HUASHUO SEMICONDUCTOR

# HSBA0204

## Dual N-Ch 100V Fast Switching MOSFETs

### Description

The HSBA0204 is the high cell density trenched N-ch MOSFETs, which provides excellent RDSON and efficiency for most of the small power switching and load switch applications.

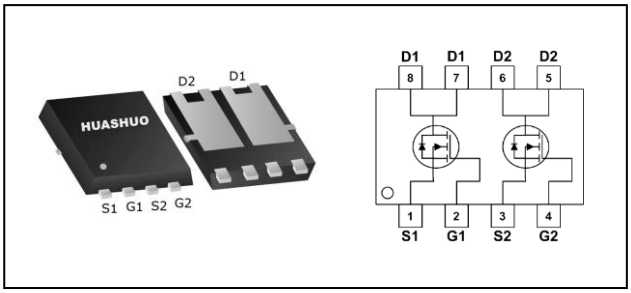
The HSBA0204 meets the RoHS and Green Product requirement with full function reliability approved.

### Product Summary

| | | |
|---|---|---|
| $V_{DS}$ | 100 | V |
| $R_{DS(ON),max}$ | 112 | mΩ |
| $I_D$ | 9.3 | A |

- Portable Equipment
- Battery Powered Systems
- Hard Switching and High-Speed Circut
- Advanced high cell density Trench technology

### PRPAK5*6 Pin Configuration




### Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 100 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 9.3 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 5. 9 | A |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 2.9 | A |
| $I_D$@$T_A$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 1.8 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 36 | A |
| EAS | Single Pulse Avalanche Energy[3] | 6.1 | mJ |
| $I_{AS}$ | Avalanche Current | 11 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[3] | 21 | 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] | --- | 63 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 6 | ℃/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 | 100 | --- | --- | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=3A | --- | 90 | 112 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=2A | --- | 95 | 120 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.2 | 1.7 | 2.5 | V |
| △$V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -4.57 | --- | mV/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=80V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=80V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | 10 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$=2A | --- | 12 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 2 | --- | Ω |
| $Q_g$ | Total Gate Charge (10V) | $V_{DS}$=60V , $V_{GS}$=10V , $I_D$=2A | --- | 19.5 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 3.2 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 3.6 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=50V , $V_{GS}$=10V , $R_G$=3.3Ω $I_D$=1A | --- | 16.2 | --- | ns |
| $T_r$ | Rise Time | | --- | 3 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 44 | --- | |
| $T_f$ | Fall Time | | --- | 2.6 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=15V , $V_{GS}$=0V , f=1MHz | --- | 1535 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 60 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 37.4 | --- | |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | 9 | A |
| $I_{SM}$ | Pulsed Source Current[2,5] | | --- | --- | 18 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1.2 | V |

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 $V_{DD}$=25V,$V_{GS}$=10V,L=0.1mH,$I_{AS}$=11A
4.The power dissipation is limited by 175℃ 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.

