



## Description

The HBSC052N03LS uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS} = 30V$   $I_D = 70A$

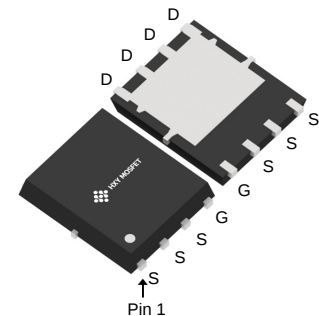
$R_{DS(ON)} < 7\text{ m}\Omega$   $V_{GS}=10V$

## Application

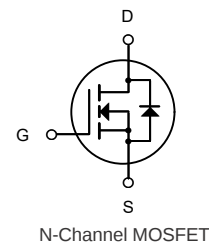
Battery protection

Load switch

Uninterruptible power supply



DFN5X6-8L  
(DFN-8(5x6))



## Package Marking and Ordering Information

| Product ID   | Pack                  | Brand      | Qty(PCS) |
|--------------|-----------------------|------------|----------|
| HBSC052N03LS | DFN5X6-8L(DFN-8(5x6)) | HXY MOSFET | 5000     |

## Absolute Maximum Ratings ( $T_c=25^{\circ}\text{C}$ unless otherwise noted)

| Symbol                        | Parameter                                        | Rating     | Units                |
|-------------------------------|--------------------------------------------------|------------|----------------------|
| $V_{DS}$                      | Drain-Source Voltage                             | 30         | V                    |
| $V_{GS}$                      | Gate-Source Voltage                              | $\pm 20$   | V                    |
| $I_D@T_c=25^{\circ}\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$       | 70         | A                    |
| $I_D@T_c=100^{\circ}\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$       | 40         | A                    |
| $I_{DM}$                      | Pulsed Drain Current <sup>2</sup>                | 140        | A                    |
| EAS                           | Single Pulse Avalanche Energy <sup>3</sup>       | 115.2      | mJ                   |
| $I_{AS}$                      | Avalanche Current                                | 48         | A                    |
| $P_D@T_c=25^{\circ}\text{C}$  | Total Power Dissipation <sup>4</sup>             | 59         | W                    |
| $P_D@T_A=25^{\circ}\text{C}$  | Total Power Dissipation <sup>4</sup>             | 2          | W                    |
| $T_{STG}$                     | Storage Temperature Range                        | -55 to 150 | $^{\circ}\text{C}$   |
| $T_J$                         | Operating Junction Temperature Range             | -55 to 150 | $^{\circ}\text{C}$   |
| $R_{\theta JA}$               | Thermal Resistance Junction-Ambient <sup>1</sup> | 62         | $^{\circ}\text{C/W}$ |
| $R_{\theta JC}$               | Thermal Resistance Junction-Case <sup>1</sup>    | 2.1        | $^{\circ}\text{C/W}$ |



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

| Symbol                       | Parameter                                      | Conditions                                                 | Min. | Typ.  | Max.      | Unit                 |
|------------------------------|------------------------------------------------|------------------------------------------------------------|------|-------|-----------|----------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                               | 30   | ---   | ---       | V                    |
| $\Delta BV_{DSS}/\Delta T_J$ | BVDSS Temperature Coefficient                  | Reference to $25^\circ\text{C}$ , $I_D=1mA$                | ---  | 0.028 | ---       | V/ $^\circ\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=30A$                                   | ---  | 5.7   | 7         | m $\Omega$           |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=15A$                                  | ---  | 11    | 13        |                      |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                           | 1.2  | ---   | 2.5       | V                    |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                            | ---  | -6.16 | ---       | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$        | ---  | ---   | 1         | $\mu A$              |
|                              |                                                | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$        | ---  | ---   | 5         |                      |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                             | ---  | ---   | $\pm 100$ | nA                   |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=30A$                                    | ---  | 43    | ---       | S                    |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                       | ---  | 1.7   | ---       | $\Omega$             |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=15V$ , $V_{GS}=4.5V$ , $I_D=15A$                   | ---  | 20    | ---       | nC                   |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                            | ---  | 7.6   | ---       |                      |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                            | ---  | 7.2   | ---       |                      |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=15V$ , $V_{GS}=10V$ ,<br>$R_G=3.3$<br>$I_D=15A$    | ---  | 7.8   | ---       | ns                   |
| $T_r$                        | Rise Time                                      |                                                            | ---  | 15    | ---       |                      |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                            | ---  | 37.3  | ---       |                      |
| $T_f$                        | Fall Time                                      |                                                            | ---  | 10.6  | ---       |                      |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1MHz$                      | ---  | 2295  | ---       | pF                   |
| $C_{oss}$                    | Output Capacitance                             |                                                            | ---  | 267   | ---       |                      |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                            | ---  | 210   | ---       |                      |
| $I_S$                        | Continuous Source Current <sup>1,5</sup>       | $V_G=V_D=0V$ , Force Current                               | ---  | ---   | 81        | A                    |
| $I_{SM}$                     | Pulsed Source Current <sup>2,5</sup>           |                                                            | ---  | ---   | 160       | A                    |
| $V_{SD}$                     | Diode Forward Voltage <sup>2</sup>             | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$            | ---  | ---   | 1         | V                    |
| $t_{rr}$                     | Reverse Recovery Time                          | $I_F=30A$ , $dI/dt=100A/\mu s$ ,<br>$T_J=25^\circ\text{C}$ | ---  | 14    | ---       | nS                   |
| $Q_{rr}$                     | Reverse Recovery Charge                        |                                                            | ---  | 5     | ---       | nC                   |

