

## General Description

The HSBA6133 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 HSBA6133 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

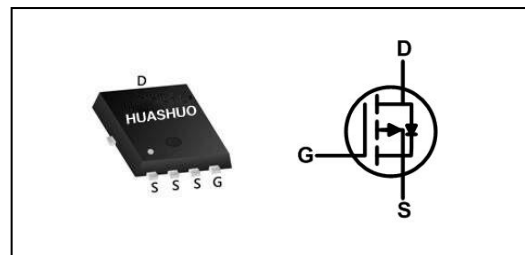
## Product Summary

|                  |     |    |
|------------------|-----|----|
| $V_{DS}$         | -60 | V  |
| $R_{DS(ON),max}$ | 18  | mΩ |
| $I_D$            | -45 | A  |

## Features

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

## PRPAK5\*6 Pin Configuration



## Absolute Maximum Ratings

| Symbol                      | Parameter                                  | Rating     | Units            |
|-----------------------------|--------------------------------------------|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                       | -60        | V                |
| $V_{GS}$                    | Gate-Source Voltage                        | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current                   | -45        | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current                   | -28        | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>1</sup>          | -175       | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>2</sup> | 310        | mJ               |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation                    | 68         | W                |
| $P_D@T_C=100^\circ\text{C}$ | Total Power Dissipation                    | 27         | W                |
| $T_{STG}$                   | Storage Temperature Range                  | -55 to 150 | $^\circ\text{C}$ |
| $T_J$                       | Operating Junction Temperature Range       | -55 to 150 | $^\circ\text{C}$ |

## Thermal Data

| Symbol          | Parameter                           | Typ. | Max. | Unit               |
|-----------------|-------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient | ---  | 62   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case    | ---  | 1.8  | $^\circ\text{C/W}$ |



**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    |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A                                               | ---  | 18   | 22.5 | mΩ   |
|                     |                                                | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A                                              | ---  | 22   | 29.5 |      |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                                 | -1.0 | -1.8 | -2.5 | V    |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                          | ---  | ---  | -1   | uA   |
|                     |                                                | V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                          | ---  | ---  | -100 |      |
| 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> =-5V, I <sub>D</sub> =-20A                                                | ---  | 40   | ---  | S    |
| R <sub>g</sub>      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                          | ---  | 3.3  | ---  | Ω    |
| Q <sub>g</sub>      | Total Gate Charge                              | V <sub>DS</sub> =-30V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A                        | ---  | 75   | ---  | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                             |                                                                                           | ---  | 14   | ---  |      |
| Q <sub>gd</sub>     | Gate-Drain Charge                              |                                                                                           | ---  | 13   | ---  |      |
| T <sub>d(on)</sub>  | Turn-On Delay Time                             | V <sub>DD</sub> =-10V, V <sub>GS</sub> =-30V, R <sub>G</sub> =3Ω,<br>R <sub>L</sub> =1.5Ω | ---  | 15   | ---  | ns   |
| T <sub>r</sub>      | Rise Time                                      |                                                                                           | ---  | 40   | ---  |      |
| T <sub>d(off)</sub> | Turn-Off Delay Time                            |                                                                                           | ---  | 175  | ---  |      |
| T <sub>f</sub>      | Fall Time                                      |                                                                                           | ---  | 52   | ---  |      |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, f=1MHz                                        | ---  | 5328 | ---  | pF   |
| C <sub>oss</sub>    | Output Capacitance                             |                                                                                           | ---  | 225  | ---  |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   |                                                                                           | ---  | 180  | ---  |      |

**Diode Characteristics**

| Symbol          | Parameter                          | Conditions                                                      | Min. | Typ. | Max. | Unit |
|-----------------|------------------------------------|-----------------------------------------------------------------|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current          | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current               | ---  | ---  | -45  | A    |
| V <sub>SD</sub> | Diode Forward Voltage <sup>3</sup> | V <sub>GS</sub> =0V, I <sub>S</sub> =-20A, T <sub>J</sub> =25°C | ---  | ---  | -1.2 | V    |
| T <sub>rr</sub> | Reverse Recovery Time              | I <sub>F</sub> =20A, di/dt=100A/μs, T <sub>J</sub> =25°C        | ---  | 26   | ---  | ns   |
| Q <sub>rr</sub> | Reverse Recovery Charge            |                                                                 | ---  | 27   | ---  | nC   |

Note :

1.Repetitive Rating: Pulse width limited by maximum junction temperature.

2.EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=-40V, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH.

3.Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.



