



## General Description

The SIR186LDP-T1-RE3 use advanced SGT MOSFET technology to provide low  $R_{DS(ON)}$ , low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable.

## General Features

$V_{DS} = 60V$   $I_D = 100A$

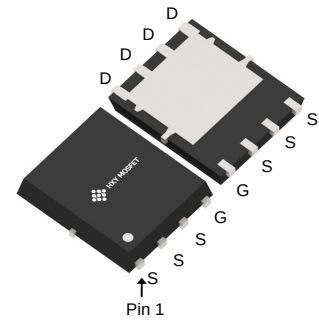
$R_{DS(ON)} < 5m\Omega$  @  $V_{GS} = 10V$

## Applications

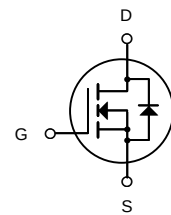
Consumer electronic power supply Motor control

Synchronous-rectification Isolated DC

Synchronous-rectification applications



DFN5X6-8L



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID       | Pack      | Brand      | Qty(PCS) |
|------------------|-----------|------------|----------|
| SIR186LDP-T1-RE3 | 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                                     | 60         | V            |
| $V_{GS}$                  | Gate-Source Voltage                                      | $\pm 20$   | V            |
| $I_D @ T_c = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$                 | 100        | A            |
| $I_D @ T_c = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$                 | 64         | A            |
| $I_{DM}$                  | Pulsed Drain Current <sup>2</sup>                        | 385        | A            |
| EAS                       | Single Pulse Avalanche Energy <sup>3</sup>               | 80         | mJ           |
| $P_D @ T_c = 25^\circ C$  | Total Power Dissipation <sup>4</sup>                     | 73.5       | W            |
| $T_{STG}$                 | Storage Temperature Range                                | -55 to 150 | $^\circ C$   |
| $T_J$                     | Operating Junction Temperature Range                     | -55 to 150 | $^\circ C$   |
| $R_{\theta JC}$           | Thermal Resistance from Junction-to-Ambient <sup>3</sup> | 1.7        | $^\circ C/W$ |
| $R_{\theta JA}$           | Thermal Resistance Junction-Ambient <sup>1</sup>         | 51         | $^\circ C/W$ |



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

| Parameter                               |                           | Symbol        | Test Conditions                                        | Min. | Typ. | Max.      | Unit       |
|-----------------------------------------|---------------------------|---------------|--------------------------------------------------------|------|------|-----------|------------|
| Drain-Source Breakdown Voltage          |                           | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$                          | 60   | -    | -         | V          |
| Gate-body Leakage Current               |                           | $I_{GSS}$     | $V_{DS} = 0V, V_{GS} = \pm 20V$                        | -    | -    | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current         | $T_J = 25^\circ\text{C}$  | $I_{DSS}$     | $V_{DS} = 60V, V_{GS} = 0V$                            | -    | -    | 1         | $\mu A$    |
|                                         | $T_J = 100^\circ\text{C}$ |               |                                                        | -    | -    | 100       |            |
| Gate-Threshold Voltage                  |                           | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu A$                      | 2    | 2.9  | 4         | V          |
| Drain-Source On-Resistance <sup>4</sup> |                           | $R_{DS(on)}$  | $V_{GS} = 10V, I_D = 21A$                              | -    | 3.7  | 5         | m $\Omega$ |
| Forward Transconductance <sup>4</sup>   |                           | $g_{fs}$      | $V_{DS} = 10V, I_D = 21A$                              | -    | 89   | -         | S          |
| Input Capacitance                       |                           | $C_{iss}$     | $V_{DS} = 30V, V_{GS} = 0V, f = 1MHz$                  | -    | 1673 | -         | pF         |
| Output Capacitance                      |                           | $C_{oss}$     |                                                        | -    | 773  | -         |            |
| Reverse Transfer Capacitance            |                           | $C_{rss}$     |                                                        | -    | 46.8 | -         |            |
| Gate Resistance                         |                           | $R_g$         | $f = 1MHz$                                             | -    | 1.8  | -         | $\Omega$   |
| Total Gate Charge                       |                           | $Q_g$         | $V_{GS} = 10V, V_{DS} = 30V, I_D = 21A$                | -    | 28.5 | -         | nC         |
| Gate-Source Charge                      |                           | $Q_{gs}$      |                                                        | -    | 7.8  | -         |            |
| Gate-Drain Charge                       |                           | $Q_{gd}$      |                                                        | -    | 8.4  | -         |            |
| Turn-On Delay Time                      |                           | $t_{d(on)}$   | $V_{GS} = 10V, V_{DD} = 30V, R_G = 3\Omega, I_D = 21A$ | -    | 11.2 | -         | ns         |
| Rise Time                               |                           | $t_r$         |                                                        | -    | 8.2  | -         |            |
| Turn-Off Delay Time                     |                           | $t_{d(off)}$  |                                                        | -    | 19.6 | -         |            |
| Fall Time                               |                           | $t_f$         |                                                        | -    | 6.2  | -         |            |
| Body Diode Reverse Recovery Time        |                           | $t_{rr}$      | $I_F = 21A, dI/dt = 100A/\mu s$                        | -    | 50   | -         | ns         |
| Body Diode Reverse Recovery Charge      |                           | $Q_{rr}$      |                                                        | -    | 20   | -         | nC         |
| Diode Forward Voltage <sup>4</sup>      |                           | $V_{SD}$      | $I_S = 21A, V_{GS} = 0V$                               | -    | -    | 1.2       | V          |
| Continuous Source Current               | $T_C = 25^\circ\text{C}$  | $I_S$         | -                                                      | -    | -    | 100       | A          |

Notes:

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ\text{C}$
2. The EAS data shows Max. rating . The test condition is  $V_{DD} = 25V, V_{GS} = 10V, L = 0.1mH, I_{AS} = 40A$ .
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
5. This value is guaranteed by design hence it is not included in the production test.