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=25V$ ,  $V_{GS}=10V$ ,  $L=0.1mH$ ,  $I_{AS}=48A$
- 4.The power dissipation is limited by  $150^\circ\text{C}$  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.



## Typical Characteristics

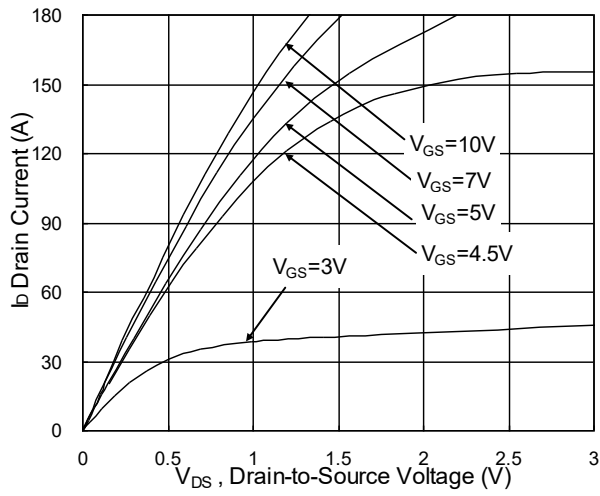


Fig.1 Typical Output Characteristics

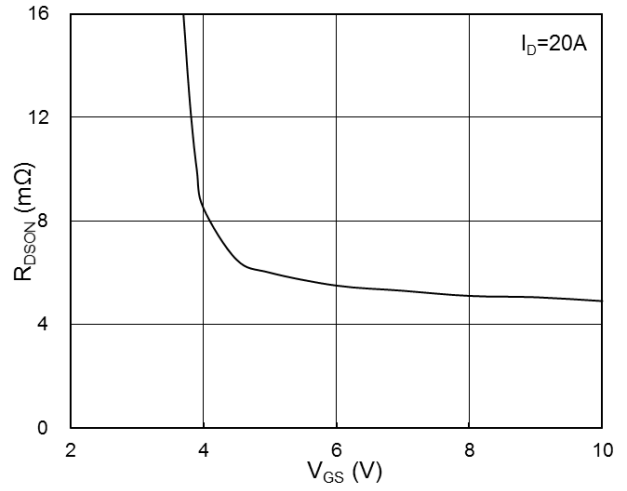


Fig.2 On-Resistance vs. G-S Voltage

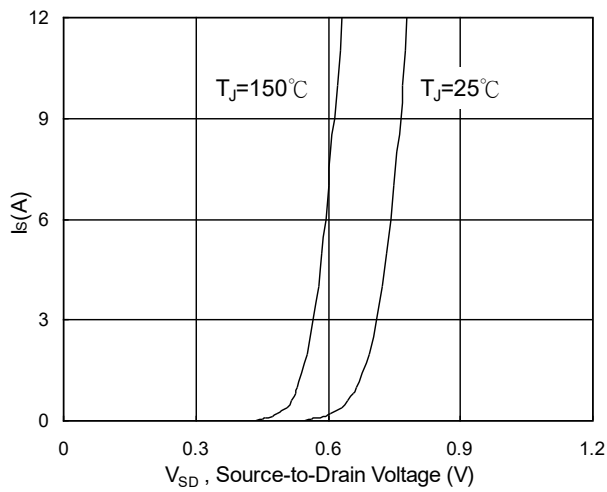


Fig.3 Forward Characteristics of Reverse

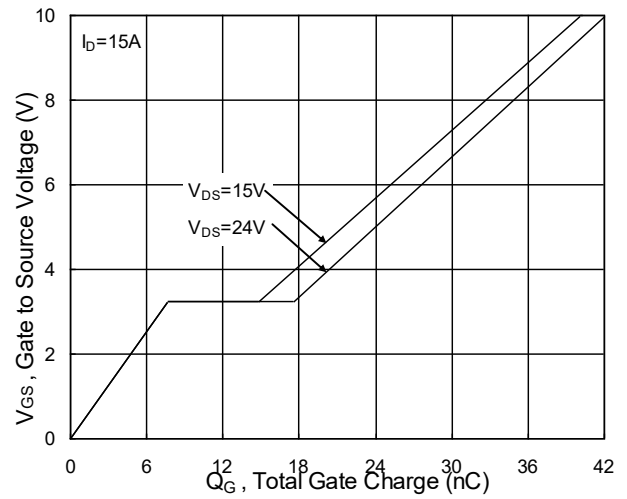


Fig.4 Gate-Charge Characteristics

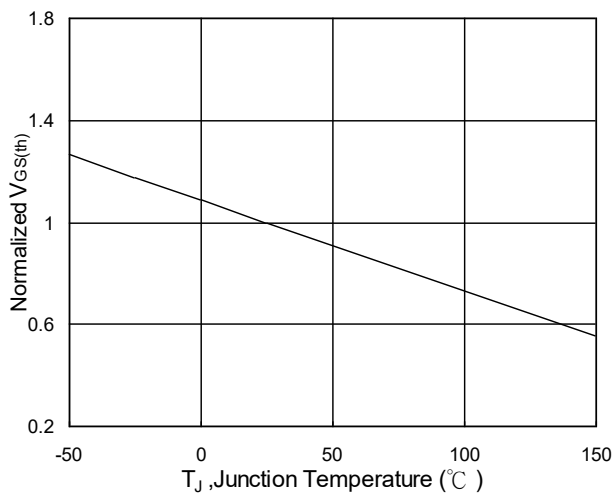


