



## Description

The RQ3E120GNTB 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

$V_{DS} = 30V$   $I_D = 35A$

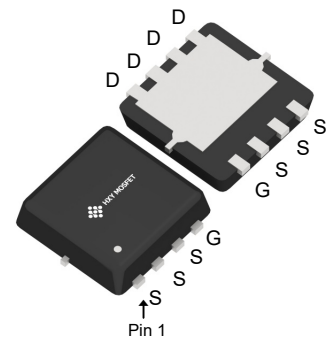
$R_{DS(ON)} < 10m\Omega$  @  $V_{GS}=10V$

## Application

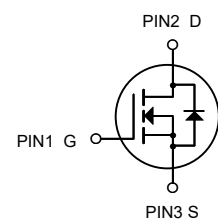
Battery protection

Load switch

Uninterruptible power supply



DFN3X3-8L



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID  | Pack      | Brand      | Qty(PCS) |
|-------------|-----------|------------|----------|
| RQ3E120GNTB | DFN3X3-8L | HXY MOSFET | 5000     |

## Absolute Maximum Ratings (Tc=25°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 <sup>1</sup> | 35         | A     |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 25         | A     |
| $I_{DM}$              | Pulsed Drain Current                                  | 112        | A     |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup>            | 24.2       | mJ    |
| $I_{AS}$              | Avalanche Current                                     | 22         | A     |
| $P_D@T_C=25^\circ C$  | Total Power Dissipation <sup>4</sup>                  | 37.5       | W     |
| $T_{STG}$             | Storage Temperature Range                             | -55 to 175 | °C    |
| $T_J$                 | Operating Junction Temperature Range                  | -55 to 175 | °C    |
| $R_{\theta JA}$       | Thermal Resistance Junction-Ambient <sup>1</sup>      | 62         | °C/W  |
| $R_{\theta JC}$       | Thermal Resistance Junction-Case <sup>1</sup>         | 4          | °C/W  |