## Typical Characteristics

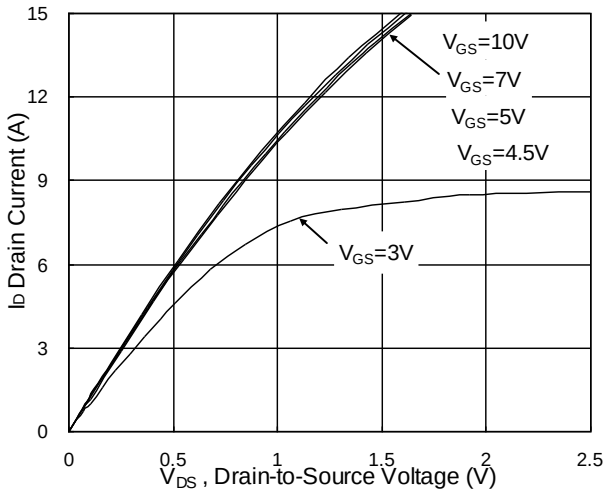



**Fig.1 Typical Output Characteristics**

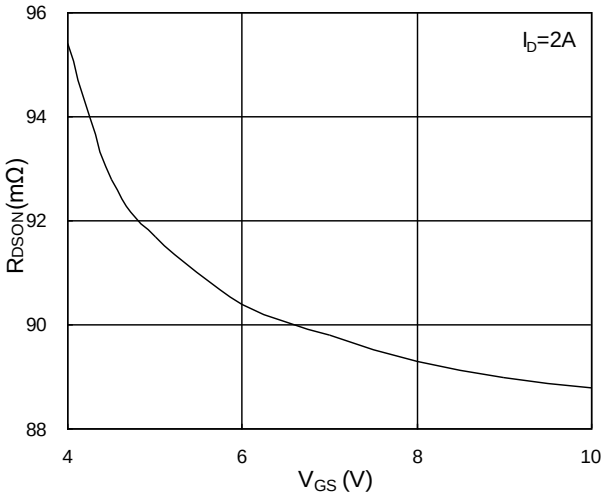



**Fig.2 On-Resistance vs. Gate-Source**

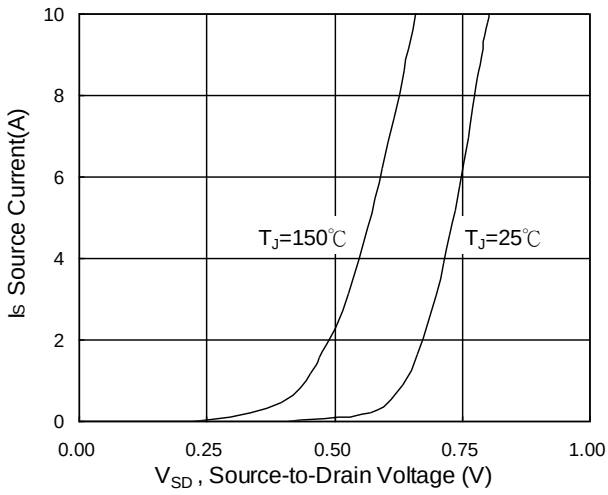



**Fig.3 Forward Characteristics Of Reverse**

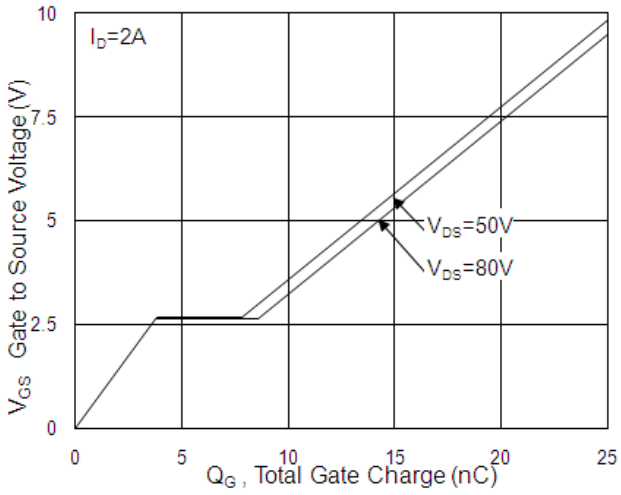



**Fig.4 Gate-Charge Characteristics**

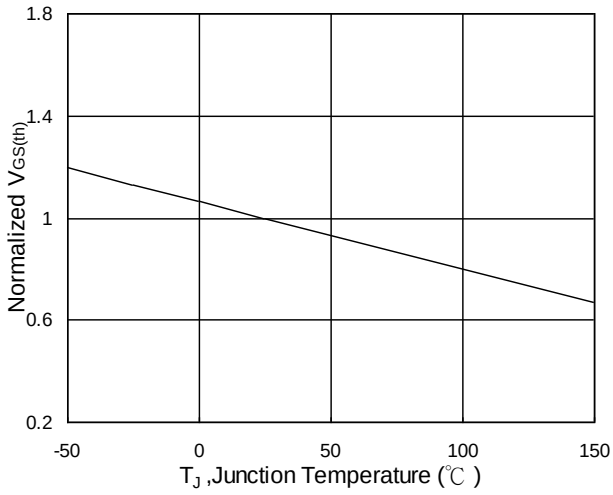