## Typical Characteristics

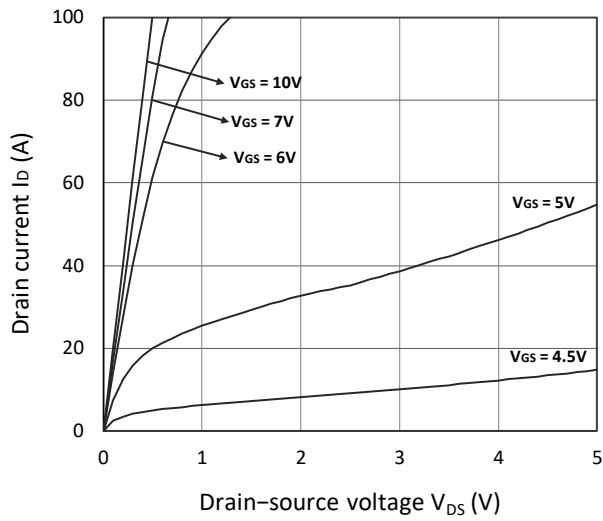


Figure 1. Output Characteristics

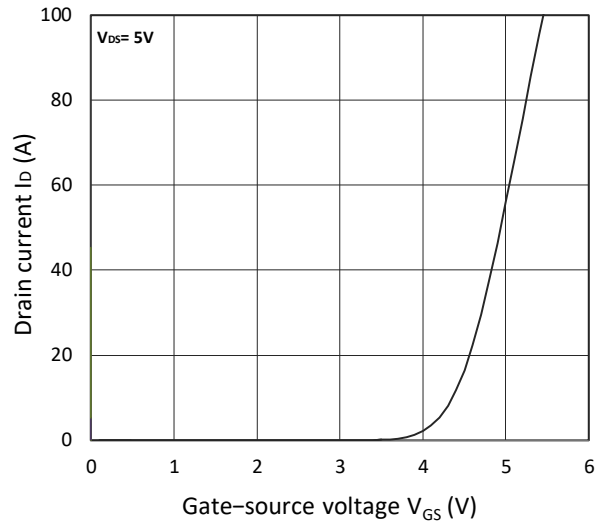


Figure 2. Transfer Characteristics

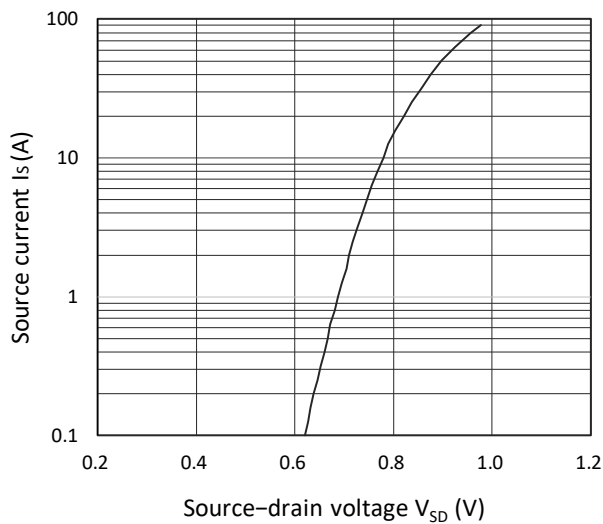


Figure 3. Forward Characteristics of Reverse

