

## General Description

The HSU4137 is the high cell density trench P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The HSU4137 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

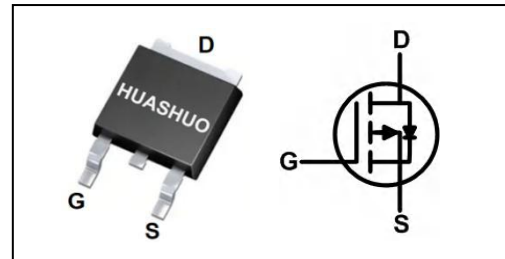
## Features

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

## Product Summary

|                  |     |    |
|------------------|-----|----|
| $V_{DS}$         | -40 | V  |
| $R_{DS(ON),Typ}$ | 15  | mΩ |
| $I_D$            | -40 | A  |

## TO252 Pin Configuration



## Absolute Maximum Ratings

| Symbol                      | Parameter                                  | Rating     | Units            |
|-----------------------------|--------------------------------------------|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                       | -40        | V                |
| $V_{GS}$                    | Gate-Source Voltage                        | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $-V_{GS}$ @ -10V | -40        | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $-V_{GS}$ @ -10V | -25        | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>1</sup>          | -160       | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>2</sup> | 187        | mJ               |
| $P_D@T_C=25^\circ\text{C}$  | Maximum Power Dissipation                  | 45         | W                |
| $P_D@T_C=100^\circ\text{C}$ | Maximum Power Dissipation                  | 19         | 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               |
|-----------------|----------------------------------|------|------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance Junction-Case | ---  | 2.7  | $^\circ\text{C/W}$ |



**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                 | $V_{GS}=0V$ , $I_D=-250\mu A$                                        | -40  | ---  | ---       | V         |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=-10V$ , $I_D=-20A$ , $T_J=25^{\circ}\text{C}$                | ---  | 15   | 18        | $m\Omega$ |
|              |                                                | $V_{GS}=-4.5V$ , $I_D=-15A$ , $T_J=25^{\circ}\text{C}$               | ---  | 19   | 25        |           |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=-250\mu A$                                    | -1.0 | -1.7 | -2.5      | V         |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=-40V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$               | ---  | ---  | -1        | $\mu A$   |
|              |                                                | $V_{DS}=-40V$ , $V_{GS}=0V$ , $T_J=55^{\circ}\text{C}$               | ---  | ---  | -100      |           |
| $I_{GSS}$    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                                       | ---  | ---  | $\pm 100$ | nA        |
| $g_{fs}$     | Forward Transconductance                       | $V_{DS}=-5V$ , $I_D=-20A$                                            | ---  | 36   | ---       | S         |
| $Q_g$        | Total Gate Charge                              | $V_{DS}=-20V$ , $V_{GS}=-10V$ , $I_D=-20A$                           | ---  | 61   | ---       | nC        |
| $Q_{gs}$     | Gate-Source Charge                             |                                                                      | ---  | 9    | ---       |           |
| $Q_{gd}$     | Gate-Drain Charge                              |                                                                      | ---  | 13   | ---       |           |
| $T_{d(on)}$  | Turn-On Delay Time                             | $V_{DS}=-20V$ , $V_{GS}=-10V$ , $R_L=1\Omega$ ,<br>$R_{GEN}=3\Omega$ | ---  | 10   | ---       | ns        |
| $T_r$        | Rise Time                                      |                                                                      | ---  | 16   | ---       |           |
| $T_{d(off)}$ | Turn-Off Delay Time                            |                                                                      | ---  | 40   | ---       |           |
| $T_f$        | Fall Time                                      |                                                                      | ---  | 18   | ---       |           |
| $C_{iss}$    | Input Capacitance                              | $V_{DS}=-20V$ , $V_{GS}=0V$ , $f=1\text{MHz}$                        | ---  | 2502 | ---       | pF        |
| $C_{oss}$    | Output Capacitance                             |                                                                      | ---  | 170  | ---       |           |
| $C_{rss}$    | Reverse Transfer Capacitance                   |                                                                      | ---  | 140  | ---       |           |

**Diode Characteristics**

| Symbol   | Parameter                          | Conditions                                                | Min. | Typ. | Max. | Unit |
|----------|------------------------------------|-----------------------------------------------------------|------|------|------|------|
| $I_S$    | Source-Drain Current(Body Diode)   | $V_G=V_D=0V$ , Force Current                              | ---  | ---  | -40  | A    |
| $T_{rr}$ | Reverse Recovery Time              | $I_F=20A$ , $dI/dt=100A/\mu s$ , $T_J=25^{\circ}\text{C}$ | ---  | 18   | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge            |                                                           | ---  | 10   | ---  | nC   |
| $V_{SD}$ | Diode Forward Voltage <sup>3</sup> | $V_{GS}=0V$ , $I_S=-20A$ , $T_J=25^{\circ}\text{C}$       | ---  | ---  | -1.2 | V    |

Note :

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

2.EAS condition :  $T_J=25^{\circ}\text{C}$ ,  $V_{DD}=-40V$ ,  $V_G=-10V$ ,  $R_g=25\Omega$ ,  $L=0.5mH$ .

