# HSU3031

## P-Ch 30V Fast Switching MOSFETs

### Description

The HSU3031 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 HSU3031 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

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

### Product Summary

| | | |
|---|---|---|
| $V_{DS}$ | -30 | V |
| $R_{DS(ON),max}$ | 7.2 | mΩ |
| $I_D$ | -70 | A |

### TO252 Pin Configuration
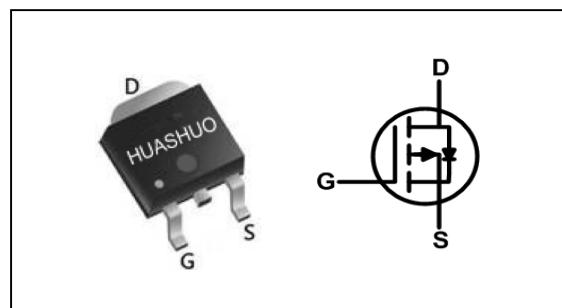


### Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | -30 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1,6] | -70 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1,6] | -50 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | -200 | A |
| EAS | Single Pulse Avalanche Energy[3] | 80 | mJ |
| $I_{AS}$ | Avalanche Current | -40 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 90 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 175 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 175 | ℃ |

### Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{θJA}$ | Thermal Resistance Junction-ambient [1](t≦10S) | --- | 20 | ℃/W |
| | Thermal Resistance Junction-ambient [1](Steady State) | --- | 50 | ℃/W |
| $R_{θJC}$ | Thermal Resistance Junction-case [1] | --- | 1.6 | ℃/W |

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## 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 | -30 | --- | --- | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=-10V , $I_D$=-20A | --- | 6 | 7.2 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-15A | --- | 9.5 | 12 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | -1.2 | --- | -2.5 | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=-24V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | -1 | uA |
| | | $V_{DS}$=-24V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | -5 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| Rg | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 1.2 | ––– | Ω |
| $Q_g$ | Total Gate Charge (-10V) | | --- | 60 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | $V_{DS}$=-15V , $V_{GS}$=-10V , $I_D$=-18A | --- | 9 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 15 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | | --- | 17 | --- | ns |
| $T_r$ | Rise Time | $V_{DD}$=-15V , $V_{GS}$=-10V , $R_G$=3.3Ω, $I_D$=-20A | --- | 40 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 55 | --- | |
| $T_f$ | Fall Time | | --- | 13 | --- | |
| $C_{iss}$ | Input Capacitance | | --- | 3450 | --- | pF |
| $C_{oss}$ | Output Capacitance | $V_{DS}$=-25V , $V_{GS}$=0V , f=1MHz | --- | 255 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 140 | --- | |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | -70 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=-1A , $T_J$=25℃ | --- | --- | -1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=-20A , di/dt=100A/μs , | --- | 22 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | $T_J$=25℃ | --- | 72 | --- | 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 $V_{DD}$=-50V,$V_{GS}$=-10V,L=0.1mH,$I_{AS}$=-40A
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
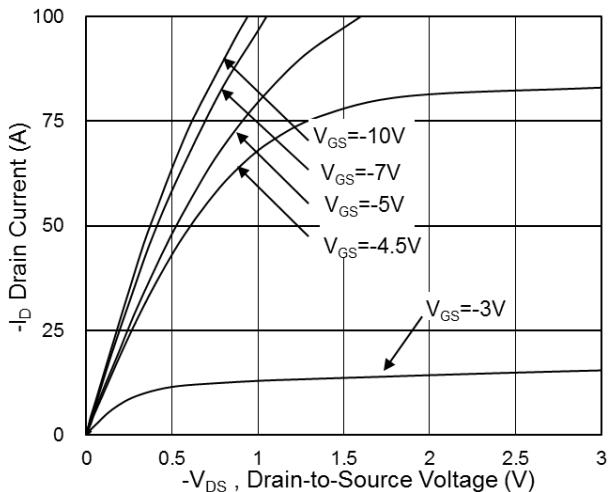