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

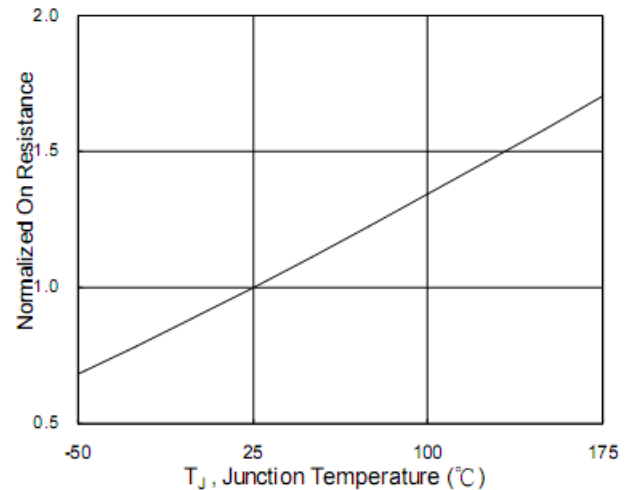
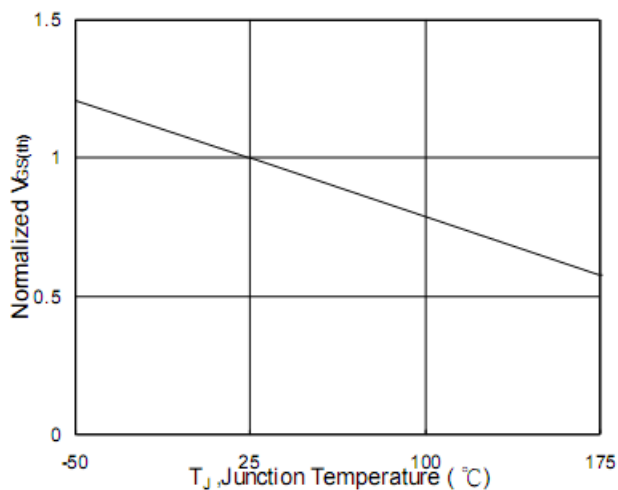
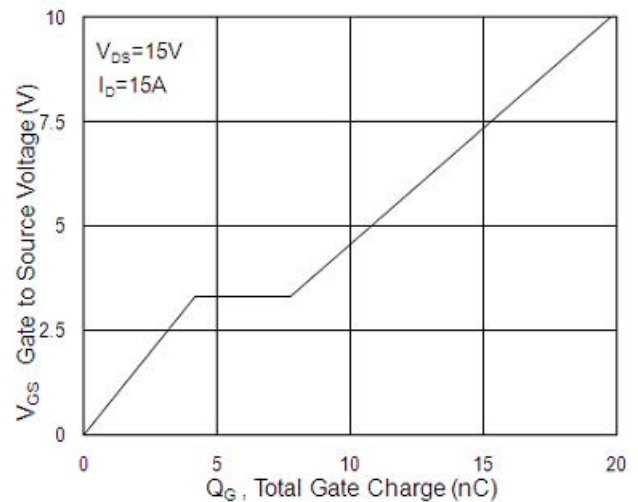
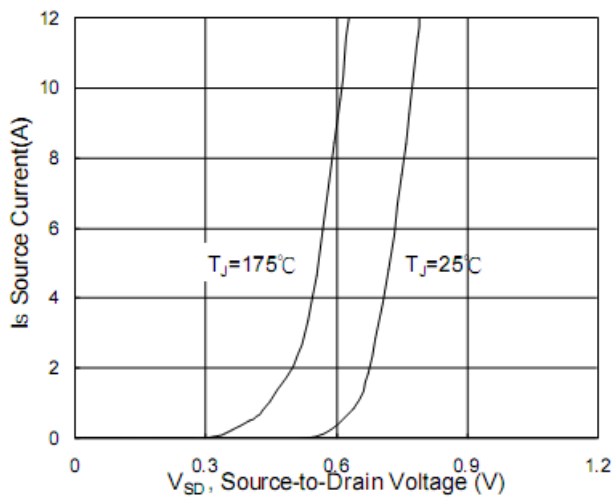
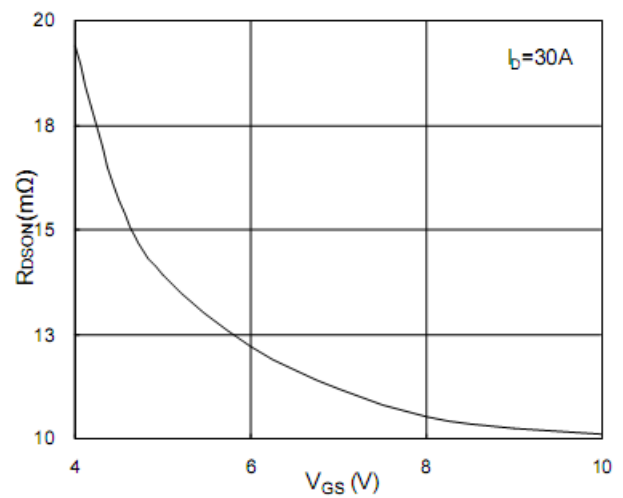
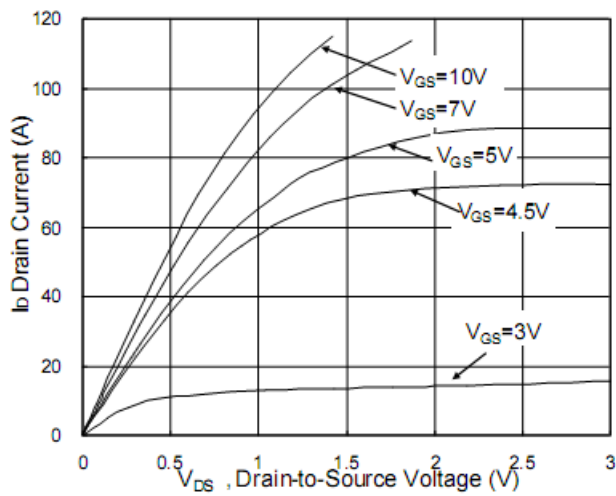
| Symbol                       | Parameter                                      | Conditions                                                | Min. | Typ.   | Max.      | Unit                         |
|------------------------------|------------------------------------------------|-----------------------------------------------------------|------|--------|-----------|------------------------------|
| $BV_{DSS}$                   | 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 $25^{\circ}\text{C}, I_D=1\text{mA}$         | ---  | 0.0193 | ---       | $V/^{\circ}\text{C}$         |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V, I_D=30A$                                     | ---  | 7.5    | 10        | $\text{m}\Omega$             |
|                              |                                                | $V_{GS}=4.5V, I_D=15A$                                    | ---  | 11     | 18        |                              |
| $V_{GS(th)}$                 | 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           |                                                           | ---  | -3.97  | ---       | $\text{mV}/^{\circ}\text{C}$ |
| $I_{DSS}$                    | 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                       | $V_{DS}=5V, I_D=30A$                                      | ---  | 34     | ---       | S                            |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$                     | ---  | 1.8    | ---       | $\Omega$                     |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=15V, V_{GS}=4.5V, I_D=15A$                        | ---  | 9.8    | ---       | nC                           |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                           | ---  | 4.2    | ---       |                              |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                           | ---  | 3.6    | ---       |                              |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=15V, V_{GS}=10V,$<br>$R_G=3.3\Omega$<br>$I_D=15A$ | ---  | 4      | ---       | ns                           |
| $T_r$                        | Rise Time                                      |                                                           | ---  | 8      | ---       |                              |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                           | ---  | 31     | ---       |                              |
| $T_f$                        | Fall Time                                      |                                                           | ---  | 4      | ---       |                              |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$                    | ---  | 940    | ---       | pF                           |
| $C_{oss}$                    | Output Capacitance                             |                                                           | ---  | 131    | ---       |                              |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                           | ---  | 109    | ---       |                              |
| $I_S$                        | Continuous Source Current <sup>1,5</sup>       | $V_G=V_D=0V, \text{Force Current}$                        | ---  | ---    | 43        | A                            |
| $I_{SM}$                     | Pulsed Source Current <sup>2,5</sup>           |                                                           | ---  | ---    | 112       | 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>$T_J=25^{\circ}\text{C}$  | ---  | 8.5    | ---       | nS                           |
| $Q_{rr}$                     | Reverse Recovery Charge                        |                                                           | ---  | 2.2    | ---       | 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  $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=22A$
- 4.The power dissipation is limited by  $175^{\circ}\text{C}$  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



