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=-20A , $T_J$=25℃ | --- | --- | -1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=-20A , di/dt=100A/μs , $T_J$=25℃ | --- | 52 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 128 | --- | nC |

Note :
1.The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper.
2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3.The EAS data shows Max. rating . The test condition is $V_{DD}$=-40V,$V_{GS}$=-10V,L=0.5mH,$I_{AS}$=-70A
4.The power dissipation is limited by 150℃ junction temperature
5.The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation
6.The maximum current rating is package limited.

## Typical Characteristics

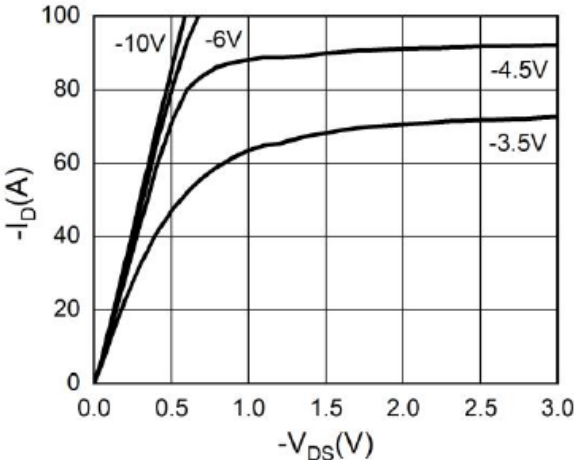