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

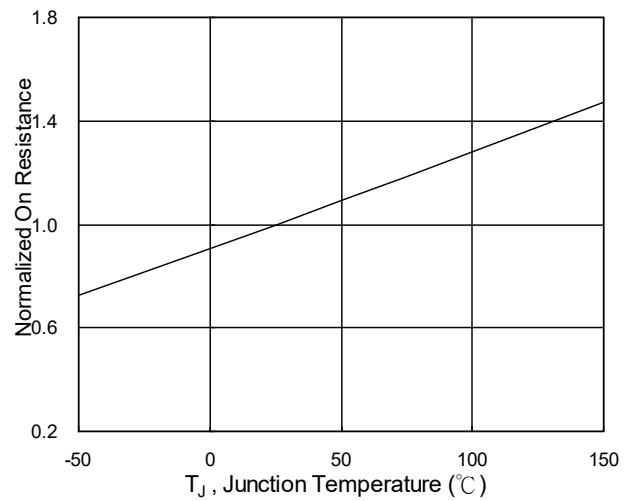


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

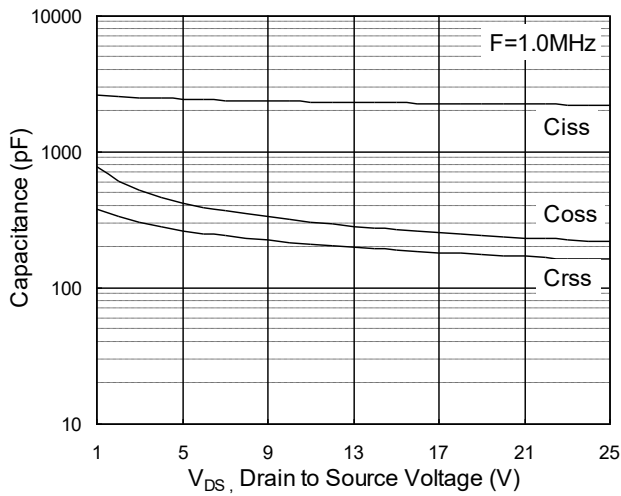


Fig.7 Capacitance

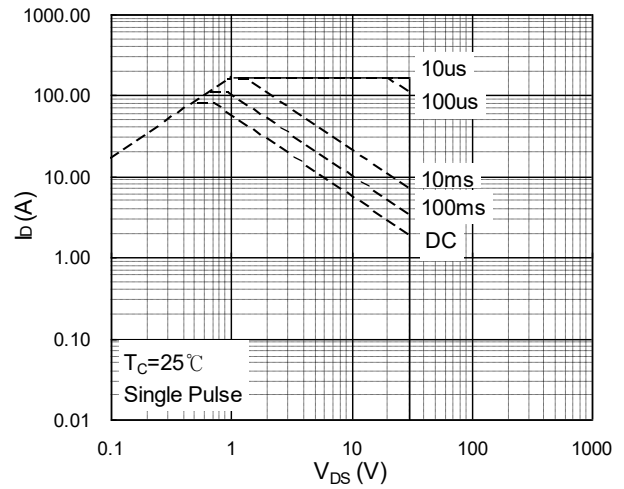


Fig.8 Safe Operating Area

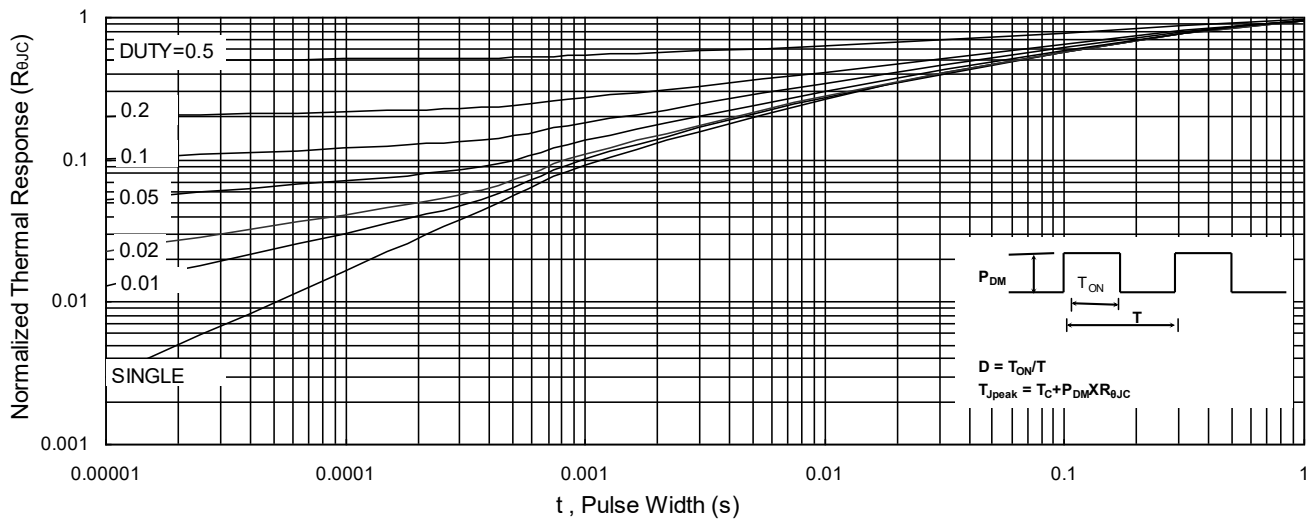


Fig.9 Normalized Maximum Transient Thermal Impedance

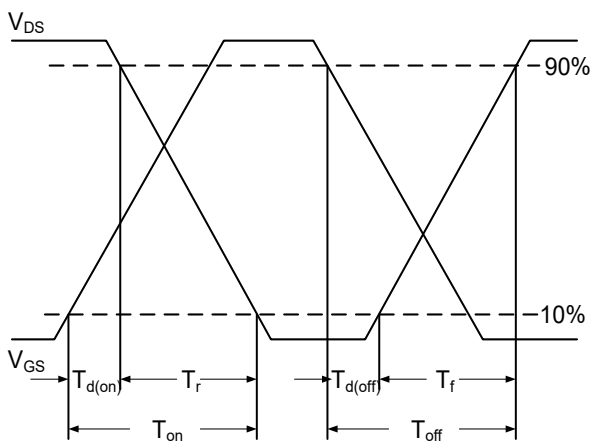


Fig.10 Switching Time Waveform

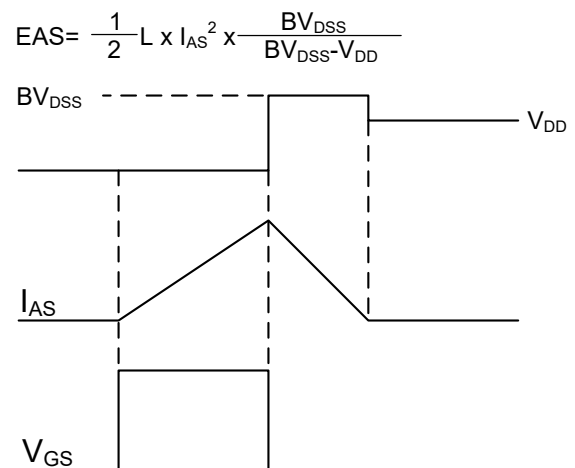
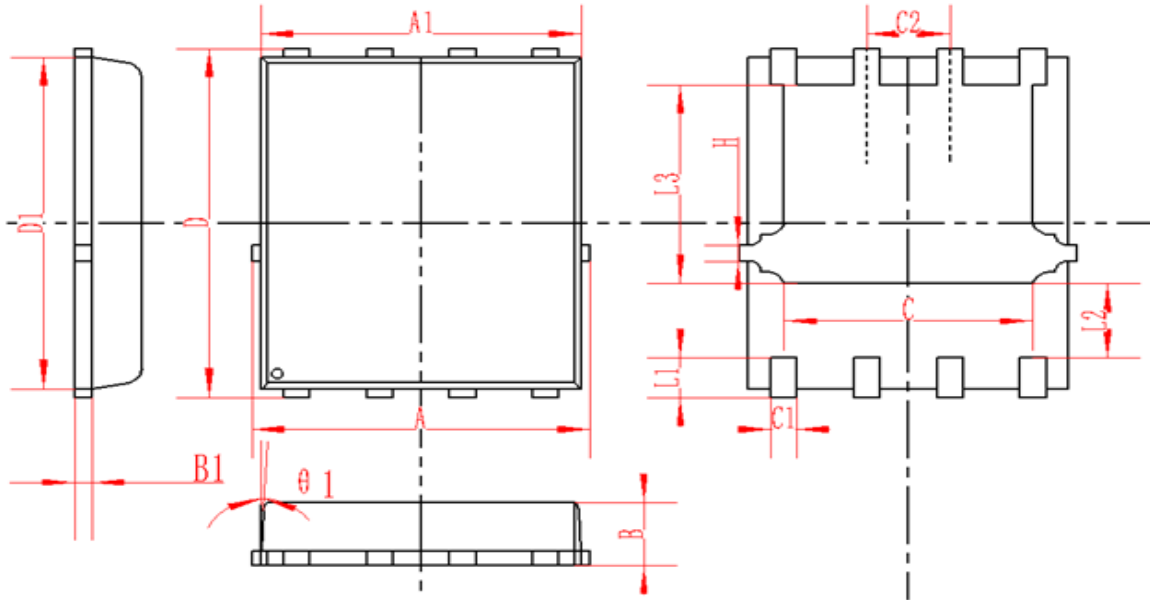


Fig.11 Unclamped Inductive Switching Waveform



