



Description

The HSBB6113 is the high cell density trenched P-ch MOSFETs, which provide excellent R_{DS(ON)} and gate charge for most of the synchronous buck converter applications.

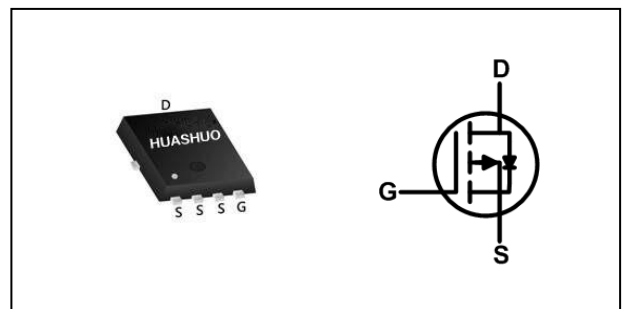
The HSBB6113 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

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

Product Summary

| | | |
|-------------------------|-----|----|
| V _{DS} | -60 | V |
| R _{DS(ON),max} | 90 | mΩ |
| I _D | -13 | A |

PRPAK3*3 Pin Configuration



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---------------------------------------|---|------------|-------|
| V _{DS} | Drain-Source Voltage | -60 | V |
| V _{GS} | Gate-Source Voltage | ±20 | V |
| I _D @T _C =25°C | Continuous Drain Current, V _{GS} @ -10V ¹ | -13 | A |
| I _D @T _C =100°C | Continuous Drain Current, V _{GS} @ -10V ¹ | -8.3 | A |
| I _{DM} | Pulsed Drain Current ² | -26 | A |
| EAS | Single Pulse Avalanche Energy ³ | 29.7 | mJ |
| I _{AS} | Avalanche Current | 24.4 | A |
| P _D @T _A =25°C | Total Power Dissipation ⁴ | 2 | W |
| T _{STG} | Storage Temperature Range | -55 to 150 | °C |
| T _J | Operating Junction Temperature Range | -55 to 150 | °C |

Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|------------------|--|------|------|------|
| R _{θJA} | Thermal Resistance Junction-Ambient ¹ | --- | 62 | °C/W |
| R _{θJC} | Thermal Resistance Junction-Case ¹ | --- | 4 | °C/W |



Electrical Characteristics ($T_J=25\text{ }^\circ\text{C}$, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|--|---|------|-------|-----------|----------------------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=-250\mu A$ | -60 | --- | --- | V |
| $\Delta BV_{DSS}/\Delta T_J$ | BV_{DSS} Temperature Coefficient | Reference to 25°C , $I_D=-1\text{mA}$ | --- | -0.03 | --- | $V/^\circ\text{C}$ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance ² | $V_{GS}=-10V, I_D=-10A$ | --- | --- | 90 | m Ω |
| | | $V_{GS}=-4.5V, I_D=-5A$ | --- | --- | 115 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}, I_D=-250\mu A$ | -1.0 | --- | -2.5 | V |
| $\Delta V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 4.56 | --- | $\text{mV}/^\circ\text{C}$ |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=-48V, V_{GS}=0V, T_J=25^\circ\text{C}$ | --- | --- | 1 | μA |
| | | $V_{DS}=-48V, V_{GS}=0V, T_J=55^\circ\text{C}$ | --- | --- | 5 | |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | --- | --- | ± 100 | nA |
| g_{fs} | Forward Transconductance | $V_{DS}=-5V, I_D=-3A$ | --- | 8.7 | --- | S |
| R_g | Gate Resistance | $V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$ | --- | 15 | --- | Ω |
| Q_g | Total Gate Charge (-4.5V) | $V_{DS}=-48V, V_{GS}=-4.5V, I_D=-3A$ | --- | 11.8 | --- | nC |
| Q_{gs} | Gate-Source Charge | | --- | 1.9 | --- | |
| Q_{gd} | Gate-Drain Charge | | --- | 6.5 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}=-15V, V_{GS}=-10V, R_G=3.3\Omega, I_D=-1A$ | --- | 8.8 | --- | ns |
| T_r | Rise Time | | --- | 19.6 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 47.2 | --- | |
| T_f | Fall Time | | --- | 9.6 | --- | |
| C_{iss} | Input Capacitance | $V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$ | --- | 1080 | --- | pF |
| C_{oss} | Output Capacitance | | --- | 73 | --- | |
| C_{rss} | Reverse Transfer Capacitance | | --- | 50 | --- | |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------|--|--|------|------|------|------|
| I_S | Continuous Source Current ^{1,5} | $V_G=V_D=0V, \text{Force Current}$ | --- | --- | -13 | A |
| I_{SM} | Pulsed Source Current ^{2,5} | | --- | --- | -26 | A |
| V_{SD} | Diode Forward Voltage ² | $V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$ | --- | --- | -1 | V |