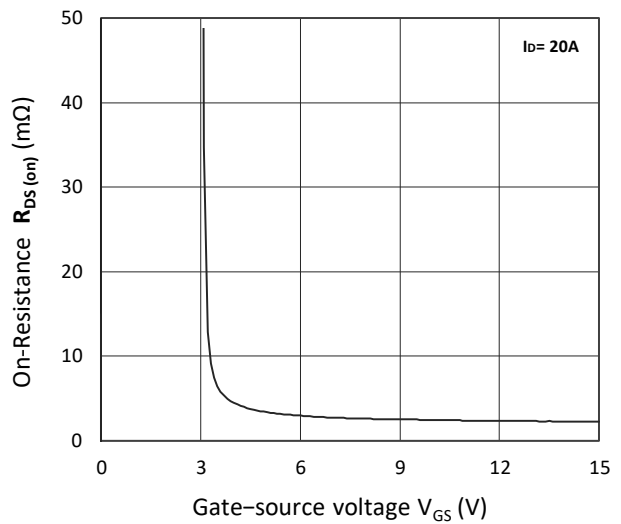


Figure 4.  $R_{DS(on)}$  vs.  $V_{GS}$

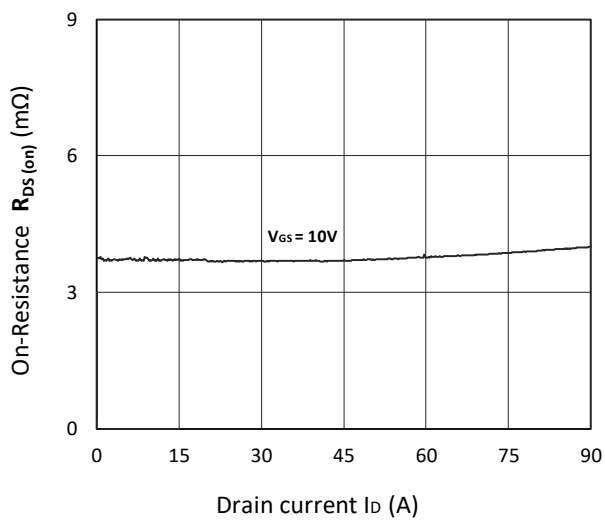


Figure 5.  $R_{DS(on)}$  vs.  $I_D$

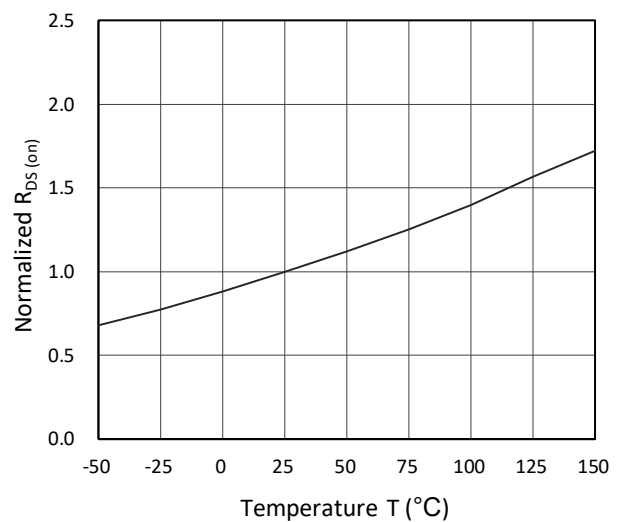


Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

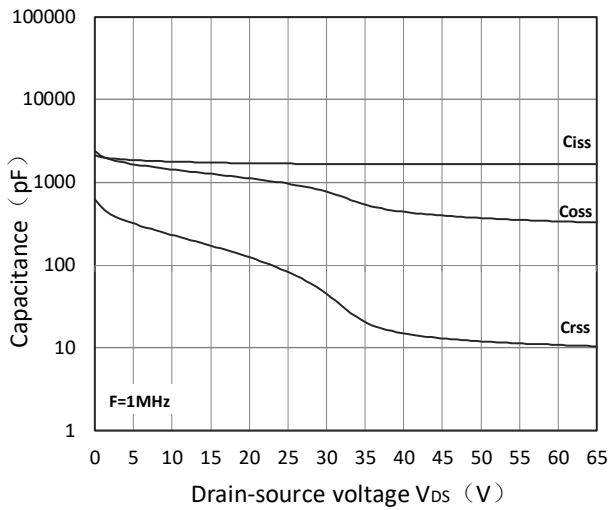


