



## Description

The SIRA12DP-T1-GE3 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

$V_{DS} = 30V$   $I_D = 120A$

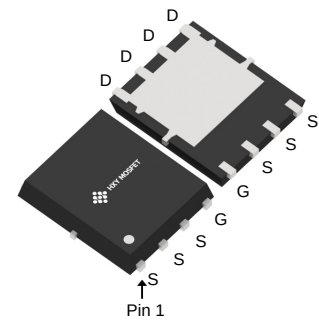
$R_{DS(ON)} < 2.6m\Omega$   $V_{GS} = 10V$

## Application

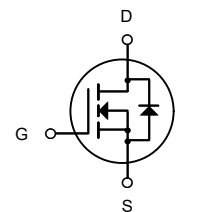
Battery protection

Load switch

Uninterruptible power supply



DFN5X6-8L



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID      | Pack      | Brand      | Qty(PCS) |
|-----------------|-----------|------------|----------|
| SIRA12DP-T1-GE3 | DFN5X6-8L | HXY MOSFET | 5000     |

## Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

| Symbol                    | Parameter                                     | Rating     | Units        |
|---------------------------|-----------------------------------------------|------------|--------------|
| $V_{DS}$                  | Drain-Source Voltage                          | 30         | V            |
| $V_{GS}$                  | Gate-Source Voltage                           | $\pm 20$   | V            |
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$      | 120        | A            |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$      | 57         | A            |
| $I_{DM}$                  | Pulsed Drain Current                          | 360        | A            |
| EAS                       | Single Pulse Avalanche Energy                 | 125        | mJ           |
| $P_D$                     | Total Power Dissipation <sup>4</sup>          | 115        | W            |
| $T_{STG}$                 | Storage Temperature Range                     | -55 to 175 | $^\circ C$   |
| $T_J$                     | Operating Junction Temperature Range          | -55 to 175 | $^\circ C$   |
| $R_{\theta JA}$           | Thermal Resistance Junction-Ambient           | 62         | $^\circ C/W$ |
| $R_{\theta JC}$           | Thermal Resistance Junction-Case <sup>2</sup> | 1.3        | $^\circ C/W$ |



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

| Symbol                             | Parameter                                       | Conditions                                                                           | Min | Typ  | Max  | Units |
|------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------|-----|------|------|-------|
| Off Characteristics                |                                                 |                                                                                      |     |      |      |       |
| BV <sub>DSS</sub>                  | Drain-Source Breakdown Voltage                  | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                           | 30  | ---  | ---  | V     |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current                 | V <sub>GS</sub> =0V, V <sub>DS</sub> =30V                                            | --- | ---  | 1    | μA    |
| I <sub>GSS</sub>                   | Gate-Source Leakage Current                     | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0A                                           | --- | ---  | ±100 | nA    |
| On Characteristics <sup>3</sup>    |                                                 |                                                                                      |     |      |      |       |
| V <sub>GS(th)</sub>                | Gate-Source Threshold Voltage                   | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μ A                            | 1   | 1.6  | 2.5  | V     |
| R <sub>DS(ON)</sub>                | Drain-Source On Resistance <sup>2</sup>         | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                            | --- | 2.6  | 3.3  | mΩ    |
|                                    |                                                 | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                           | --- | 3.8  | 5    |       |
| Dynamic Characteristics            |                                                 |                                                                                      |     |      |      |       |
| C <sub>iss</sub>                   | Input Capacitance                               | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                                    | --- | 2218 | ---  | pF    |
| C <sub>oss</sub>                   | Output Capacitance                              |                                                                                      | --- | 480  | ---  |       |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance                    |                                                                                      | --- | 340  | ---  |       |
| Switching Characteristics          |                                                 |                                                                                      |     |      |      |       |
| t <sub>d(on)</sub>                 | Turn-On Delay Time <sup>3, 4</sup>              | V <sub>DD</sub> =15V, I <sub>D</sub> =15A, R <sub>G</sub> =3.3Ω V <sub>GS</sub> =10V | --- | 12.6 | ---  | ns    |
| t <sub>r</sub>                     | Rise Time <sup>3, 4</sup>                       |                                                                                      | --- | 19.5 | ---  | ns    |
| t <sub>d(off)</sub>                | Turn-Off Delay Time <sup>3, 4</sup>             |                                                                                      | --- | 42.8 | ---  | ns    |
| t <sub>f</sub>                     | Fall Time <sup>3, 4</sup>                       |                                                                                      | --- | 13.2 | ---  | ns    |
| Q <sub>g</sub>                     | Total Gate Charge <sup>3, 4</sup>               | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A                     | --- | 24   | ---  | nC    |
| Q <sub>gs</sub>                    | Gate-Source Charge <sup>3, 4</sup>              |                                                                                      | --- | 4.2  | ---  | nC    |
| Q <sub>gd</sub>                    | Gate-Drain “Miller” Charge <sup>3, 4</sup>      |                                                                                      | --- | 13   | ---  | nC    |
| Drain-Source Diode Characteristics |                                                 |                                                                                      |     |      |      |       |
| V <sub>SD</sub>                    | Source-Drain Diode Forward Voltage <sup>3</sup> | V <sub>GS</sub> =0V, I <sub>S</sub> =1A                                              | --- | ---  | 1    | V     |
| I <sub>S</sub>                     | Continuous Source Current                       | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current                                   | --- | ---  | 120  | A     |
| I <sub>SM</sub>                    | Pulsed Source Current                           |                                                                                      | --- | ---  | 360  | A     |
| T <sub>rr</sub>                    | Reverse Recovery Time                           | V <sub>GS</sub> =30V, I <sub>S</sub> =1A , di/dt=100A/μs                             | --- | 258  | ---  | NS    |
| Q <sub>rr</sub>                    | Reverse Recovery Charge                         | T <sub>J</sub> =25°C                                                                 | --- | 324  | ---  | NC    |