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is $V_{DD}=-25V, V_{GS}=-10V, L=0.1\text{mH}, I_{AS}=-24.4A$
- 4.The power dissipation is limited by 150°C 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.



P-Ch 60V Fast Switching MOSFETs

Typical Characteristics

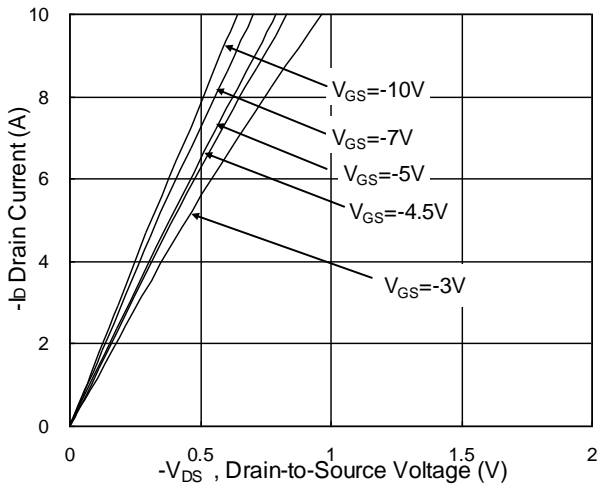


Fig.1 Typical Output Characteristics

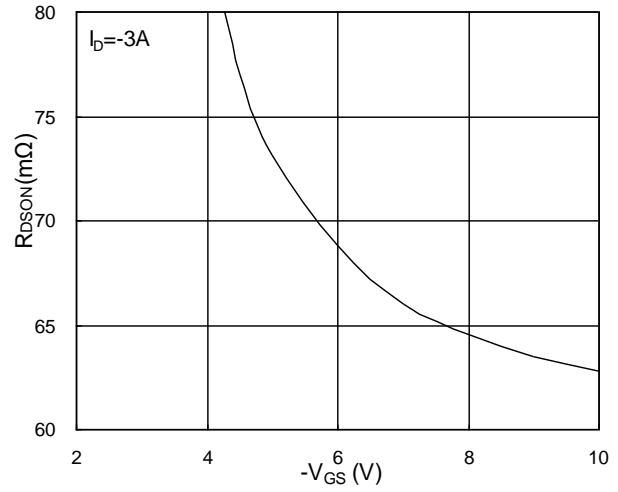


Fig.2 On-Resistance v.s Gate-Source

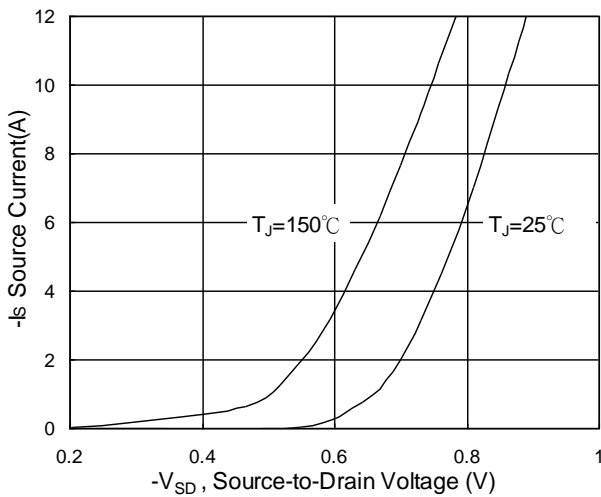


Fig.3 Forward Characteristics of Reverse

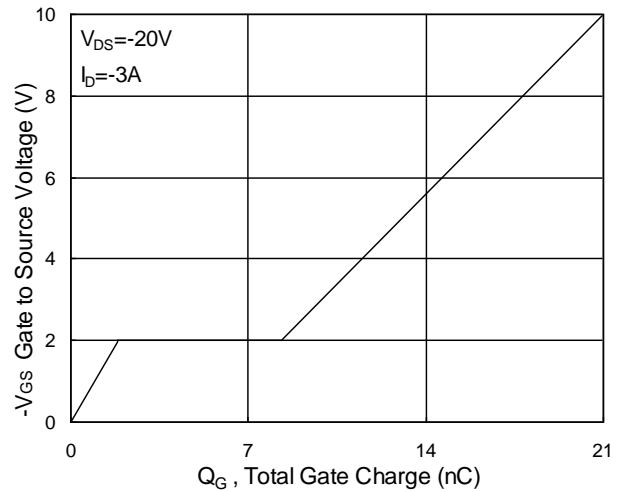


Fig.4 Gate-Charge Characteristics