## Typical Characteristics

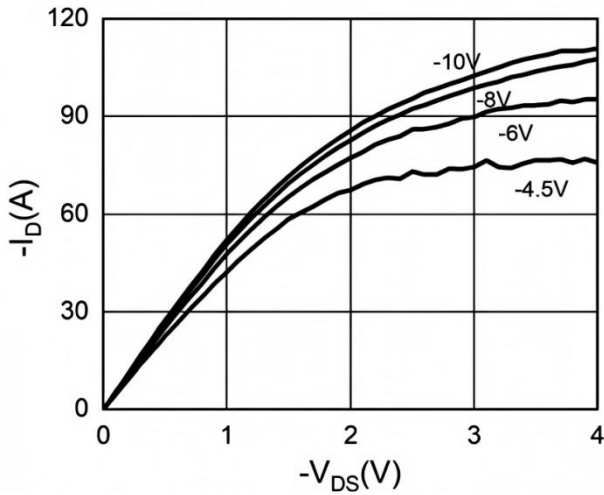


Figure 1. Output Characteristics

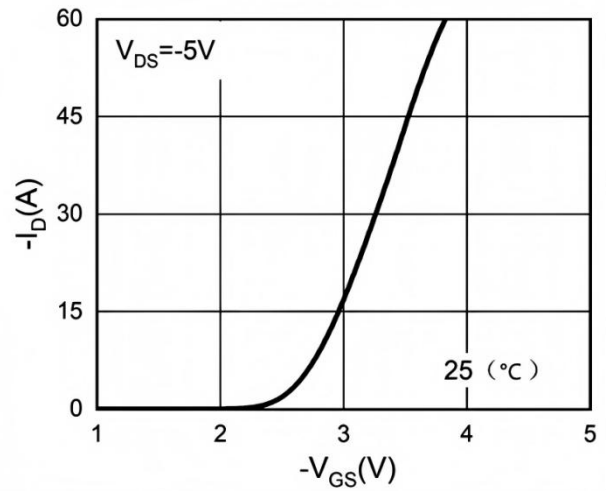


Figure 2. Transfer Characteristics

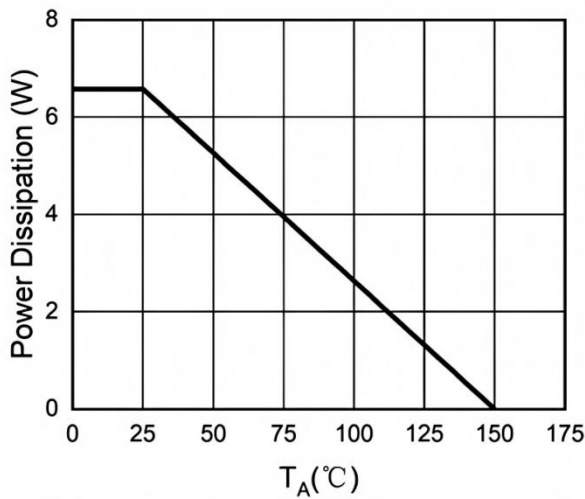


Figure 3. Power Dissipation

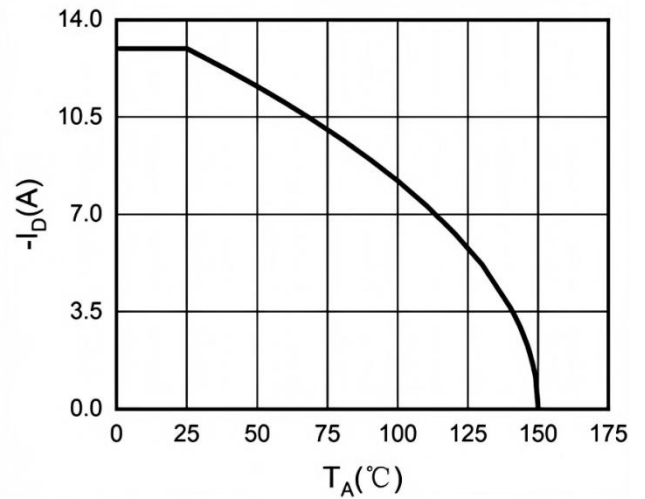


Figure 4. Drain Current