Fig.1 Output Characteristics

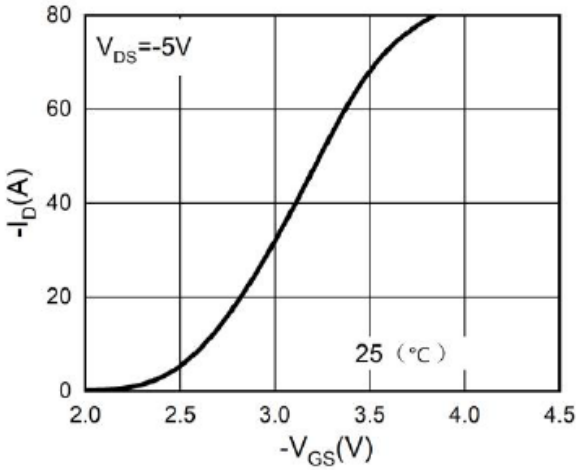



Fig.2 Transfer Characteristics

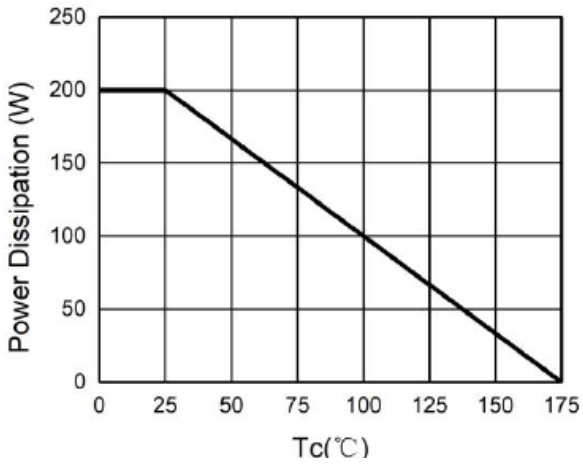



Fig.3 Power Dissipation

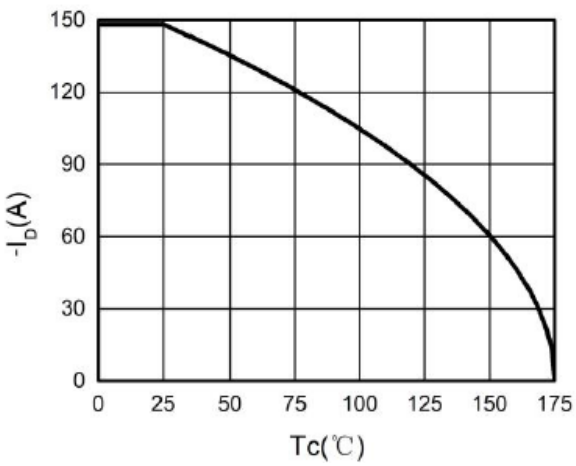



Fig.4 Drain Current

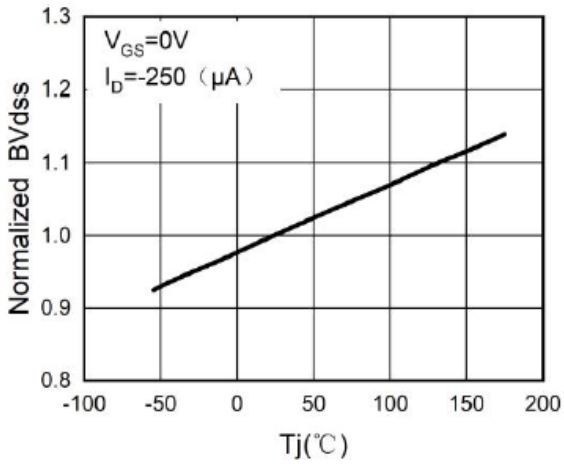



Fig.5 BVdss vs Junction Temperature

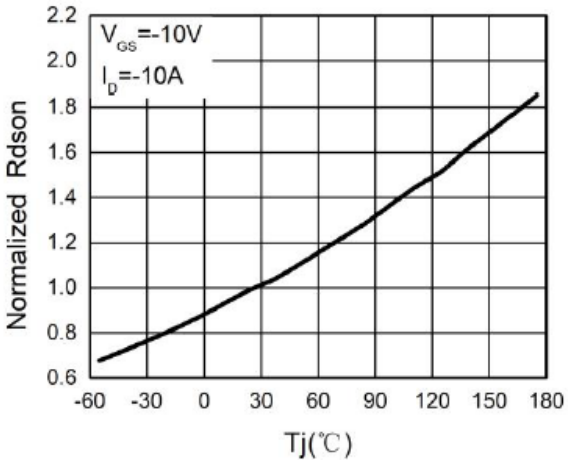



Fig.6 Rds(on) vs Junction Temperature

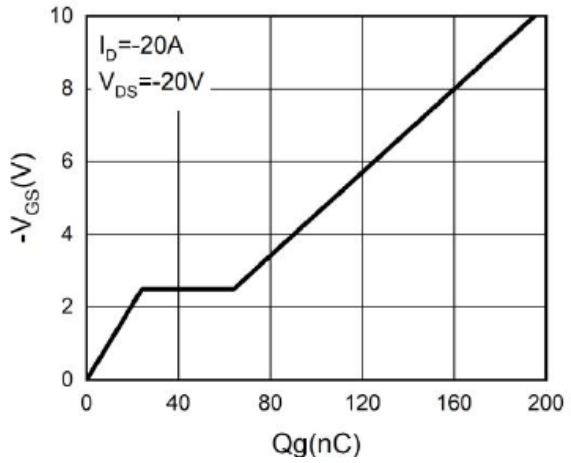



Fig.7 Gate Charge Waveforms

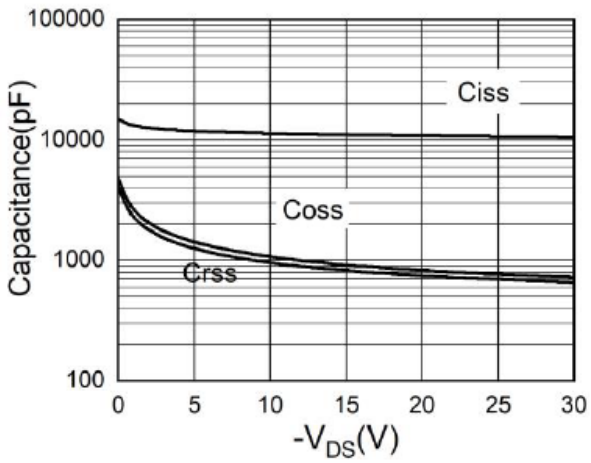



Fig.8 Capacitance

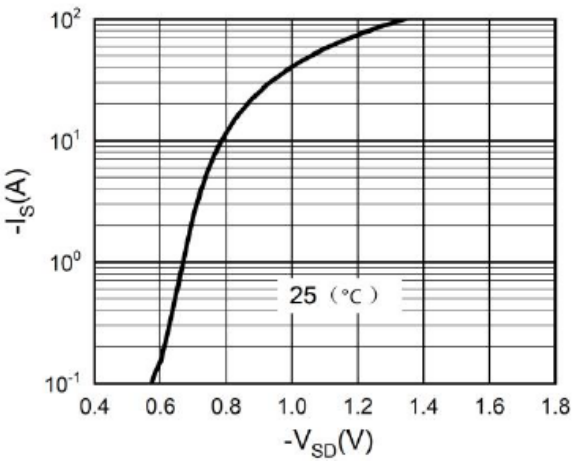



Fig.9 Body-Diode Characteristics

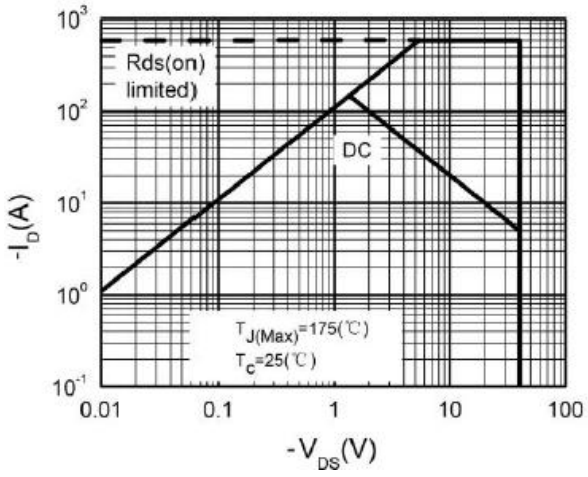
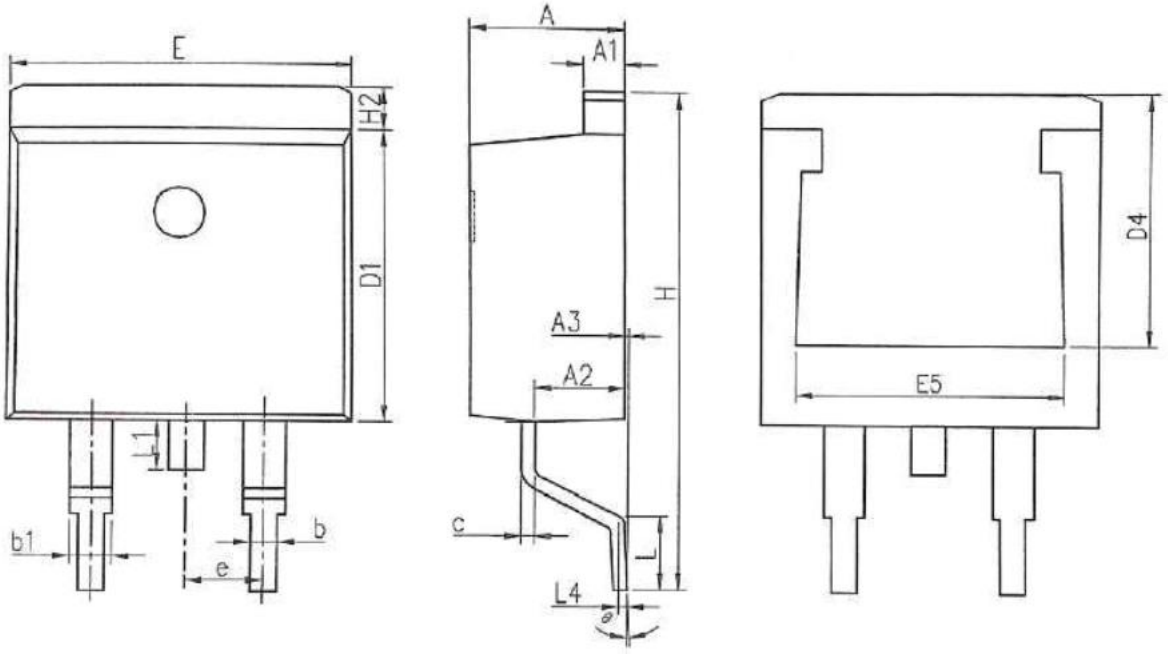



Fig.10 Maximum Safe Operating Area




| SYMBOLS | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.370 | 4.770 | 0.172 | 0.188 |
| A1 | 1.220 | 1.420 | 0.048 | 0.056 |
| A2 | 2.200 | 2.890 | 0.087 | 0.114 |
| A3 | 0.000 | 0.250 | 0.000 | 0.010 |
| b | 0.700 | 0.960 | 0.028 | 0.038 |
| b1 | 1.170 | 1.470 | 0.046 | 0.058 |
| c | 0.300 | 0.530 | 0.012 | 0.021 |
| D1 | 8.500 | 9.300 | 0.335 | 0.366 |
| D4 | 6.600 | - | 0.260 | - |
| E | 9.860 | 10.36 | 0.388 | 0.408 |
| E5 | 7.060 | - | 0.278 | - |
| e | 2.540 BSC | | 0.100 BSC | |
| H | 14.70 | 15.70 | 0.579 | 0.618 |
| H2 | 1.070 | 1.470 | 0.042 | 0.058 |
| L | 2.000 | 2.600 | 0.079 | 0.102 |
| L1 | 1.400 | 1.750 | 0.055 | 0.069 |
| L4 | 0.250 BSC | | 0.010 BSC | |
| Θ | 0° | 9° | 0° | 9° |

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