**Fig.5 Normalized $V_{GS(th)}$ vs. $T_J$**

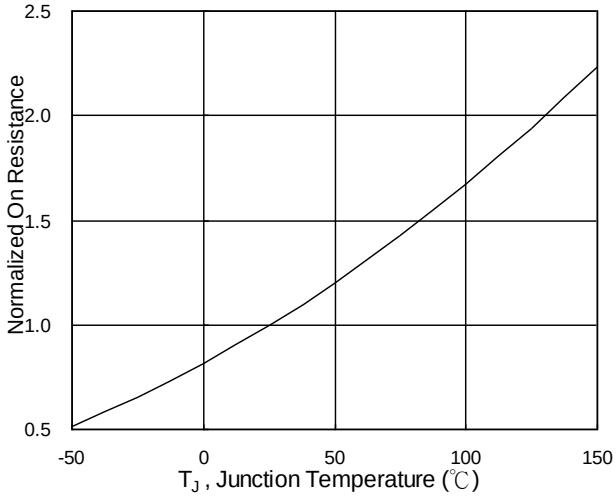



**Fig.6 Normalized $R_{DSON}$ vs. $T_J$**

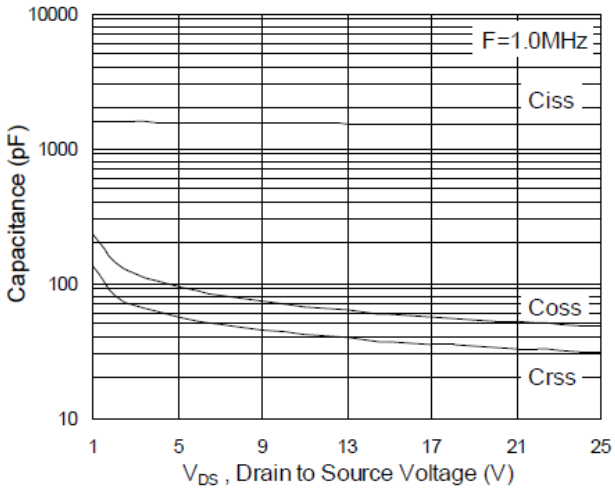



Fig.7 Capacitance

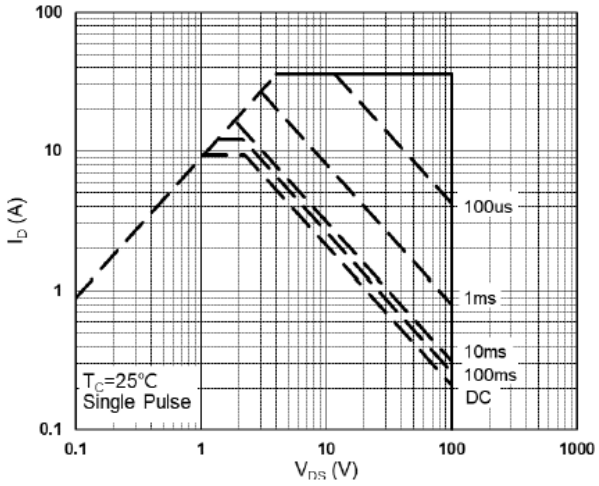



Fig.8 Safe Operating Area

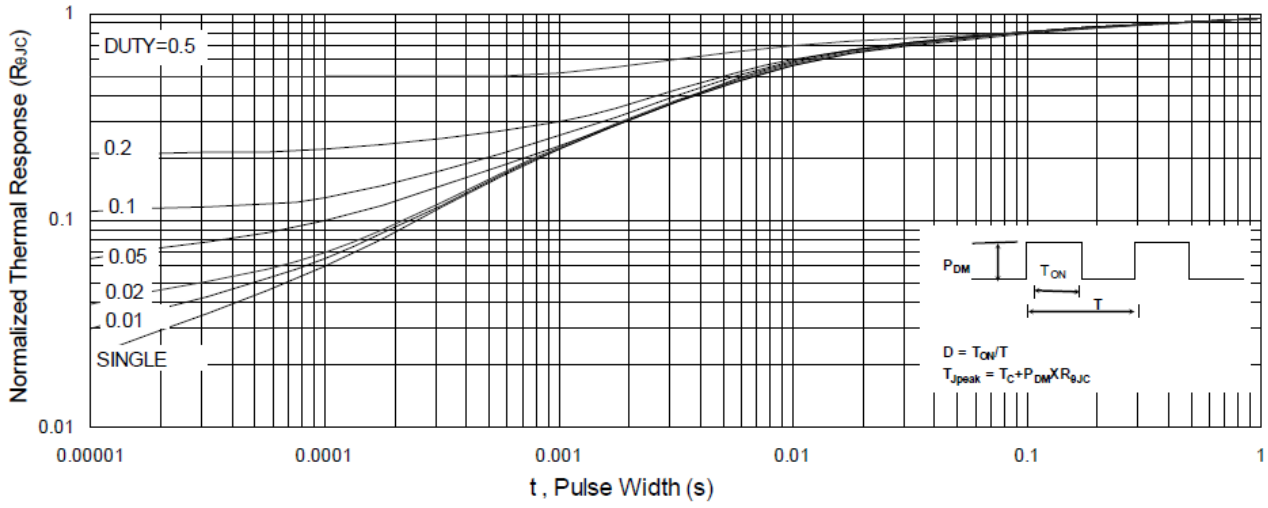



Fig.9 Normalized Maximum Transient Thermal Impedance

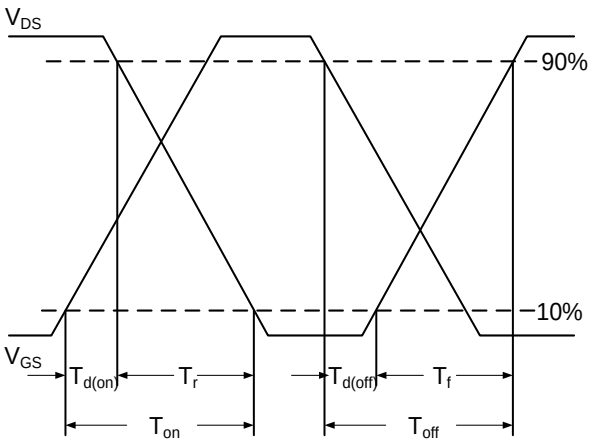