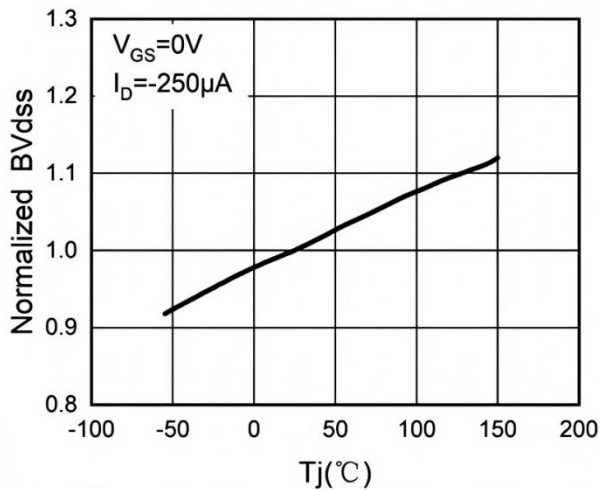


Figure 5.  $BV_{DSS}$  vs Junction Temperature

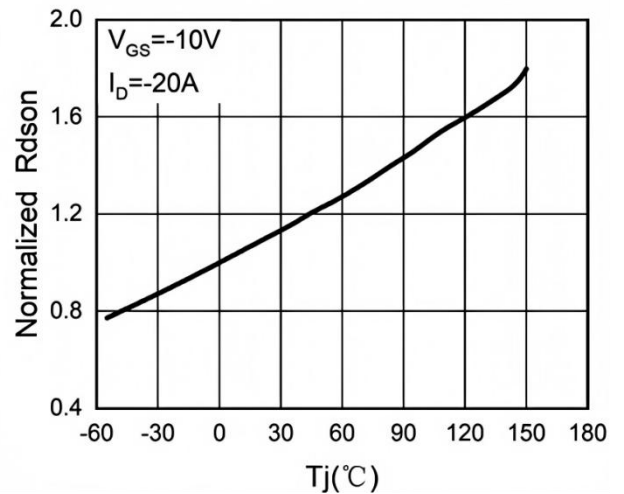
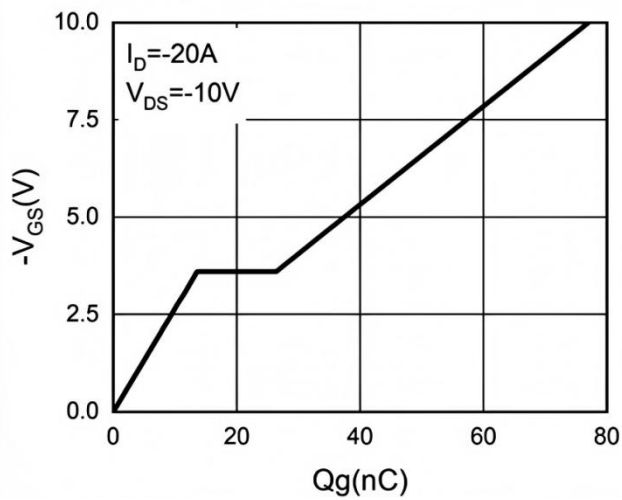
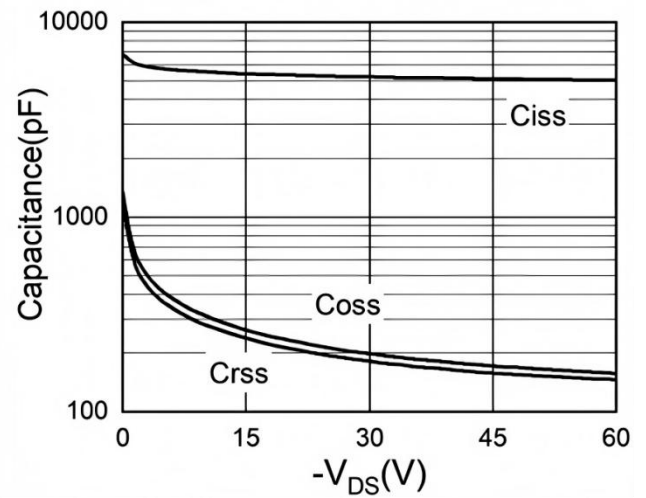


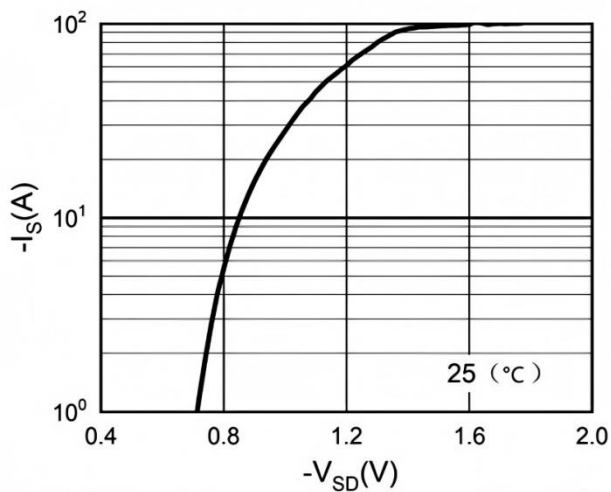
Figure 6.  $R_{DS(ON)}$  vs Junction Temperature