Fig.1 Typical Output Characteristics
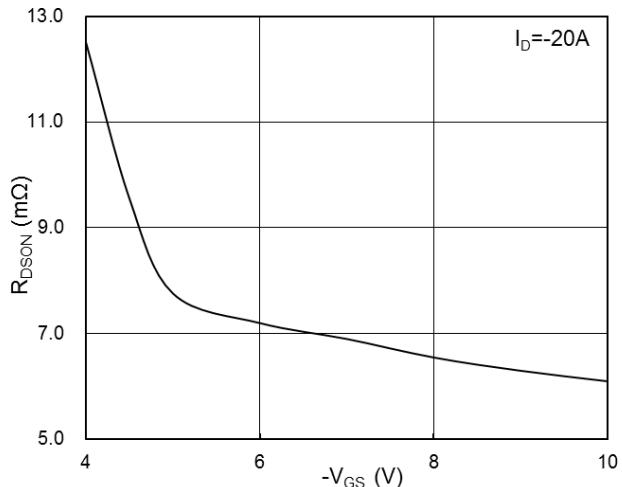


Fig.2 On-Resistance vs. Gate-Source
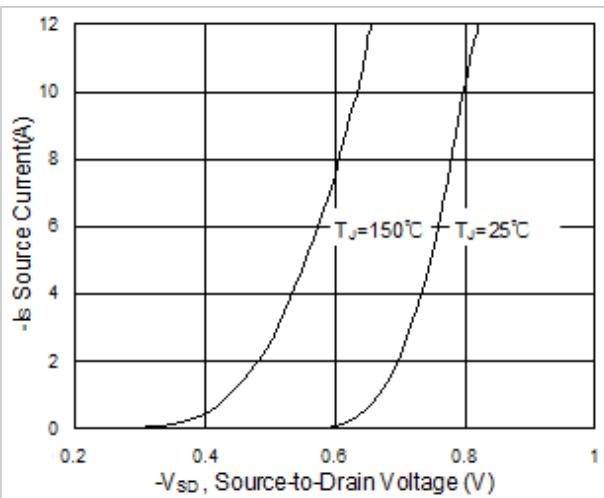


Fig.3 Forward Characteristics of Reverse
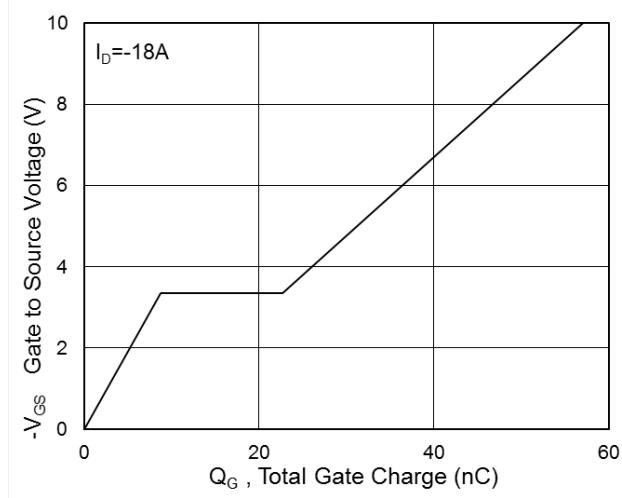