3.Repetitive Rating : Pluse width limited by maximum junction temperature.



## Typical Characteristics

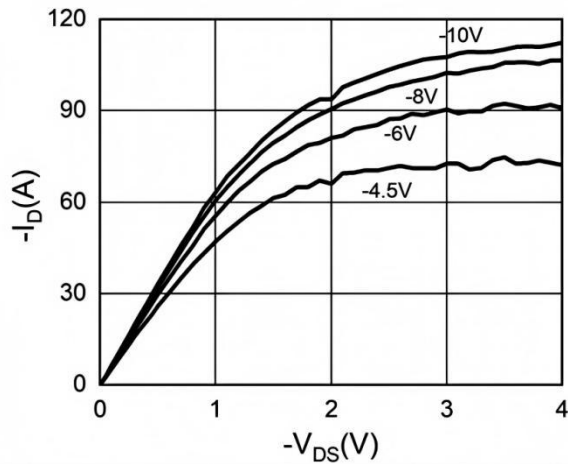


Figure 1. Output Characteristics

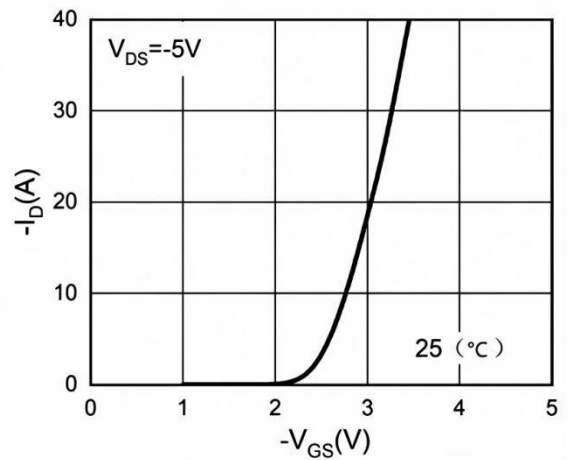


Figure 2. Transfer Characteristics

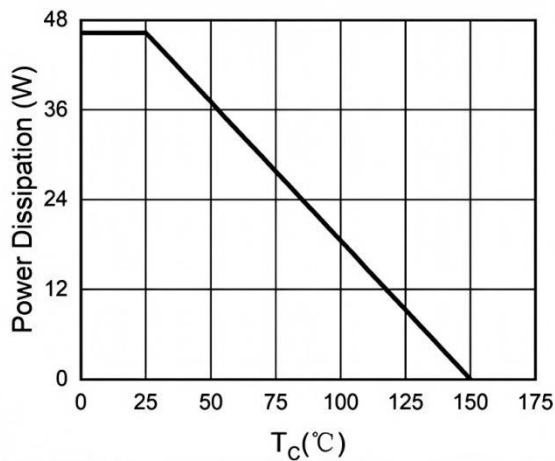


Figure 3. Power Dissipation