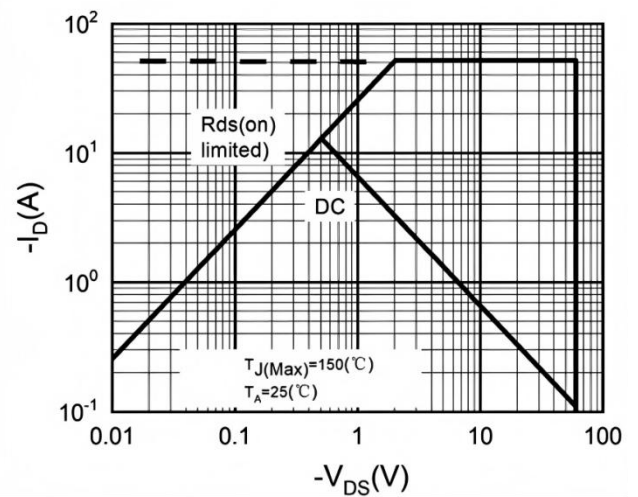
**Figure 7. Gate Charge Waveforms**



**Figure 8. Capacitance**



**Figure 9. Body-Diode Characteristics**



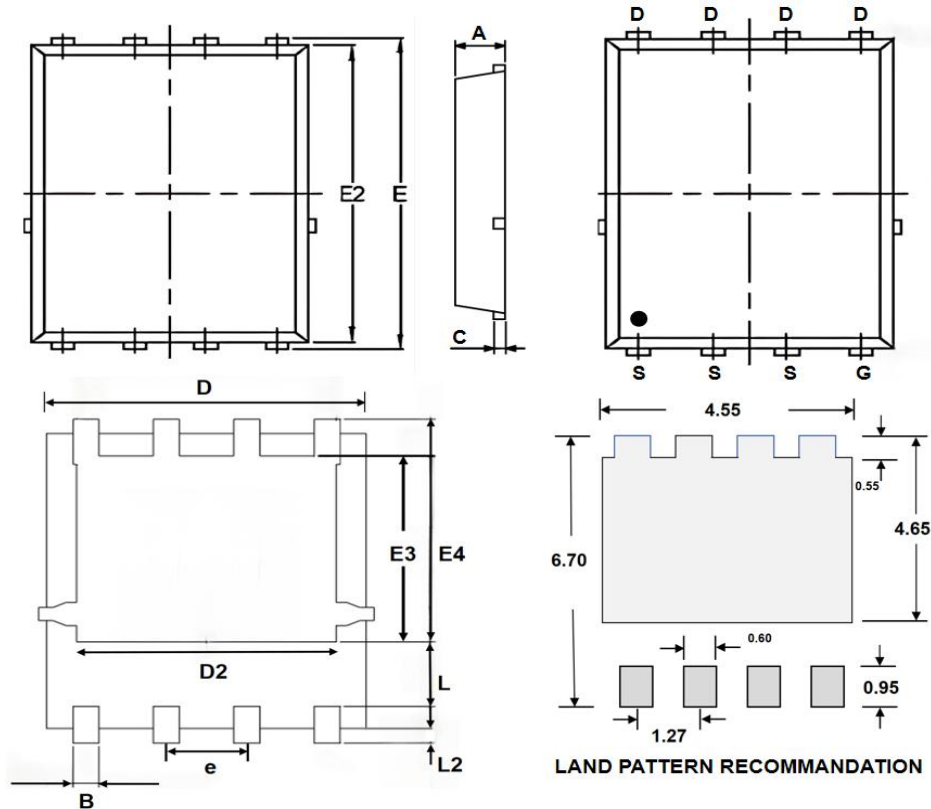
**Figure 10. Maximum Safe Operating Area**



## Ordering Information

| Part Number | Package code | Packaging      |
|-------------|--------------|----------------|
| HSBA6133    | PRPAK5*6     | 3000/Tape&Reel |

### PRPAK5\*6 Package Outline



| SYMBOLS | MILLIMETERS |      |      | INCHES |       |       |
|---------|-------------|------|------|--------|-------|-------|
|         | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A       | 0.80        | --   | 1.20 | 0.031  | --    | 0.047 |
| B       | 0.25        | --   | 0.51 | 0.012  | --    | 0.020 |
| C       | 0.15        | --   | 0.35 | 0.006  | --    | 0.014 |
| D       | 4.80        | --   | 5.45 | 0.189  | --    | 0.209 |
| D2      | 3.61        | --   | 4.35 | 0.142  | --    | 0.171 |
| E       | 5.90        | --   | 6.35 | 0.232  | --    | 0.250 |
| E2      | 5.42        | --   | 6.06 | 0.213  | --    | 0.232 |
| E3      | 3.23        | --   | 3.90 | 0.127  | --    | 0.154 |
| E4      | 3.69        | --   | 4.55 | 0.145  | --    | 0.179 |
| L       | 0.61        | --   | 1.80 | 0.024  | --    | 0.071 |
| L2      | 0.05        | --   | 0.36 | 0.002  | --    | 0.014 |
| e       | --          | 1.27 | --   | --     | 0.050 | --    |



## HSBA6133 Marking:

