

## GENERAL FEATURES

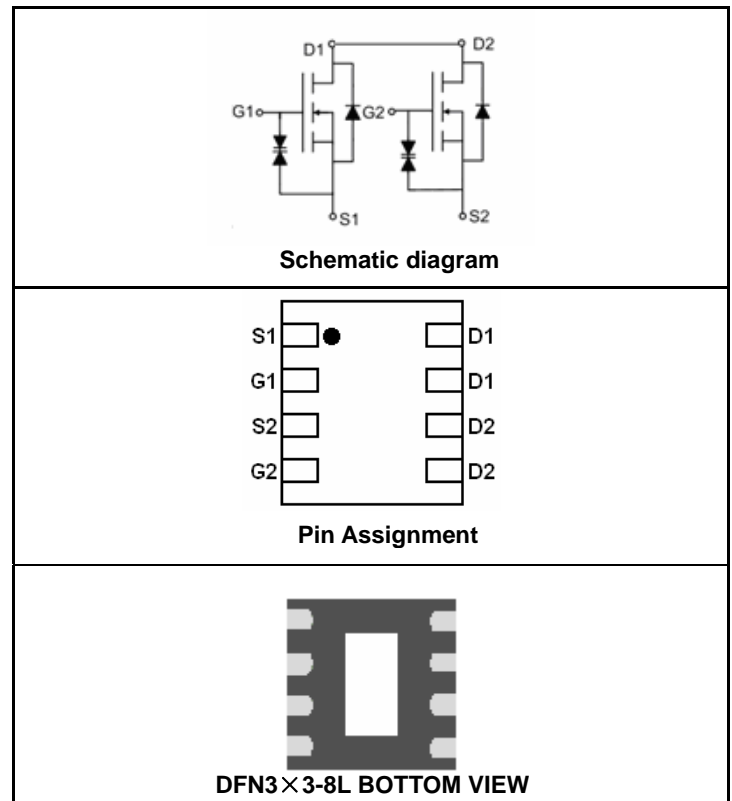
- $V_{DS} = 20V, I_D = 7A$   
 $R_{DS(ON)} < 35m\Omega @ V_{GS}=2.5V$   
 $R_{DS(ON)} < 30m\Omega @ V_{GS}=3.1V$   
 $R_{DS(ON)} < 24m\Omega @ V_{GS}=4V$   
 $R_{DS(ON)} < 23m\Omega @ V_{GS}=4.5V$

ESD Rating: 2000V HBM

- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

## Application

- Battery protection
- Load switch
- Power management



## PACKAGE MARKING AND ORDERING INFORMATION

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| 2316E          | SSF2316E | DFN3x3-8L      | -         | -          | -        |

## ABSOLUTE MAXIMUM RATINGS(TA=25°C unless otherwise noted)

| Parameter                                         | Symbol         | Limit      | Unit |
|---------------------------------------------------|----------------|------------|------|
| Drain-Source Voltage                              | $V_{DS}$       | 20         | V    |
| Gate-Source Voltage                               | $V_{GS}$       | $\pm 12$   | V    |
| Drain Current-Continuous@ Current-Pulsed (Note 1) | $I_D$          | 7          | A    |
|                                                   | $I_{DM}$       | 40         | A    |
| Maximum Power Dissipation                         | $P_D$          | 1.4        | W    |
| Operating Junction and Storage Temperature Range  | $T_J, T_{STG}$ | -55 To 150 | °C   |

## THERMAL CHARACTERISTICS

|                                                  |                 |    |      |
|--------------------------------------------------|-----------------|----|------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 83 | °C/W |
|--------------------------------------------------|-----------------|----|------|

## ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

| Parameter                      | Symbol     | Condition                 | Min | Typ | Max | Unit |
|--------------------------------|------------|---------------------------|-----|-----|-----|------|
| <b>OFF CHARACTERISTICS</b>     |            |                           |     |     |     |      |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}=0V, I_D=250\mu A$ | 20  |     |     | V    |

|                                           |              |                                                        |     |      |          |            |
|-------------------------------------------|--------------|--------------------------------------------------------|-----|------|----------|------------|
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | $V_{DS}=20V, V_{GS}=0V$                                |     |      | 1        | $\mu A$    |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 8V, V_{DS}=0V$                             |     |      | $\pm 10$ | $\mu A$    |
| <b>ON CHARACTERISTICS (Note 3)</b>        |              |                                                        |     |      |          |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                          | 0.5 |      | 1.3      | V          |
| Drain-Source On-State Resistance          | $R_{DS(on)}$ | $V_{GS}=4.5V, I_D=4A$                                  |     | 17   | 23       | m $\Omega$ |
|                                           |              | $V_{GS}=4V, I_D=4A$                                    |     | 18   | 24       | m $\Omega$ |
|                                           |              | $V_{GS}=3.1V, I_D=4A$                                  |     | 20   | 30       | m $\Omega$ |
|                                           |              | $V_{GS}=2.5V, I_D=2A$                                  |     | 24   | 35       | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=10V, I_D=3.5A$                                 |     | 11   |          | S          |
| <b>DYNAMIC CHARACTERISTICS (Note4)</b>    |              |                                                        |     |      |          |            |
| Input Capacitance                         | $C_{iss}$    | $V_{DS}=8V, V_{GS}=0V,$<br>$F=1.0MHz$                  |     | 900  |          | PF         |
| Output Capacitance                        | $C_{oss}$    |                                                        |     | 350  |          | PF         |
| Reverse Transfer Capacitance              | $C_{rss}$    |                                                        |     | 150  |          | PF         |
| <b>SWITCHING CHARACTERISTICS (Note 4)</b> |              |                                                        |     |      |          |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=10V, I_D=1A$<br>$V_{GS}=4.5V, R_{GEN}=6\Omega$ |     | 15   |          | nS         |
| Turn-on Rise Time                         | $t_r$        |                                                        |     | 100  |          | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |                                                        |     | 60   |          | nS         |
| Turn-Off Fall Time                        | $t_f$        |                                                        |     | 90   |          | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=10V, I_D=7A,$<br>$V_{GS}=4.5V$                 |     | 20   |          | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |                                                        |     | 2.5  |          | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |                                                        |     | 3    |          | nC         |
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS</b> |              |                                                        |     |      |          |            |
| Diode Forward Voltage (Note 3)            | $V_{SD}$     | $V_{GS}=0V, I_S=7A$                                    |     | 0.83 | 1.2      | V          |

## NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production testing.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