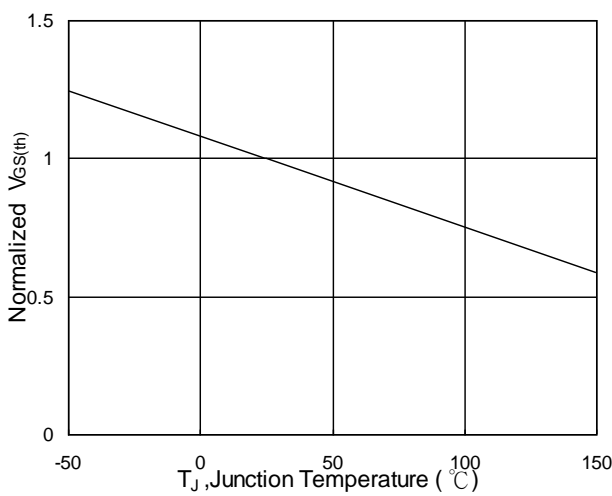


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

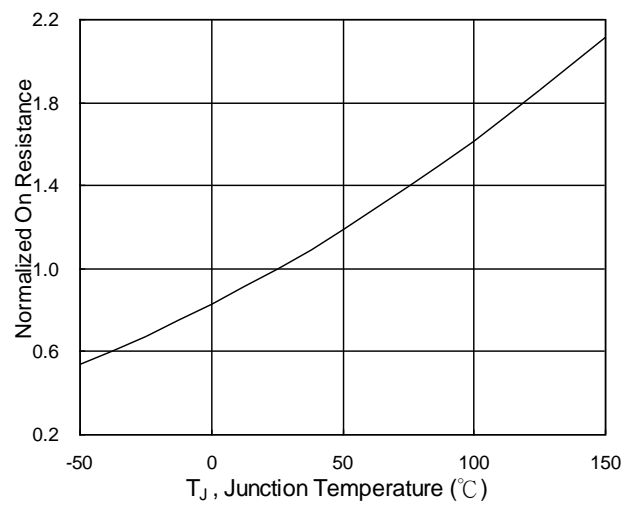


Fig.6 Normalized R_{bSON} vs. T_J



P-Ch 60V Fast Switching MOSFETs

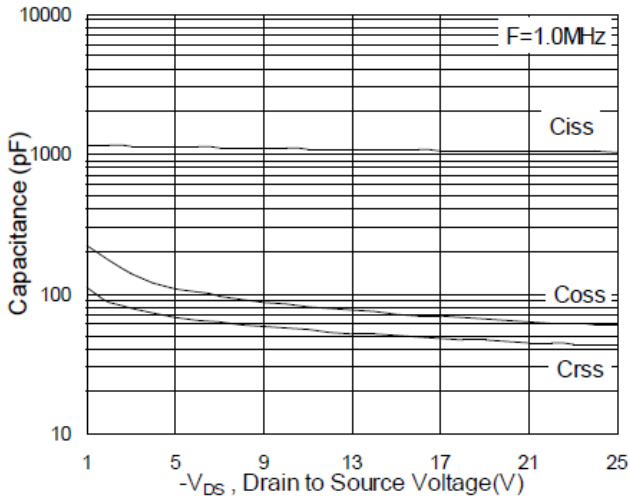


Fig.7 Capacitance

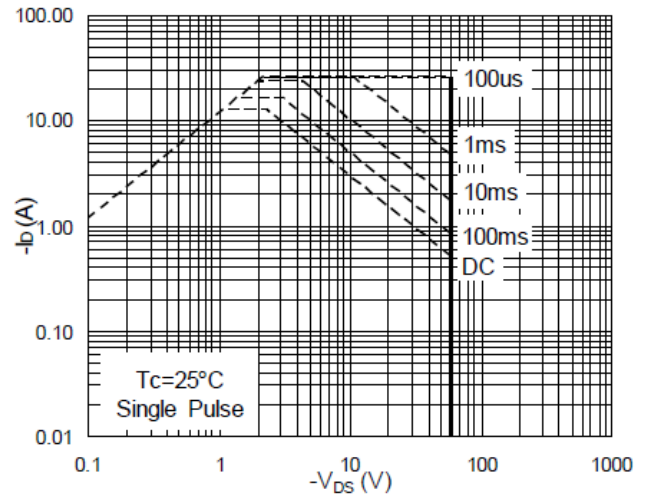


Fig.8 Safe Operating Area

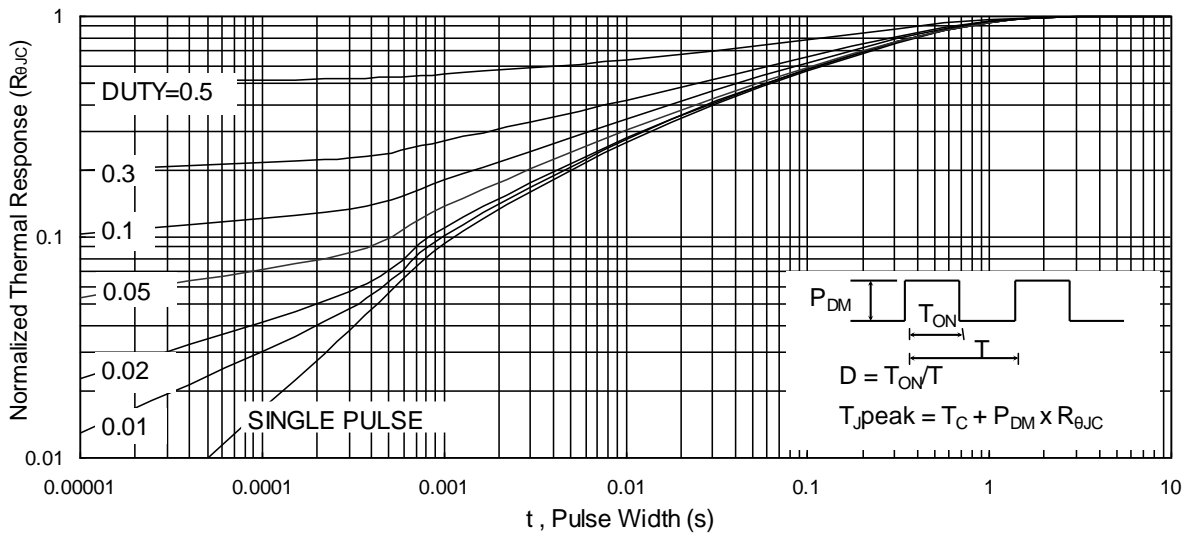


Fig.9 Normalized Maximum Transient Thermal Impedance

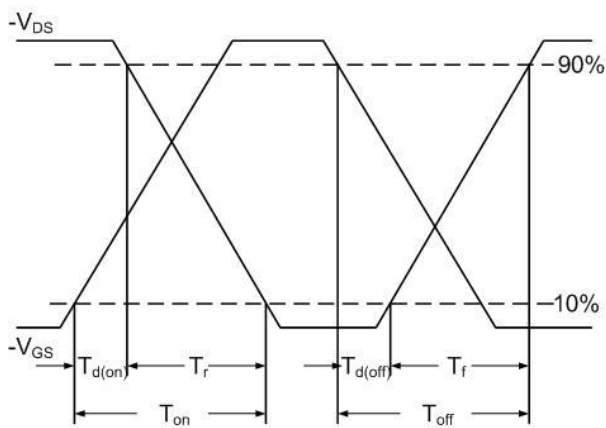


Fig.10 Switching Time Waveform

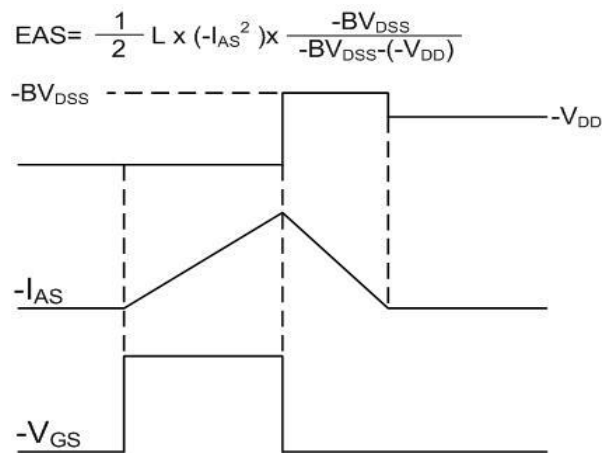