Figure 7. Capacitance Characteristics

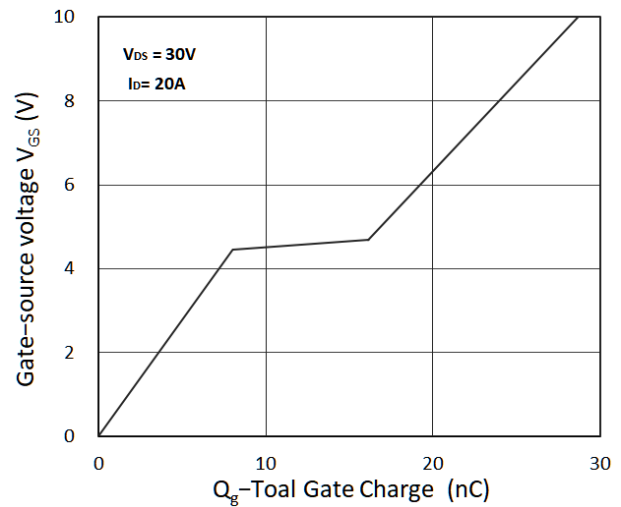


Figure 8. Gate Charge Characteristics

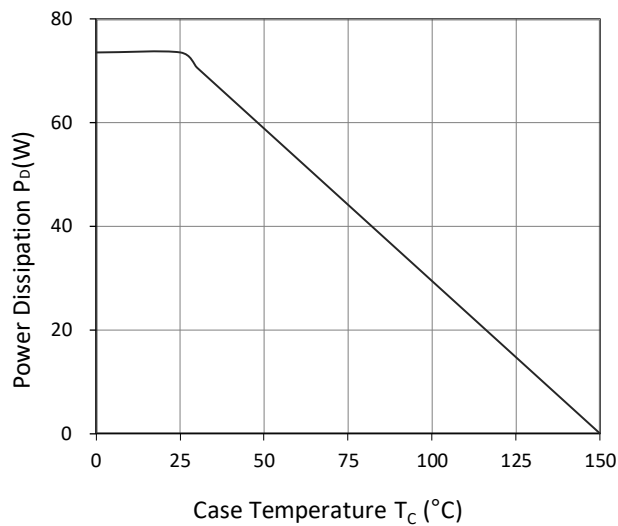


Figure 9. Power Dissipation

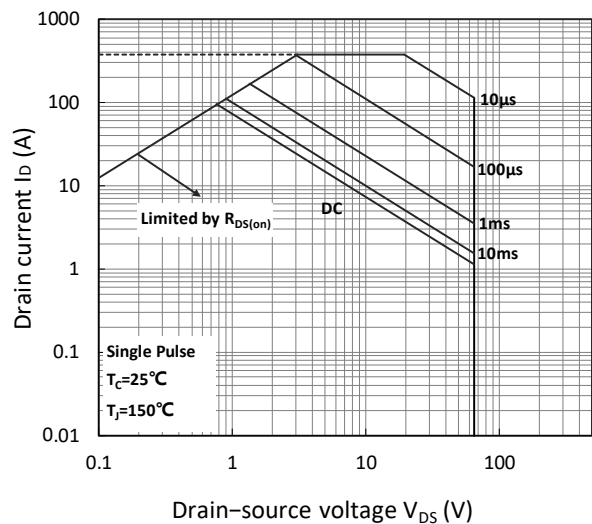


Figure 10. Safe Operating Area