## DFN5X6-8L(DFN-8(5x6)) Package Information



| SYMBOL | MM       |      |       | INCH     |       |       |
|--------|----------|------|-------|----------|-------|-------|
|        | MIN      | NOM  | MAX   | MIN      | NOM   | MAX   |
| A      | 4.95     | 5    | 5.05  | 0.195    | 0.197 | 0.199 |
| A1     | 4.82     | 4.9  | 4.98  | 0.190    | 0.193 | 0.196 |
| D      | 5.98     | 6    | 6.02  | 0.235    | 0.236 | 0.237 |
| D1     | 5.67     | 5.75 | 5.83  | 0.223    | 0.226 | 0.230 |
| B      | 0.9      | 0.95 | 1     | 0.035    | 0.037 | 0.039 |
| B1     | 0.254REF |      |       | 0.010REF |       |       |
| C      | 3.95     | 4    | 4.05  | 0.156    | 0.157 | 0.159 |
| C1     | 0.35     | 0.4  | 0.45  | 0.014    | 0.016 | 0.018 |
| C2     | 1.27TYP  |      |       | 0.5TYP   |       |       |
| θ1     | 8°       | 10°  | 12°   | 8°       | 10°   | 12°   |
| L1     | 0.63     | 0.64 | 0.65  | 0.025    | 0.025 | 0.026 |
| L2     | 1.2      | 1.3  | 1.4   | 0.047    | 0.051 | 0.055 |
| L3     | 3.415    | 3.42 | 3.425 | 0.134    | 0.135 | 0.135 |
| H      | 0.24     | 0.25 | 0.26  | 0.009    | 0.010 | 0.010 |



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