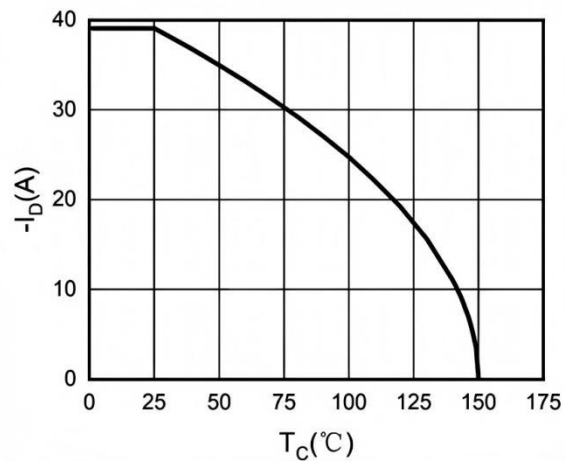


Figure 4. Drain Current

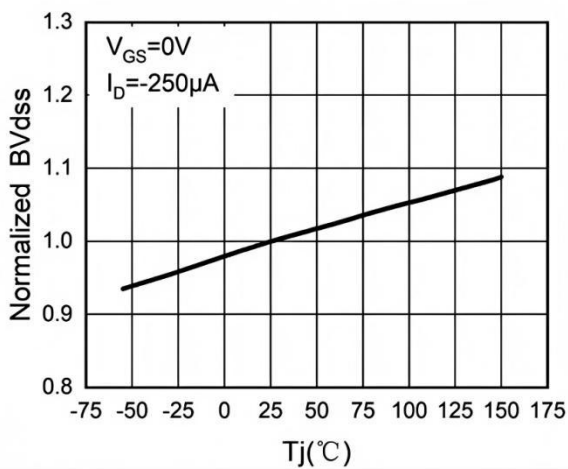


Figure 5. BVDSS vs Junction Temperature

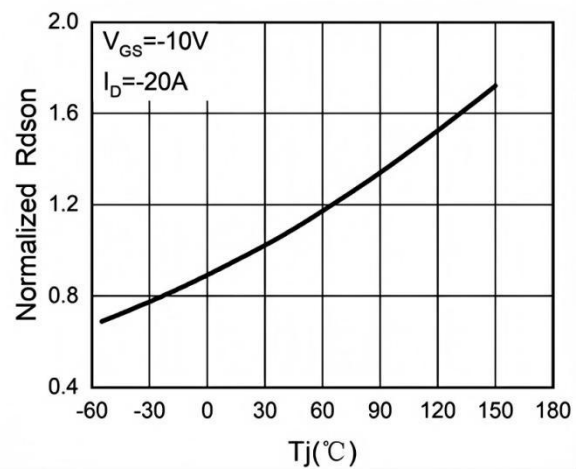
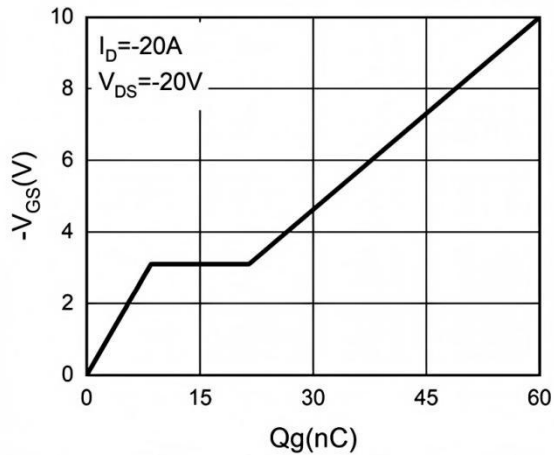


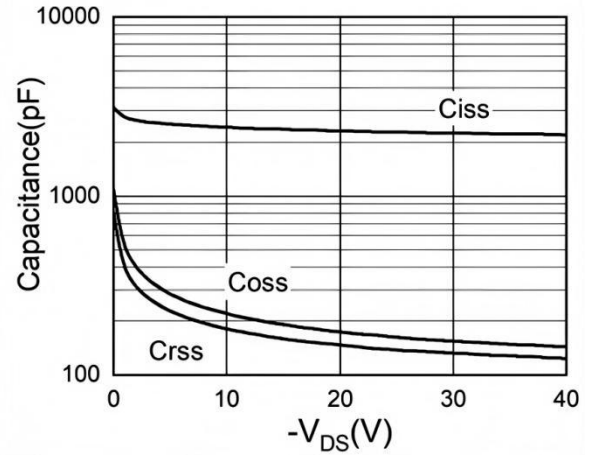
Figure 6.  $R_{DS(ON)}$  vs Junction Temperature