**Notes:**

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=50A, R_G=25\Omega, \text{Starting } T_J=25^{\circ}\text{C}$ .
3. The data tested by pulsed , pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
4. Essentially independent of operating temperature.



## Typical Characteristics

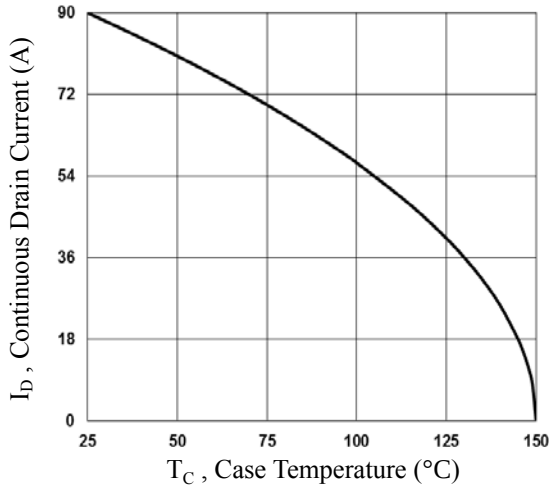


Fig.1 Continuous Drain Current vs.  $T_C$

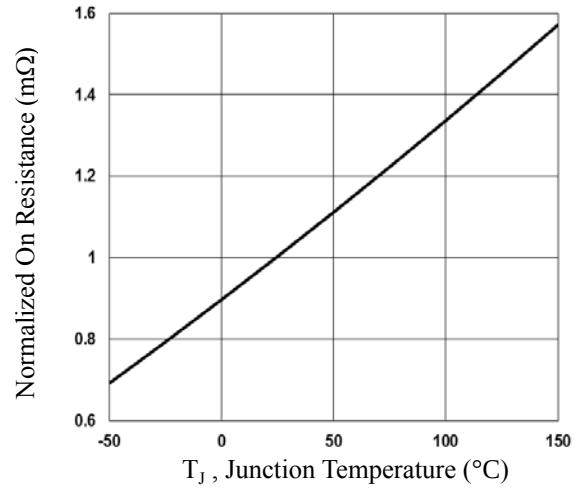


Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$

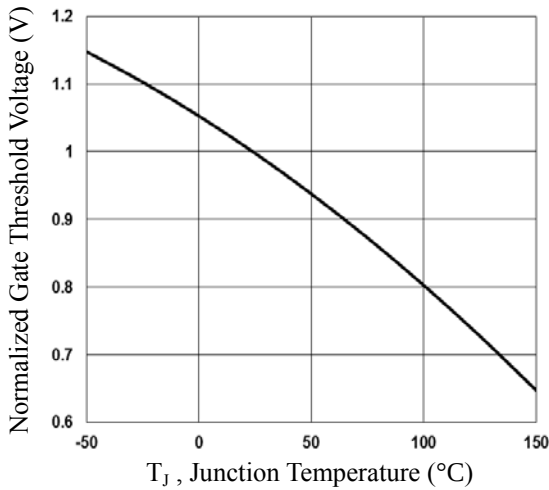