Fig.4 Gate-Charge Characteristics
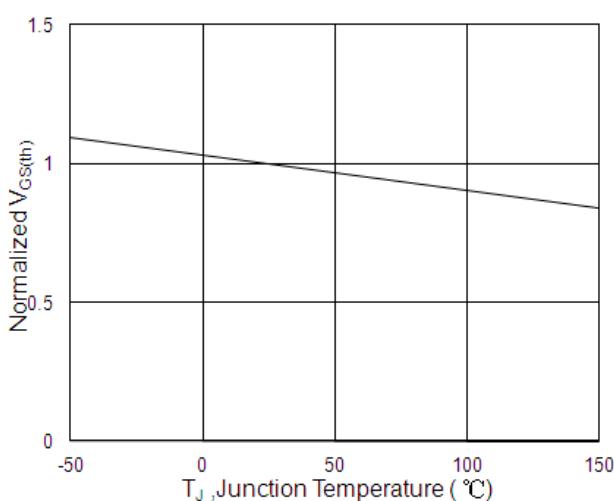


Fig.5 Normalized $-V_{GS(th)}$ vs. $T_J$
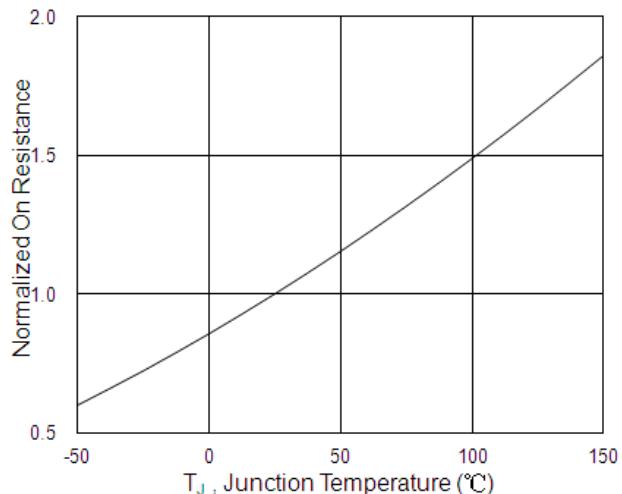