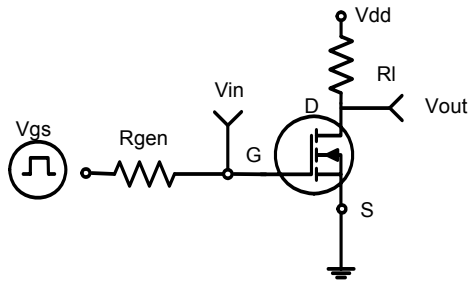


Figure 1: Switching Test Circuit

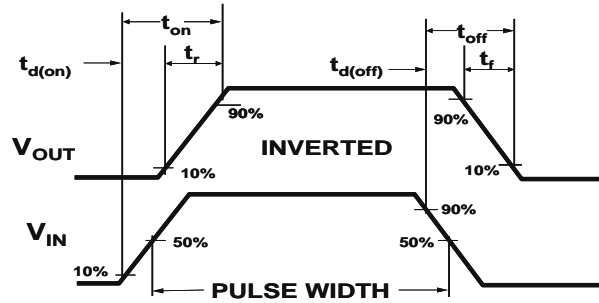


Figure 2: Switching Waveforms

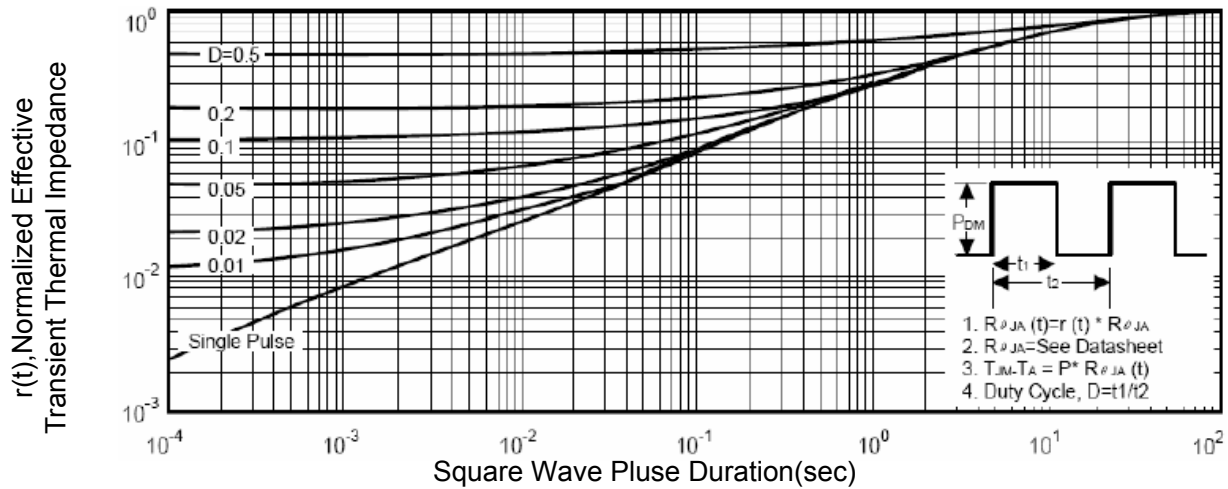
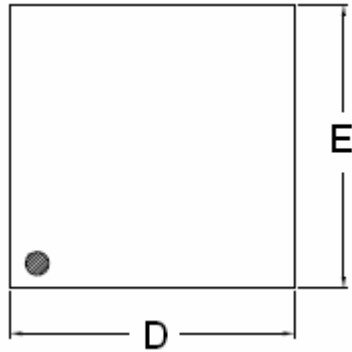
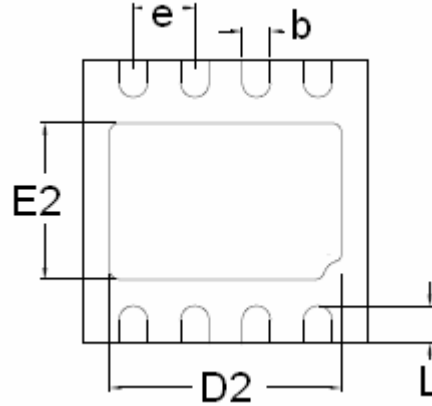


Figure 3 Normalized Maximum Transient Thermal Impedance

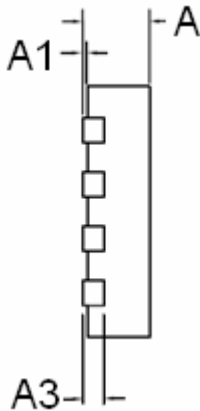
## DFN3x3-8L PACKAGE INFORMATION



TOP VIEW



BOTTOM VIEW



SIDE VIEW

| COMMON DIMENSIONS(MM) |                   |      |      |
|-----------------------|-------------------|------|------|
| PKG.                  | W: VERY VERY THIN |      |      |
| REF.                  | MIN.              | NOM. | MAX. |
| A                     | 0.70              | 0.75 | 0.80 |
| A1                    | 0.00              | —    | 0.05 |
| A3                    | 0.2REF.           |      |      |
| D                     | 2.95              | 3.00 | 3.05 |
| E                     | 2.95              | 3.00 | 3.05 |
| b                     | 0.25              | 0.30 | 0.35 |
| L                     | 0.30              | 0.40 | 0.50 |
| D2                    | 2.30              | 2.45 | 2.55 |
| E2                    | 2.50              | 1.65 | 1.75 |
| e                     | 0.65BSC           |      |      |

### NOTES:

1. Dimensions are inclusive of plating
2. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 6 mils.
3. Dimension L is measured in gauge plane.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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