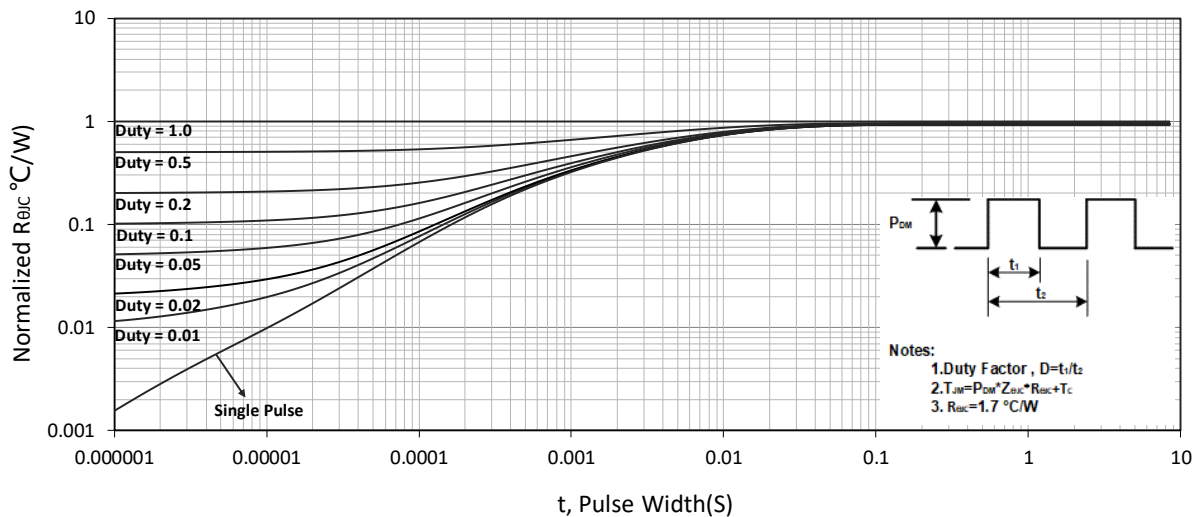


Figure 11. Normalized Maximum Transient Thermal Impedance



## Test Circuit

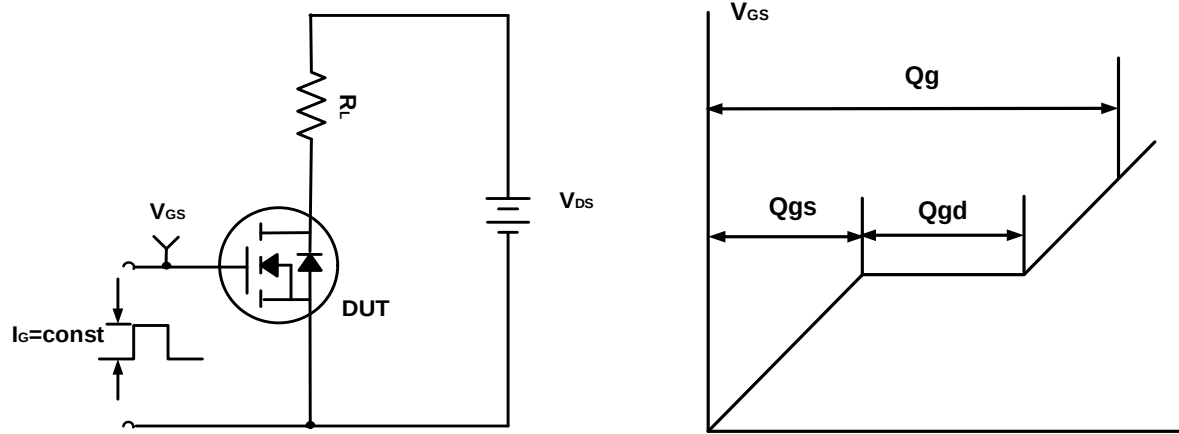


Figure A. Gate Charge Test Circuit & Waveforms

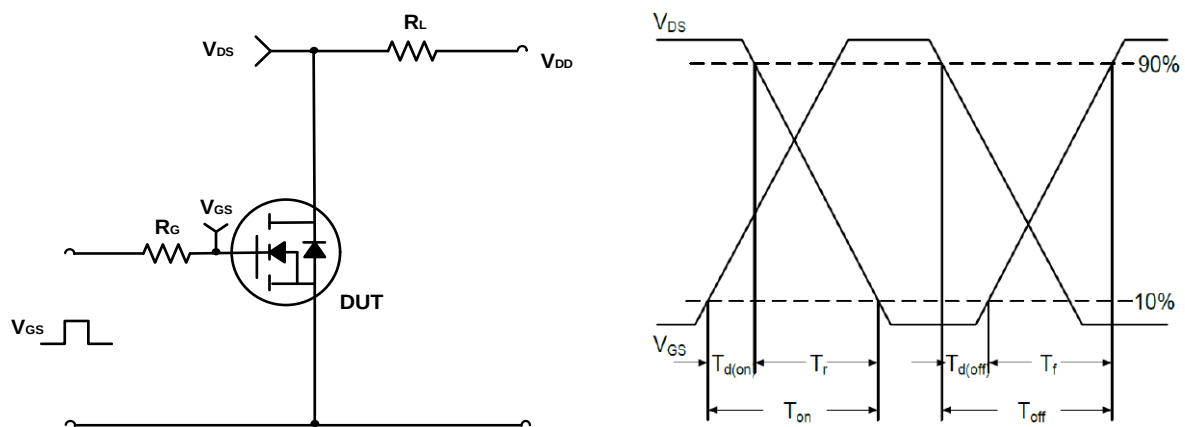


Figure B. Switching Test Circuit & Waveforms