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

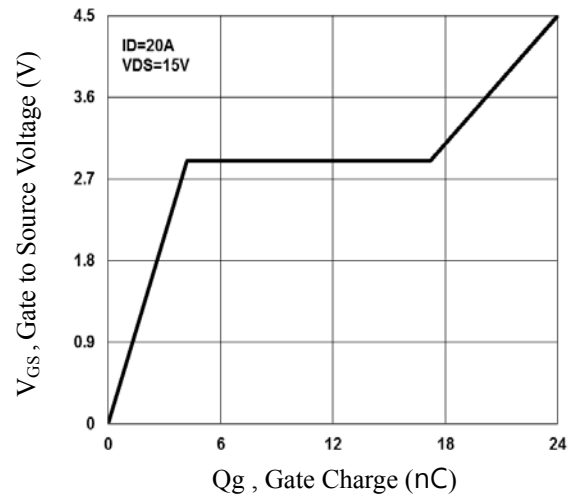


Fig.4 Gate Charge Waveform

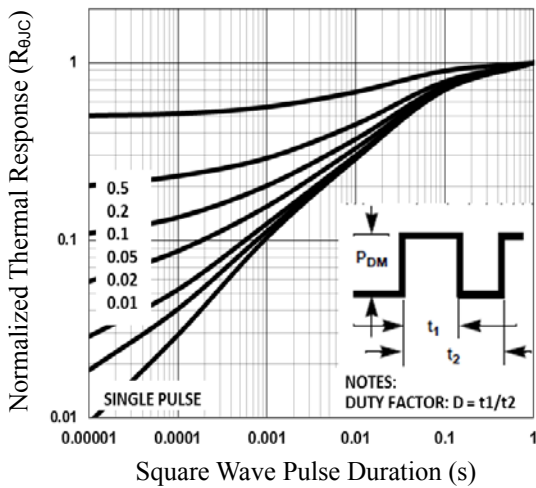


Fig.5 Normalized Transient Impedance

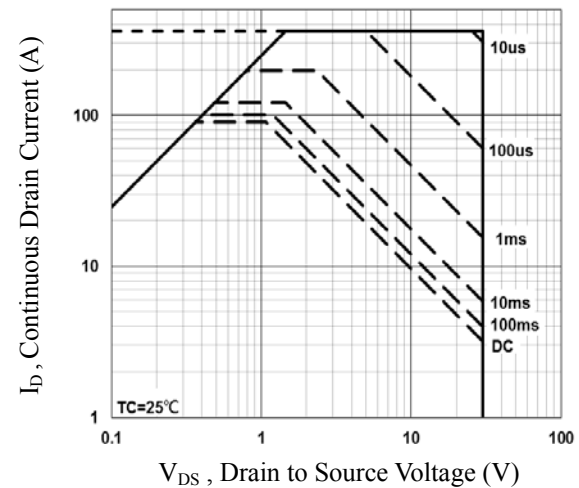


Fig.6 Maximum Safe Operation Area

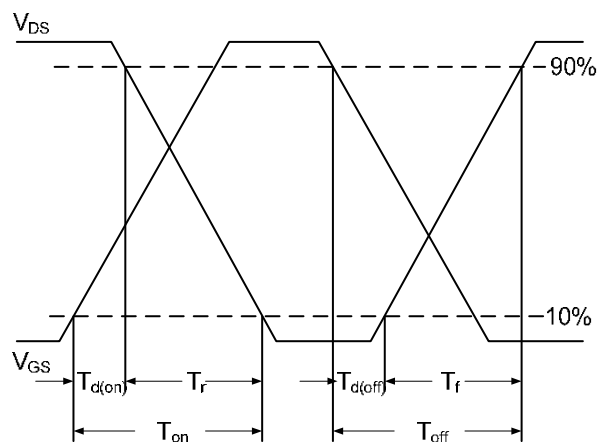


Fig.7 Switching Time Waveform

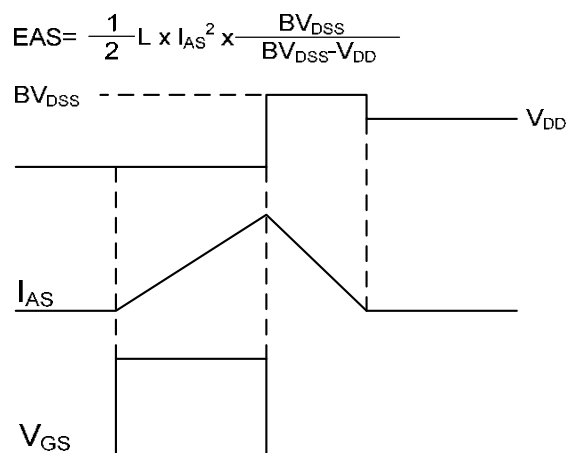
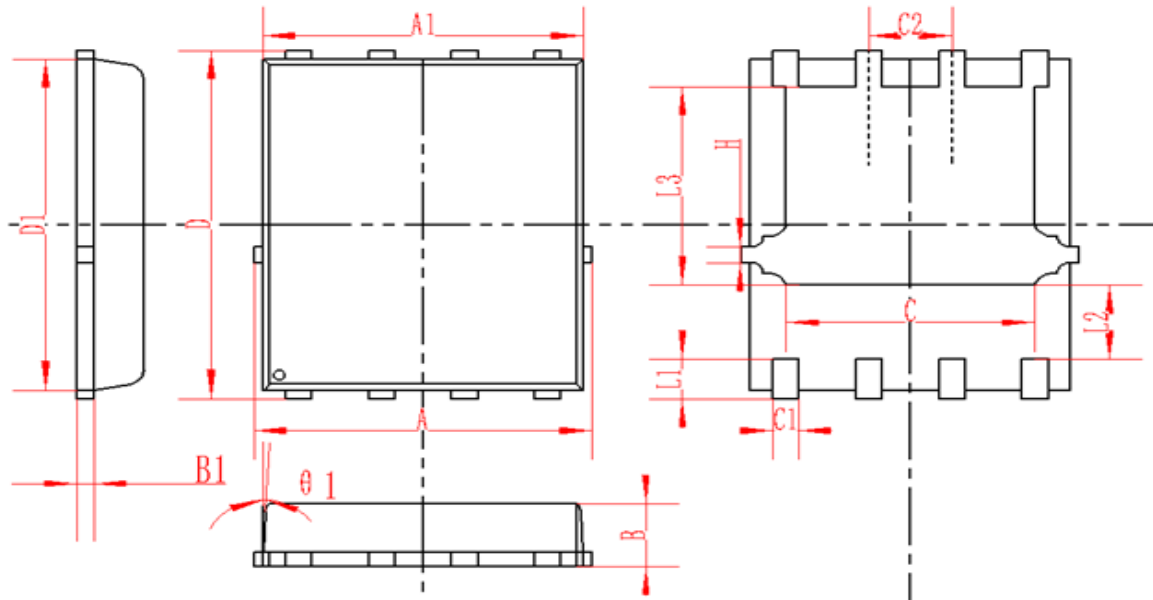


Fig.8 EAS Waveform



## DFN5X6-8L Package Information



| SYMBOL | MM       |      |       | INCH     |       |       |
|--------|----------|------|-------|----------|-------|-------|
|        | MIN      | NOM  | MAX   | MIN      | NOM   | MAX   |
| A      | 5.3      | 5.5  | 5.7   | 0.208    | 0.216 | 0.224 |
| A1     | 5.1      | 5.2  | 5.3   | 0.2      | 0.204 | 0.209 |
| D      | 5.98     | 6    | 6.02  | 0.235    | 0.236 | 0.237 |
| D1     | 5.85     | 6.05 | 6.25  | 0.23     | 0.238 | 0.246 |
| B      | 0.85     | 0.95 | 1.05  | 0.033    | 0.037 | 0.041 |
| 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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