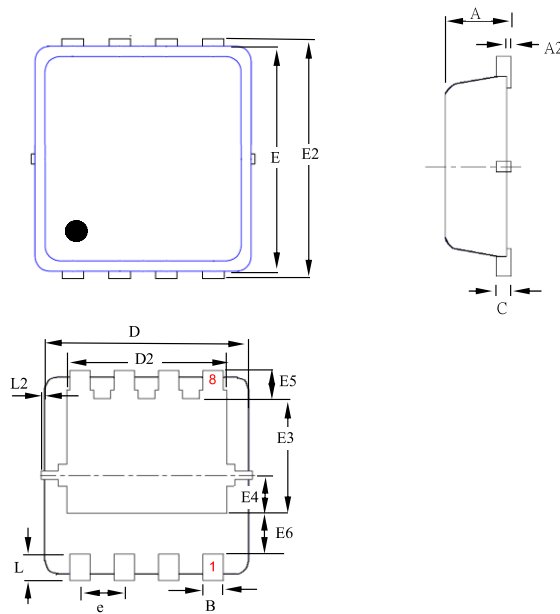
Fig.11 Unclamped Inductive Waveform



Ordering Information

| Part Number | Package code | Packaging |
|-------------|--------------|----------------|
| HSBB6113 | SOP-8 | 3000/Tape&Reel |

PRPAK 3*3(E) Single Outline



| SYMBOLS | MILLIMETERS | | | INCHES | | |
|---------|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.70 | 0.80 | 0.90 | 0.028 | 0.031 | 0.035 |
| A2 | 0.00 | -- | 0.05 | 0.000 | -- | 0.002 |
| B | 0.24 | 0.30 | 0.35 | 0.009 | 0.012 | 0.014 |
| C | 0.10 | 0.15 | 0.25 | 0.004 | 0.006 | 0.010 |
| D | 2.90 | 3.00 | 3.20 | 0.114 | 0.118 | 0.126 |
| D2 | 2.15 | 2.35 | 2.59 | 0.085 | 0.093 | 0.102 |
| E | 2.90 | 3.00 | 3.12 | 0.114 | 0.118 | 0.123 |
| E2 | 3.05 | 3.20 | 3.45 | 0.120 | 0.126 | 0.136 |
| E3 | 1.55 | 1.75 | 1.95 | 0.061 | 0.069 | 0.077 |
| E4 | 0.48 | 0.58 | 0.68 | 0.019 | 0.023 | 0.027 |
| E5 | 0.28 | 0.43 | 0.58 | 0.011 | 0.017 | 0.023 |
| E6 | 0.43 | 0.63 | 0.87 | 0.017 | 0.025 | 0.034 |
| L | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| L2 | 0.00 | -- | 0.10 | 0.000 | -- | 0.004 |
| e | -- | 0.65 | -- | -- | 0.026 | -- |

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