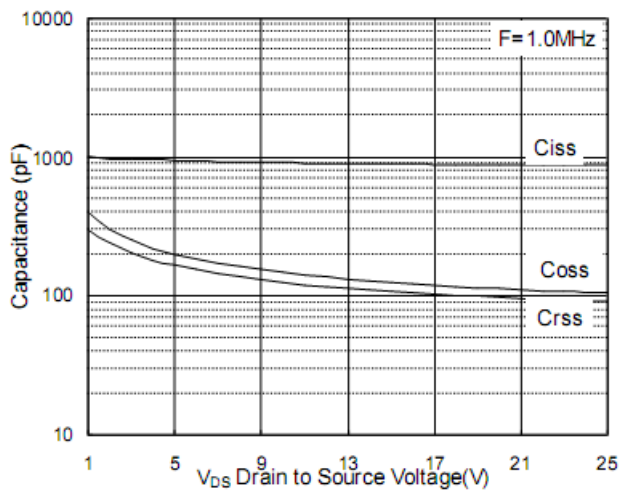


Fig.7 Capacitance

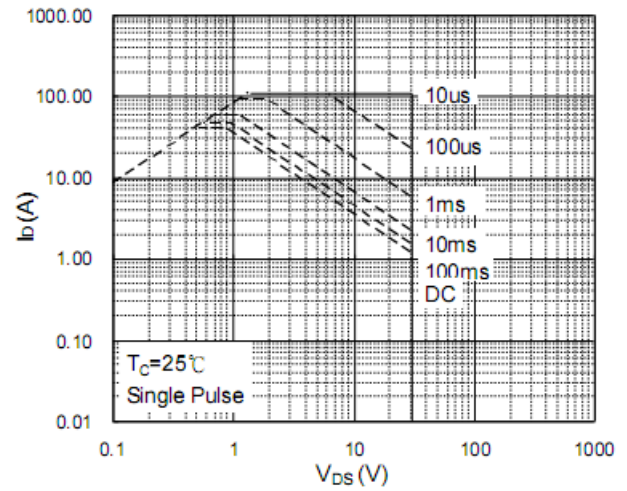


Fig.8 Safe Operating Area

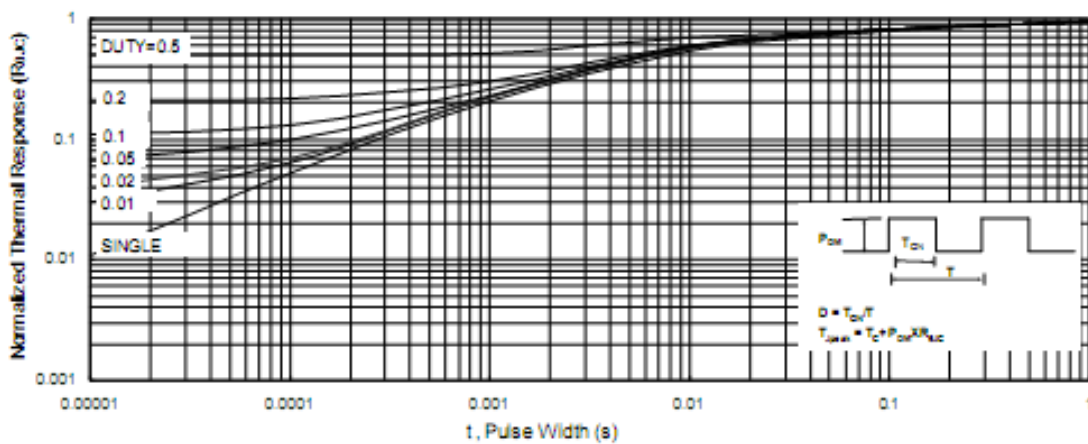


Fig.9 Normalized Maximum Transient Thermal Impedance

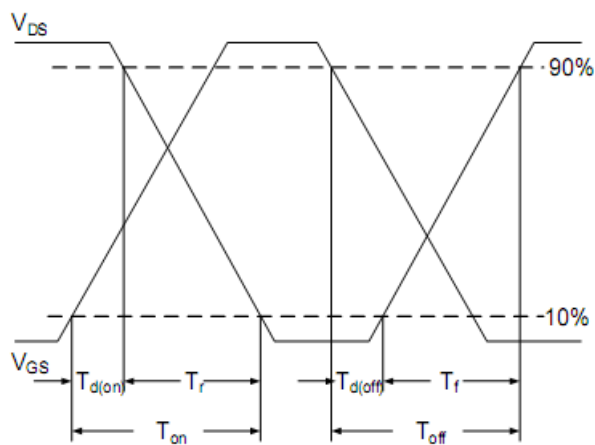


Fig.10 Switching Time Waveform

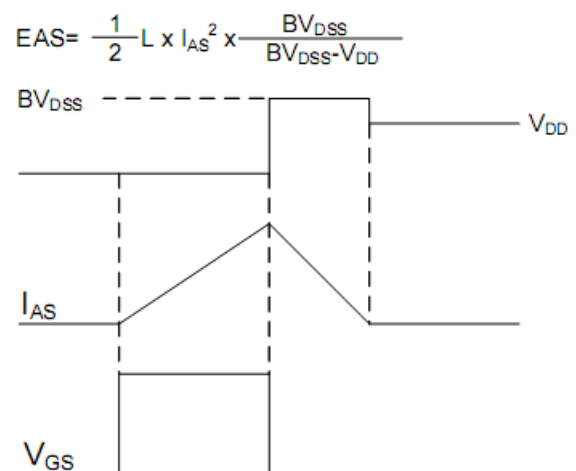
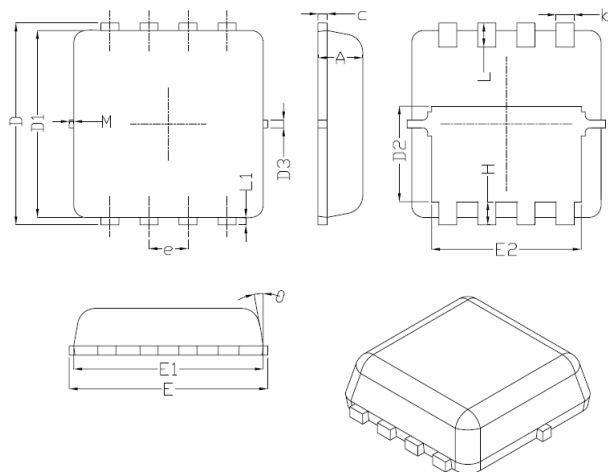


Fig.11 Unclamped Inductive Switching Waveform



## DFN3X3-8L Package Information



| Symbol | Dimensions In Millimeters |      |      |
|--------|---------------------------|------|------|
|        | Min.                      | Nom. | Max. |
| A      | 0.70                      | 0.75 | 0.80 |
| b      | 0.25                      | 0.30 | 0.35 |
| c      | 0.10                      | 0.15 | 0.25 |
| D      | 3.25                      | 3.35 | 3.45 |
| D1     | 3.00                      | 3.10 | 3.20 |
| D2     | 1.48                      | 1.58 | 1.68 |
| D3     | -                         | 0.13 | -    |
| E      | 3.20                      | 3.30 | 3.40 |
| E1     | 3.00                      | 3.15 | 3.20 |
| E2     | 2.39                      | 2.49 | 2.59 |
| e      | 0.65BSC                   |      |      |
| H      | 0.30                      | 0.39 | 0.50 |
| L      | 0.30                      | 0.40 | 0.50 |
| L1     | -                         | 0.13 | -    |
| M      | *                         | *    | 0.15 |
| θ      |                           | 10°  | 12°  |



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