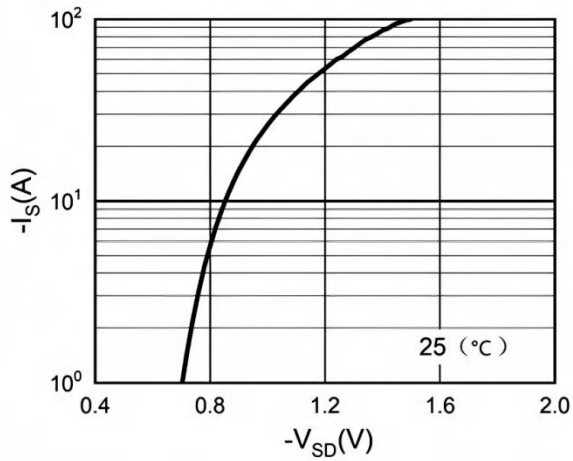
**P-Ch 60V Fast Switching MOSFETs**



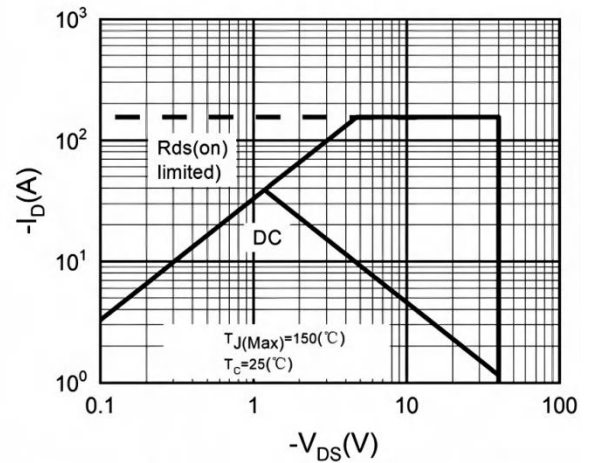
**Figure 7. Gate Charge Waveforms**



**Figure 8. Capacitance**



**Figure 9. Body-Diode Characteristics**



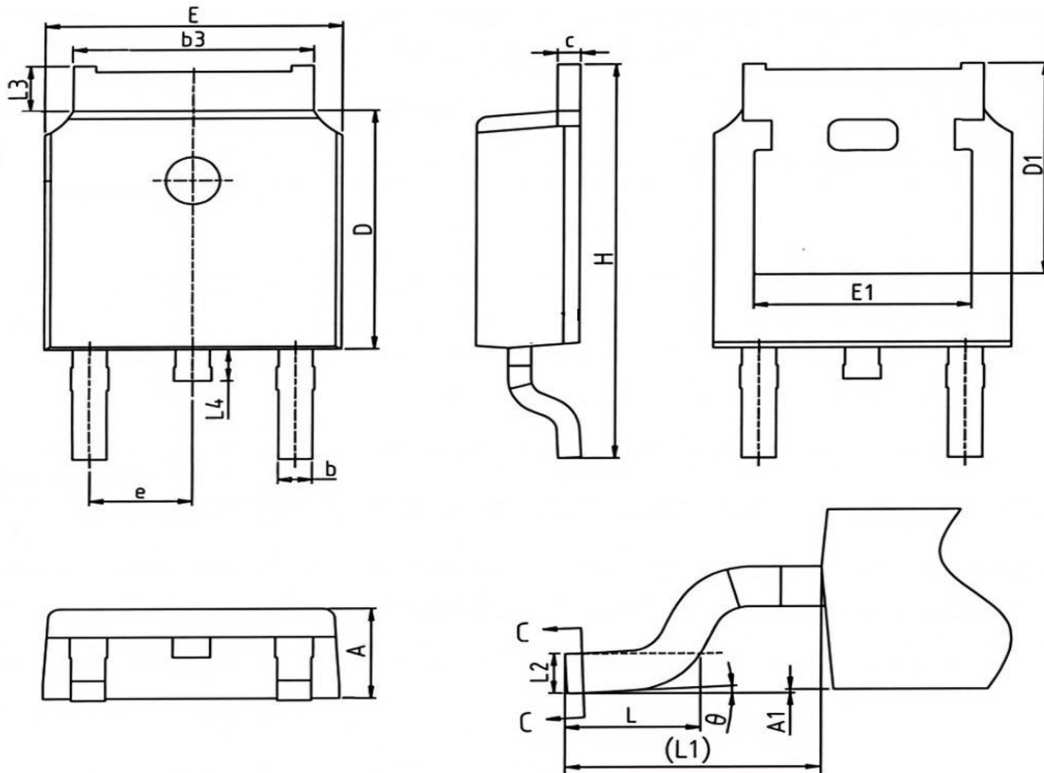
**Figure 10. Maximum Safe Operating Area**



## Ordering Information

| Part Number | Package code | Packaging      |
|-------------|--------------|----------------|
| HSU4137     | TO252        | 2500/Tape&Reel |

**TO252 Package Outline**



| SYMBOLS | MILLIMETERS |      | INCHES   |       |
|---------|-------------|------|----------|-------|
|         | MIN         | MAX  | MIN      | MAX   |
| A       | 2.18        | 2.40 | 0.086    | 0.095 |
| A1      | -           | 0.2  | -        | 0.008 |
| b       | 0.68        | 0.9  | 0.026    | 0.036 |
| b3      | 4.95        | 5.46 | 0.194    | 0.215 |
| C       | 0.43        | 0.89 | 0.017    | 0.035 |
| D       | 5.97        | 6.22 | 0.235    | 0.245 |
| D1      | 5.300REF    |      | 0.209REF |       |
| E       | 6.35        | 6.73 | 0.250    | 0.265 |
| E1      | 4.32        | ---  | 0.170    | -     |
| e       | 2.286BSC    |      | 0.09BSC  |       |
| H       | 9.4         | 10.5 | 0.370    | 0.413 |
| L       | 1.38        | 1.78 | 0.054    | 0.070 |
| L1      | 2.90REF     |      | 0.114REF |       |
| L2      | 0.51BSC     |      | 0.020BSC |       |
| L3      | 0.88        | 1.28 | 0.034    | 0.050 |
| L4      | 0.5         | 1    | 0.019    | 0.039 |
| θ       | 0°          | 8°   | 0°       | 8°    |



## HSU4137 Marking:

