

## N-Ch 30V Fast Switching MOSFETs

- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

## Product Summary

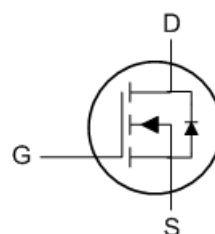
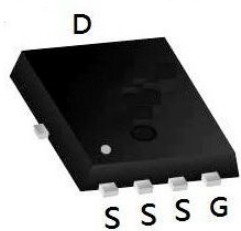


| BVDSS | RDSON | ID   |
|-------|-------|------|
| 30V   | 1.5mΩ | 150A |

## Description

The XR150N03F is the high cell density trenched N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The XR150N03F meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

## PDFN5060-8L Pin Configuration



## Absolute Maximum Ratings

| 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, $V_{GS} @ 10V^{1,6}$ | 150        | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 80         | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>              | 450        | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup>     | 580        | mJ               |
| $I_{AS}$                    | Avalanche Current                              | 60         | A                |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>           | 87         | W                |
| $T_{STG}$                   | Storage Temperature Range                      | -55 to 150 | $^\circ\text{C}$ |
| $T_J$                       | Operating Junction Temperature Range           | -55 to 150 | $^\circ\text{C}$ |

## Thermal Data

| Symbol          | Parameter                                        | Typ. | Max. | Unit               |
|-----------------|--------------------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | 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 ( $T_J=25\text{ }^{\circ}\text{C}$ , 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                      |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^{\circ}\text{C}$ , $I_D=1\text{mA}$                         | ---  | 0.02 | ---       | V/ $^{\circ}\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=30A$ , $T_J=25^{\circ}\text{C}$                          | ---  | 1.5  | 1.8       | $m\Omega$              |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=30A$ , $T_J=25^{\circ}\text{C}$                         | ---  | 2.2  | 2.65      |                        |
|                              |                                                | $V_{GS}=10V$ , $I_D=30A$ , $T_J=125^{\circ}\text{C}$                         | ---  | 2.5  | ---       |                        |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                                             | 1.2  | ---  | 2.4       | V                      |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                                              | ---  | ---  | ---       | mV/ $^{\circ}\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=30V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$                        | ---  | ---  | 1         | $\mu A$                |
|                              |                                                | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=125^{\circ}\text{C}$                       | ---  | ---  | 50        |                        |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                                               | ---  | ---  | $\pm 100$ | nA                     |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=30A$                                                      | ---  | 73   | ---       | S                      |
| $Q_g$                        | Total Gate Charge                              | $V_{DS}=24V$ , $V_{GS}=10V$ , $I_D=30A$<br>$I_G=5\text{mA}$<br>(note 4,5)    | ---  | 143  | ---       | nC                     |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                                              | ---  | 17   | ---       |                        |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                                              | ---  | 43   | ---       |                        |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=15V$ , $V_{GS}=10V$ ,<br>$R_G=4.7\Omega$ , $I_D=30A$ ,<br>(note 4,5) | ---  | 20   | ---       | ns                     |
| $T_r$                        | Rise Time                                      |                                                                              | ---  | 58   | ---       |                        |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                                              | ---  | 158  | ---       |                        |
| $T_f$                        | Fall Time                                      |                                                                              | ---  | 77   | ---       |                        |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1\text{MHz}$                                 | ---  | 6272 | ---       | pF                     |
| $C_{oss}$                    | Output Capacitance                             |                                                                              | ---  | 1022 | ---       |                        |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                                              | ---  | 718  | ---       |                        |

## Diode Characteristics

| Symbol   | Parameter                                | Conditions                                                   | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|--------------------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,4</sup> | $V_G=V_D=0V$ , Force Current                                 | ---  | ---  | 150  | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V$ , $I_S=45A$ , $T_J=25^{\circ}\text{C}$           | ---  | ---  | 1.4  | V    |
| $t_{rr}$ | Reverse Recovery Time                    | $I_F=30A$ , $di/dt=100A/\mu s$ ,<br>$T_J=25^{\circ}\text{C}$ | ---  | 26   | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  |                                                              | ---  | 10   | ---  | nC   |

## ※. Notes

1. Repeattive rating : pulse width limited by junction temperature.
2.  $L=0.5\text{mH}$ ,  $I_{AS}=48A$ ,  $V_{DD}=30V$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$
3.  $I_{SD}\leq 30A$ ,  $di/dt=100A/\mu s$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^{\circ}\text{C}$
4. Pulse Test : Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .

Fig. 1. On-state characteristics

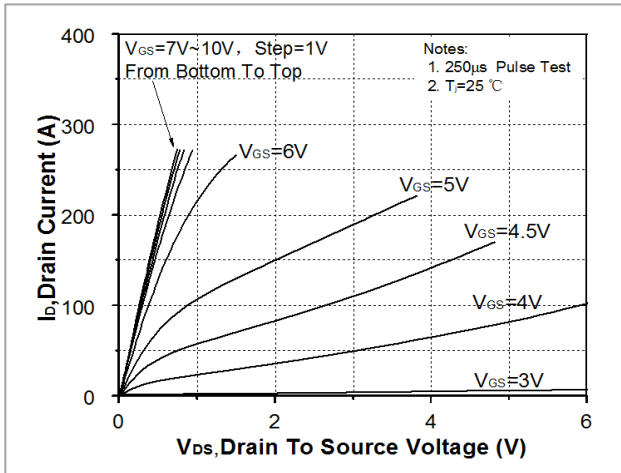


Fig. 2. Transfer Characteristics

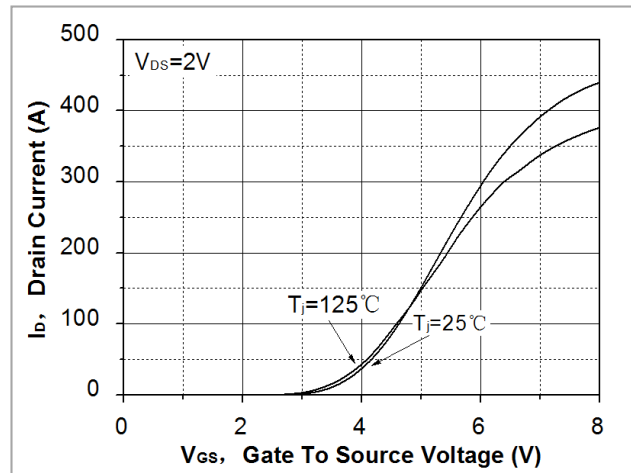


Fig. 3. On-resistance variation vs. drain current and gate voltage

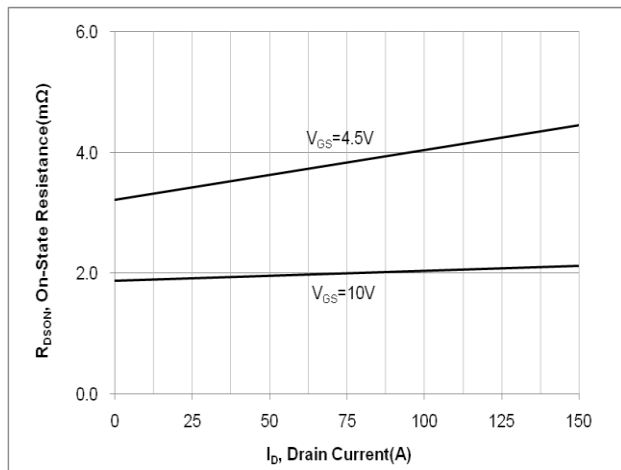


Fig. 4. On-state current vs. diode forward voltage

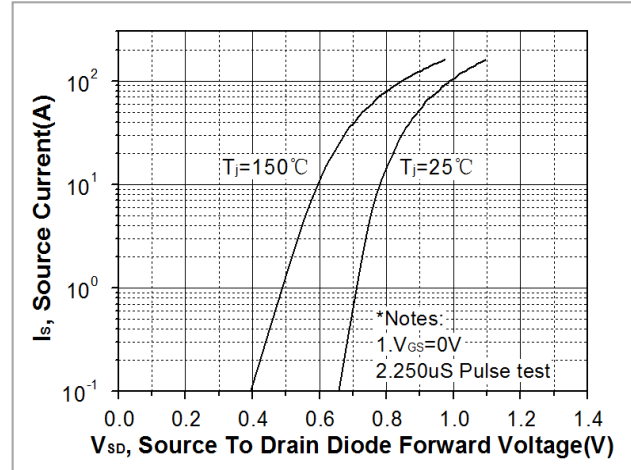


Fig 5. Breakdown voltage variation vs. junction temperature

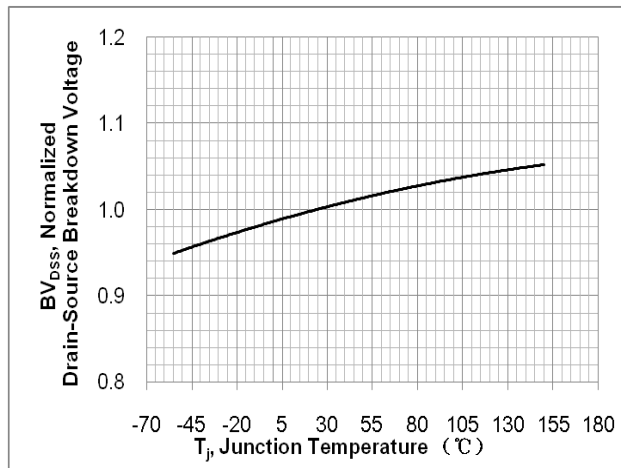


Fig. 6. On-resistance variation vs. junction temperature

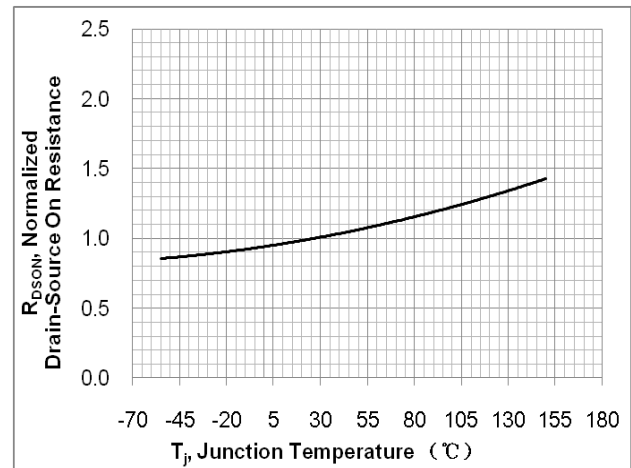


Fig. 7. Gate charge characteristics

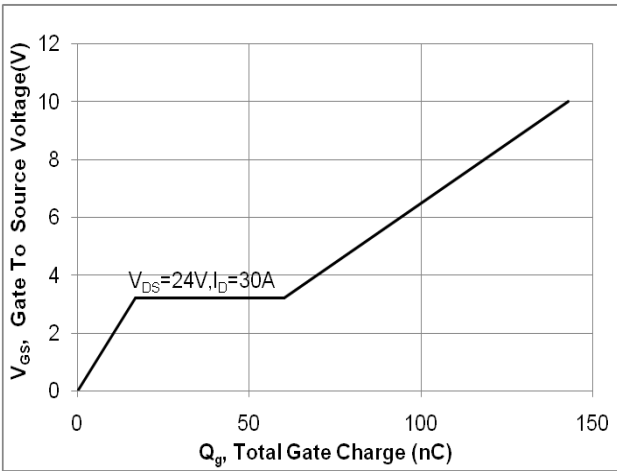


Fig. 8. Capacitance Characteristics

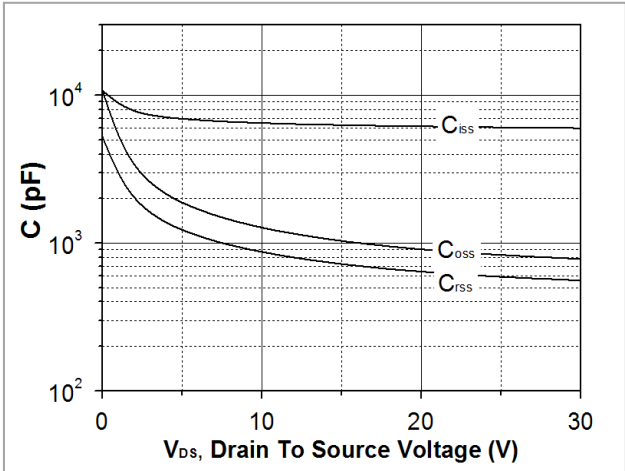


Fig. 9. Maximum safe operating area

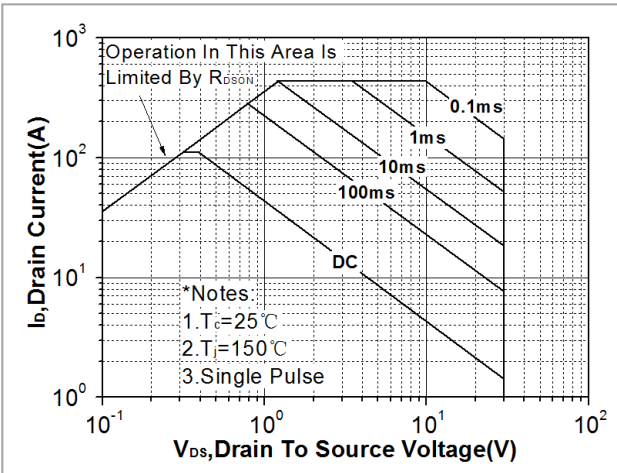


Fig. 10. Maximum drain current vs. case temperature

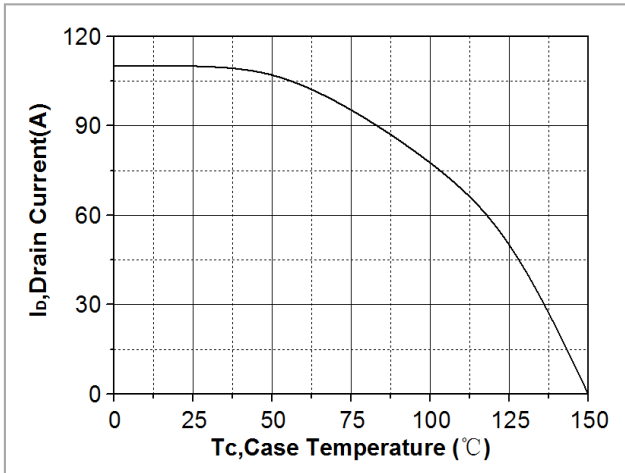
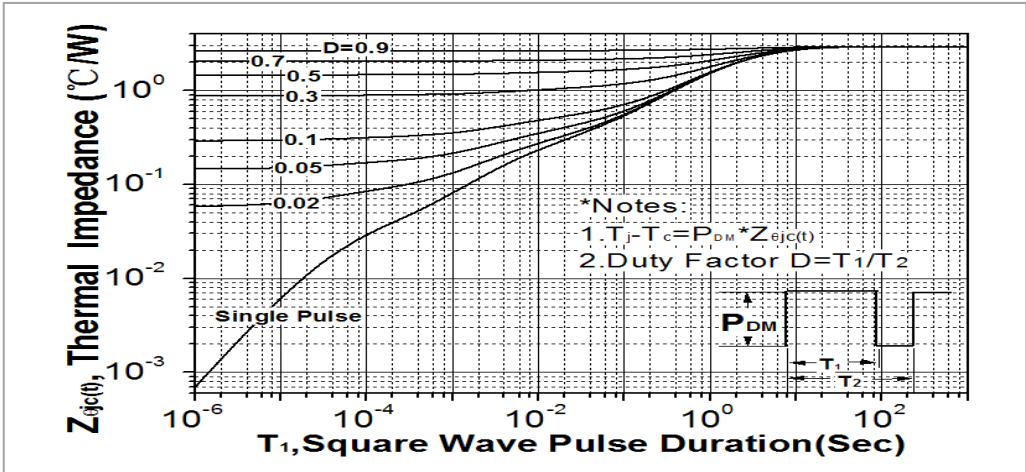


Fig. 11. Transient thermal response curve



### Test Circuit

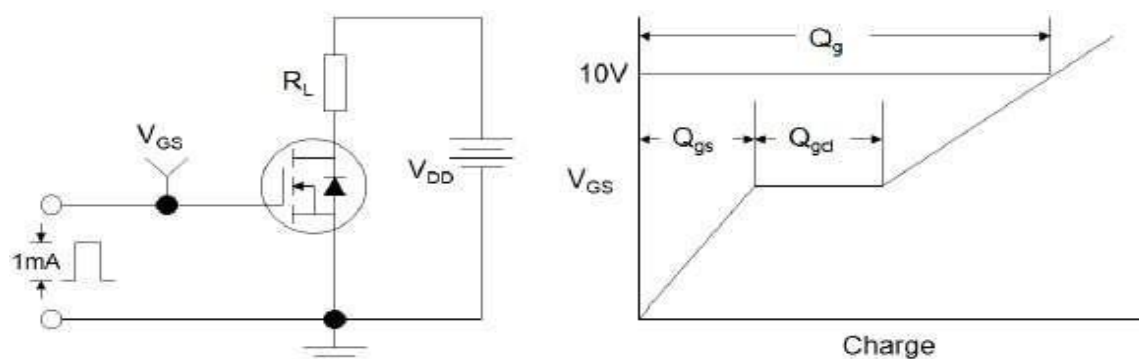


Figure1:Gate Charge Test Circuit & Waveform

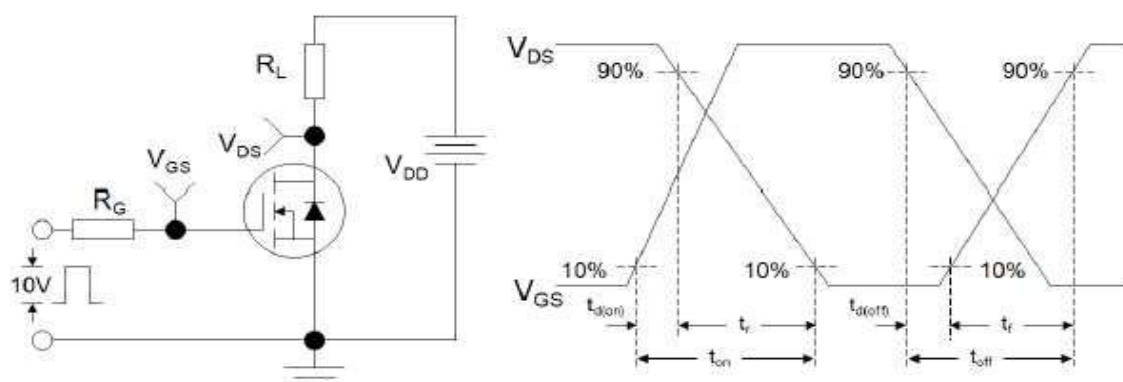


Figure 2: Resistive Switching Test Circuit & Waveforms

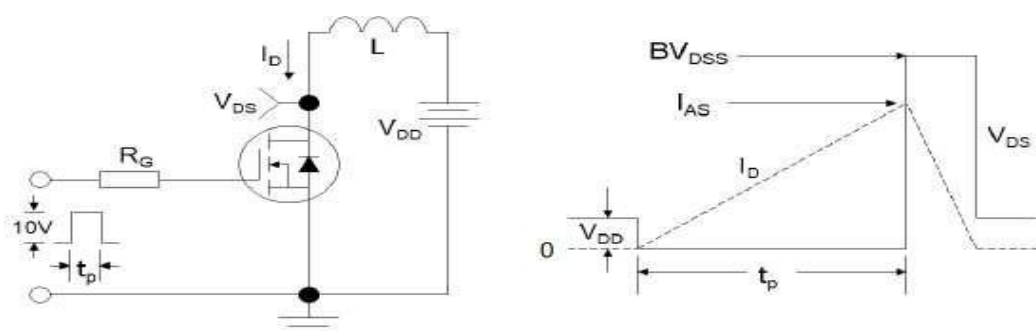
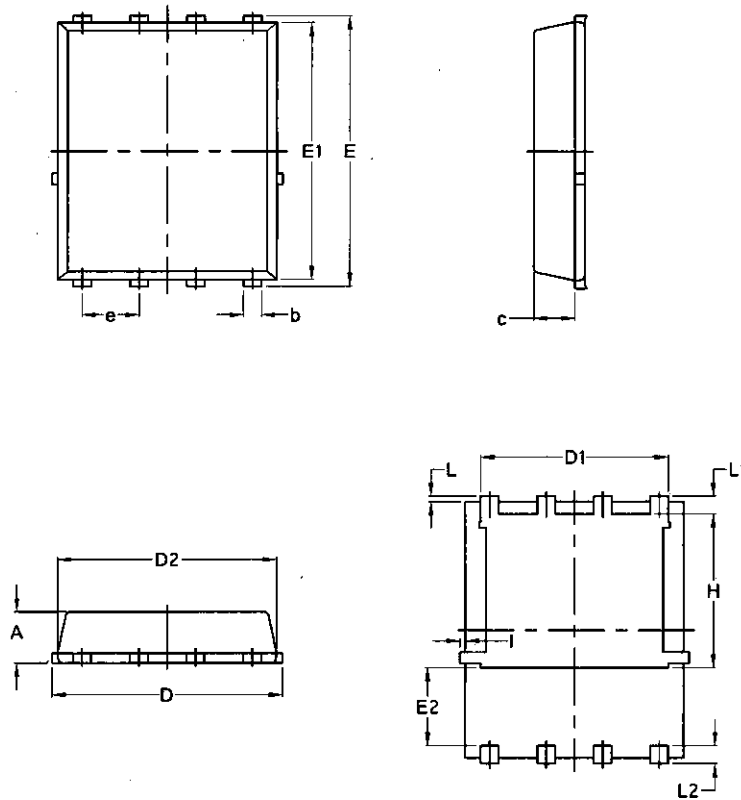


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

#### Package Mechanical Data-PDFN5060-8L-JQ Single



| Symbol | Common   |        |          |        |
|--------|----------|--------|----------|--------|
|        | mm       |        | Inch     |        |
|        | Mim      | Max    | Min      | Max    |
| A      | 1.03     | 1.17   | 0.0406   | 0.0461 |
| b      | 0.34     | 0.48   | 0.0134   | 0.0189 |
| c      | 0.824    | 0.0970 | 0.0324   | 0.082  |
| D      | 4.80     | 5.40   | 0.1890   | 0.2126 |
| D1     | 4.11     | 4.31   | 0.1618   | 0.1697 |
| D2     | 4.80     | 5.00   | 0.1890   | 0.1969 |
| E      | 5.95     | 6.15   | 0.2343   | 0.2421 |
| E1     | 5.65     | 5.85   | 0.2224   | 0.2303 |
| E2     | 1.60     | /      | 0.0630   | /      |
| e      | 1.27 BSC |        | 0.05 BSC |        |
| L      | 0.05     | 0.25   | 0.0020   | 0.0098 |
| L1     | 0.38     | 0.50   | 0.0150   | 0.0197 |
| L2     | 0.38     | 0.50   | 0.0150   | 0.0197 |
| H      | 3.30     | 3.50   | 0.1299   | 0.1378 |
| I      | /        | 0.18   | /        | 0.0070 |