Fig.6 Normalized $R_{DSON}$ vs. $T_J$
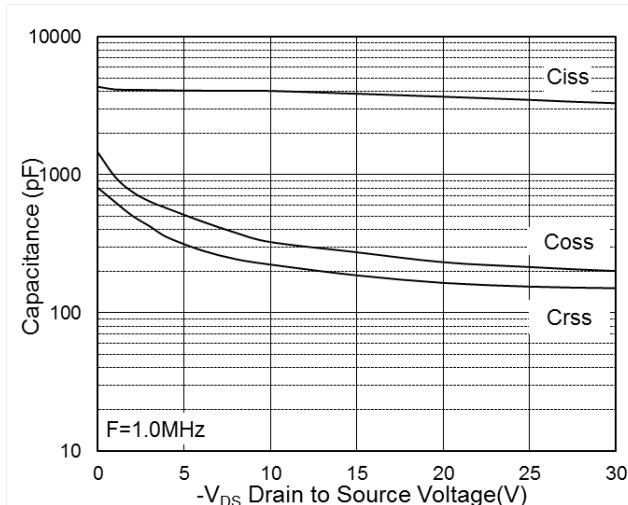
**Fig.7 Capacitance**
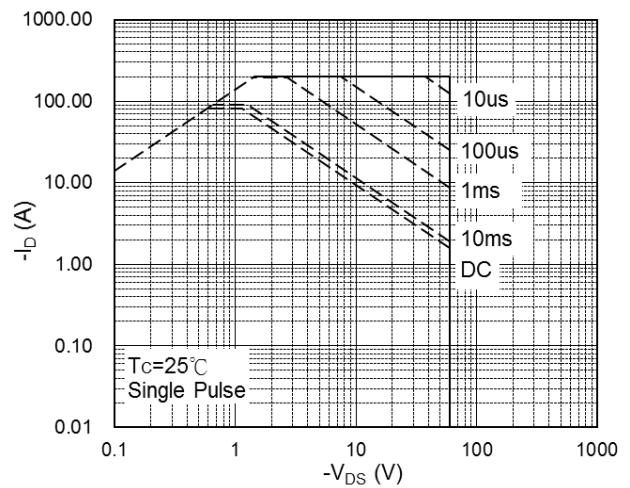
**Fig.8 Safe Operating Area**
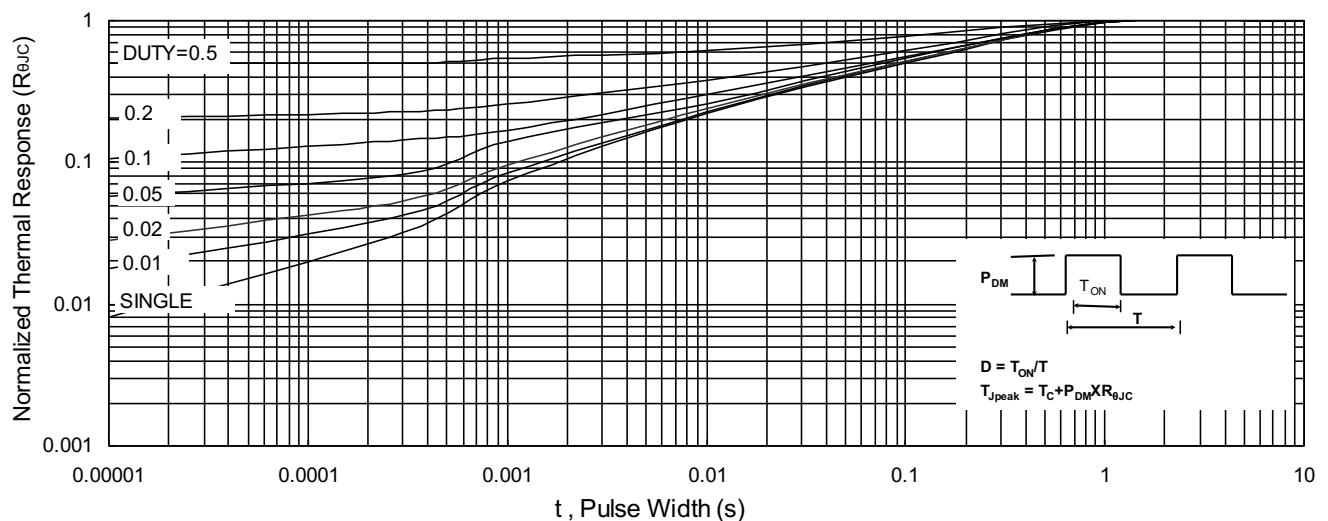
**Fig.9 Normalized Maximum Transient Thermal Impedance**

$$D = T_{ON}/T$$
$$T_{Jpeak} = T_C + P_{DM} \times R_{\theta JC}$$
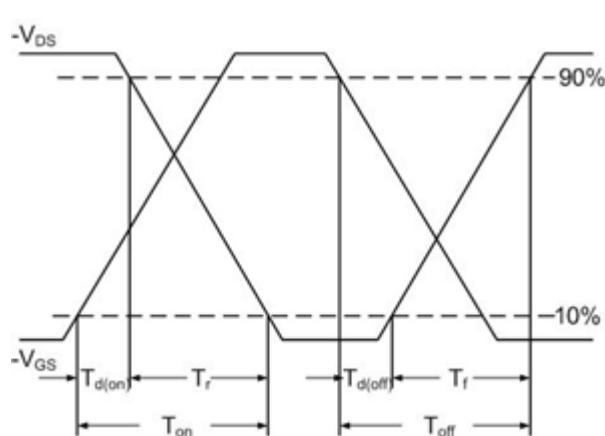
**Fig.10 Switching Time Waveform**