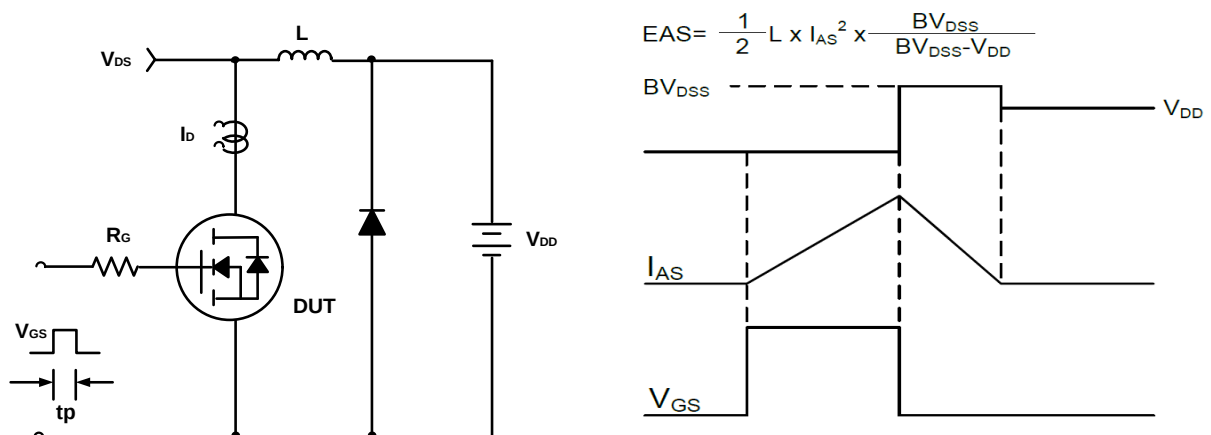
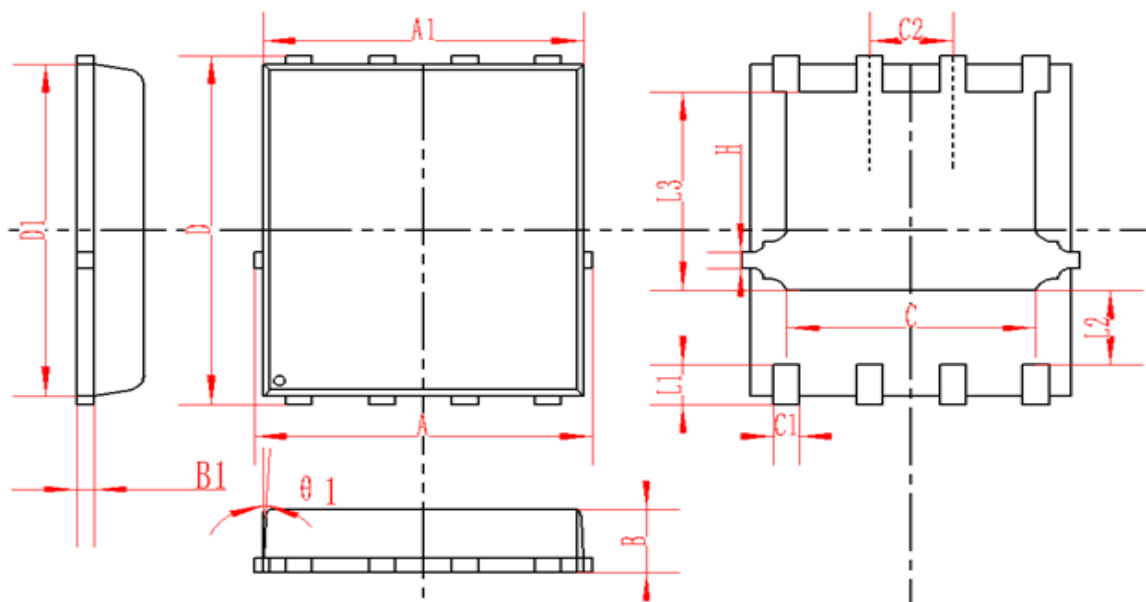


Figure C. Unclamped Inductive Switching Circuit & Waveforms



## DFN5X6-8L 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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