Fig.10 Switching Time Waveform

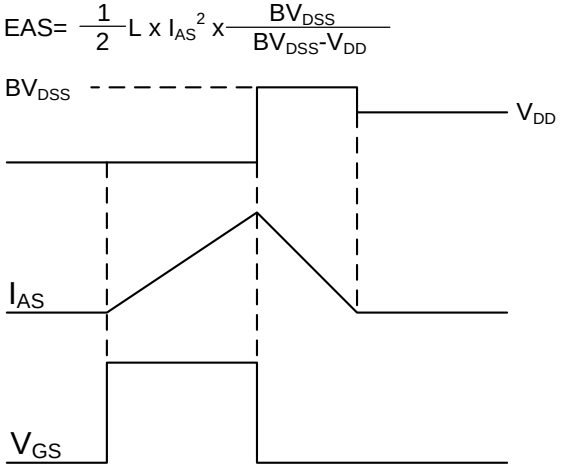
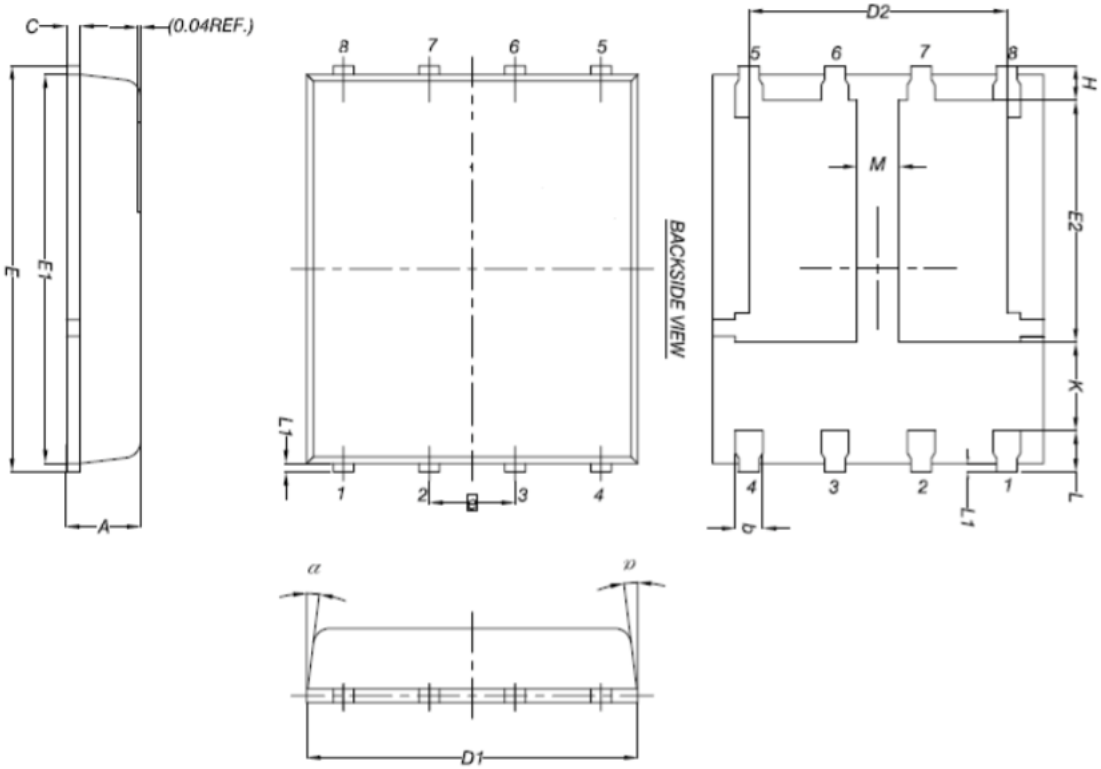



Fig.11 Unclamped Inductive Switching

# PRPAK5x6-8L Dual EP2 Package Outline




| SYMBOLS | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.90 | 1.17 | 0.035 | 0.046 |
| b | 0.33 | 0.51 | 0.013 | 0.020 |
| C | 0.20 | 0.30 | 0.008 | 0.012 |
| D1 | 4.80 | 5.20 | 0.189 | 0.205 |
| D2 | 3.61 | 3.96 | 0.142 | 0.156 |
| E | 5.90 | 6.15 | 0.232 | 0.242 |
| E1 | 5.70 | 5.85 | 0.224 | 0.230 |
| E2 | 3.30 | 3.78 | 0.130 | 0.149 |
| e | 1.27 BSC | | 0.05 BSC | |
| H | 0.38 | 0.61 | 0.015 | 0.024 |
| K | 1.10 | --- | 0.043 | --- |
| L | 0.38 | 0.61 | 0.015 | 0.024 |
| L1 | 0.05 | 0.25 | 0.002 | 0.010 |
| M | 0.50 | --- | 0.020 | --- |
| α | 0° | 12° | 0° | 12° |