$$EAS = \frac{1}{2} L \times (-I_{AS}^2) \times \frac{-BV_{DSS}}{-BV_{DSS} - (-V_{DD})}$$
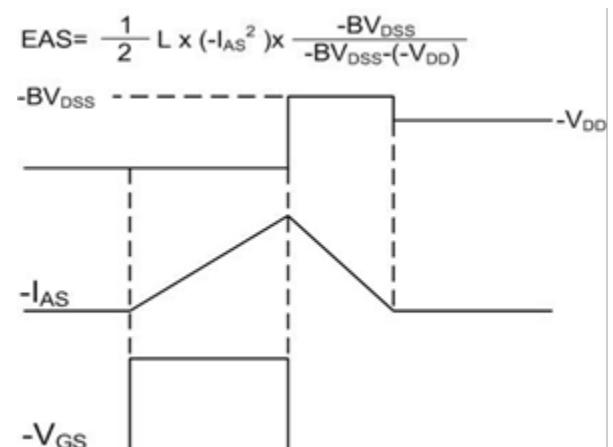
**Fig.11 Unclamped Inductive Switching**

# Ordering Information

| Part Number | Package code | Packaging |
|:---:|:---:|:---:|
| HSU3031 | TO252-2 | 2500/Tape&Reel |



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|:---:|:---:|:---:|:---:|:---:|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| B | 1.350 | 1.650 | 0.053 | 0.065 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.700 | 0.900 | 0.028 | 0.035 |
| c | 0.430 | 0.580 | 0.017 | 0.023 |
| c1 | 0.430 | 0.580 | 0.017 | 0.023 |
| D | 6.350 | 6.650 | 0.250 | 0.262 |
| D1 | 5.200 | 5.400 | 0.205 | 0.213 |
| E | 5.400 | 5.700 | 0.213 | 0.224 |
| e | 2.300 TYP. | | 0.091 TYP. | |
| e1 | 4.500 | 4.700 | 0.177 | 0.185 |
| L | 9.500 | 9.900 | 0.374 | 0.390 |
| L1 | 2.550 | 2.900 | 0.100 | 0.114 |
| L2 | 1.400 | 1.780 | 0.055 | 0.070 |
| L3 | 0.600 | 0.900 | 0.024 | 0.035 |
| V | 3.800 REF. | | 0.150 REF. | |
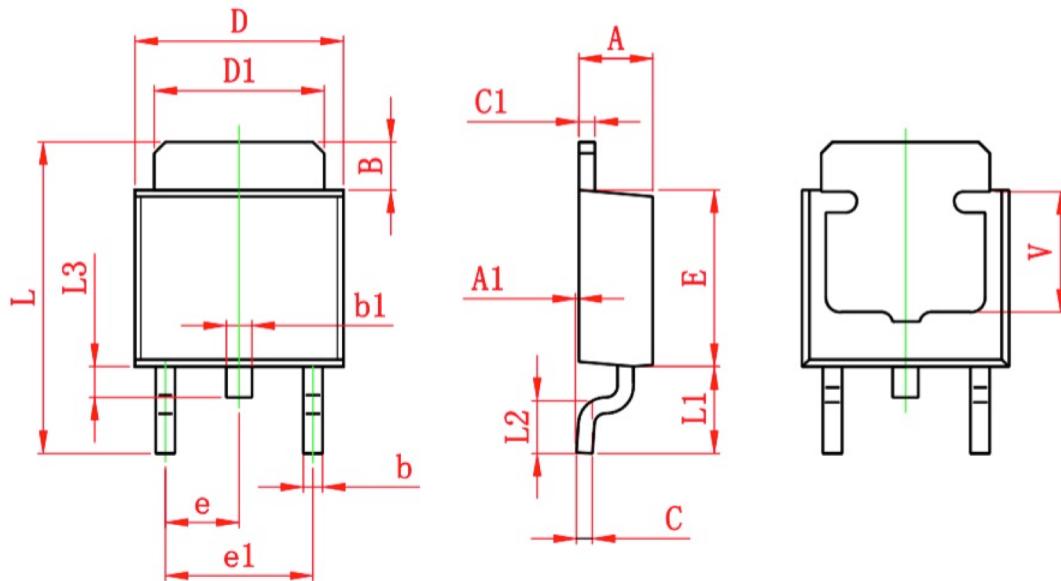
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