

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

## Product Summary



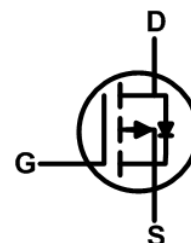
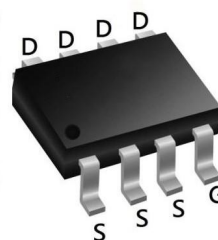
| BVDSS | RDSON | ID  |
|-------|-------|-----|
| -100V | 254mΩ | -5A |

## Description

The XR5P10S is the high cell density trench P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The XR5P10S meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

## SOP8 Pin Configuration



## Absolute Maximum Ratings

| Symbol                      | Parameter                                      | Rating     | Units            |
|-----------------------------|------------------------------------------------|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                           | -100       | V                |
| $V_{GS}$                    | Gate-Source Voltage                            | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | -5         | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | -3.6       | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>              | -26.8      | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup>     | 109        | mJ               |
| $I_{AS}$                    | Avalanche Current                              | ---        | A                |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>           | 40         | 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> | ---  | ---  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 3.7  | $^\circ\text{C/W}$ |

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                 | $V_{GS}=0V$ , $I_D=-250\mu A$                            | -100 | ---  | ---       | V                      |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^{\circ}\text{C}$ , $I_D=1\text{mA}$     | ---  | ---  | ---       | V/ $^{\circ}\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=-10V$ , $I_D=-15A$                               | ---  | 254  | 330       | m $\Omega$             |
|                              |                                                | $V_{GS}=-4.5V$ , $I_D=-10A$                              | ---  | 271  | 352       |                        |
|                              |                                                | $V_{GS}=-2.5V$ , $I_D=-5A$                               | ---  | ---  | ---       |                        |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=-250\mu A$                        | -1   | -1.7 | -2.5      | V                      |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                          | ---  | ---  | ---       | mV/ $^{\circ}\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=-100V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$  | ---  | ---  | -1        | $\mu A$                |
|                              |                                                | $V_{DS}=-100V$ , $V_{GS}=0V$ , $T_J=100^{\circ}\text{C}$ | ---  | ---  | -100      |                        |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                           | ---  | ---  | $\pm 100$ | nA                     |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=-10V$ , $I_D=-4A$                                | ---  | 10   | ---       | S                      |
| $Q_g$                        | Total Gate Charge                              | $V_{DS}=-50V$ , $V_{GS}=-10V$ , $I_D=-3A$                | ---  | 19.6 | ---       | nC                     |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                          | ---  | 6    | ---       |                        |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                          | ---  | 4.2  | ---       |                        |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=-50V$ , $V_{GS}=-10V$ ,<br>$R_G=3\Omega$         | ---  | 13.5 | ---       | ns                     |
| $T_r$                        | Rise Time                                      |                                                          | ---  | 3.8  | ---       |                        |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                          | ---  | 42   | ---       |                        |
| $T_f$                        | Fall Time                                      |                                                          | ---  | 6.4  | ---       |                        |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=-50V$ , $V_{GS}=0V$ , $f=1\text{MHz}$            | ---  | 1199 | ---       | pF                     |
| $C_{oss}$                    | Output Capacitance                             |                                                          | ---  | 33.8 | ---       |                        |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                          | ---  | 28.2 | ---       |                        |

## 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                              | ---  | ---  | -5   | A    |
| $I_{SM}$ | Pulsed Source Current <sup>2,4</sup>     |                                                           | ---  | ---  | -20  | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^{\circ}\text{C}$        | ---  | ---  | -1.2 | V    |
| $t_{rr}$ | Reverse Recovery Time                    | $I_F=-3A$ , $di/dt=100A/\mu s$ , $T_J=25^{\circ}\text{C}$ | ---  | 42.9 | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  |                                                           | ---  | 83.7 | ---  | nC   |

Note :

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ 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  $T_J=25^{\circ}\text{C}$ ,  $V_{DD}=-50V$ ,  $V_G=-10V$ ,  $R_G=25\Omega$ ,  $L=0.5\text{mH}$ .4. The power dissipation is limited by  $150^{\circ}\text{C}$  junction temperature5. The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power

dissipation.

### Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

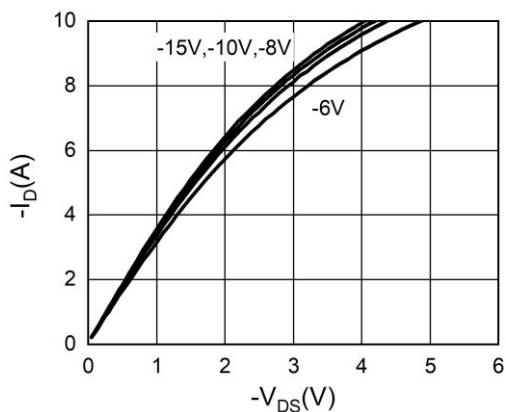


Figure 2. Transfer Characteristics

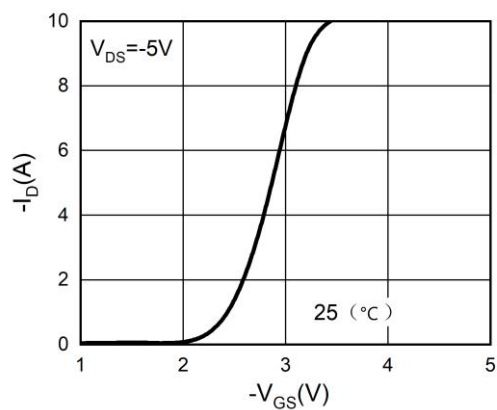


Figure 3. Power Dissipation

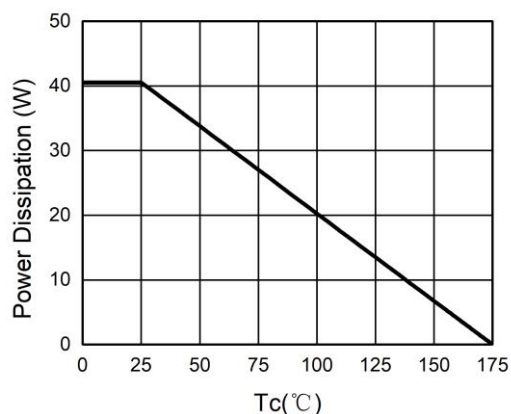


Figure 4. Drain Current

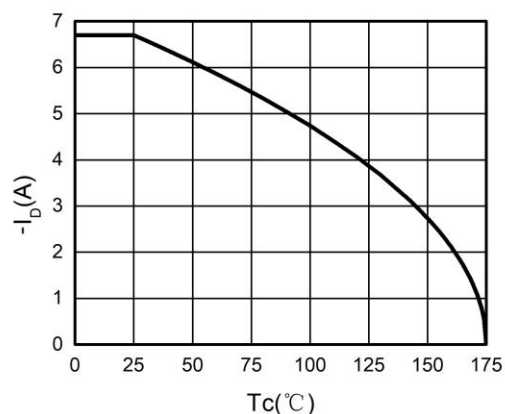


Figure 5.  $BV_{DSS}$  vs Junction Temperature

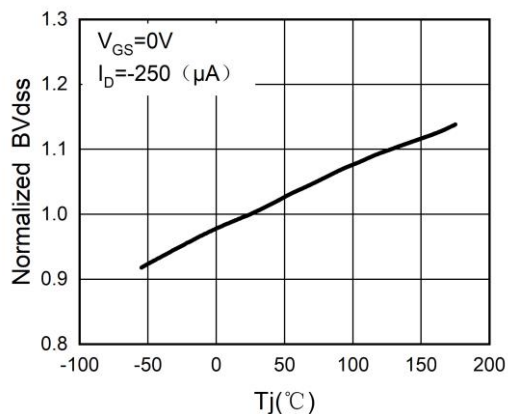


Figure 6.  $R_{DS(ON)}$  vs Junction Temperature

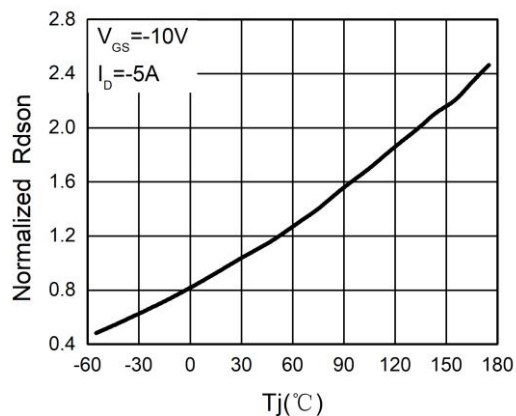


Figure 7. Gate Charge Waveforms

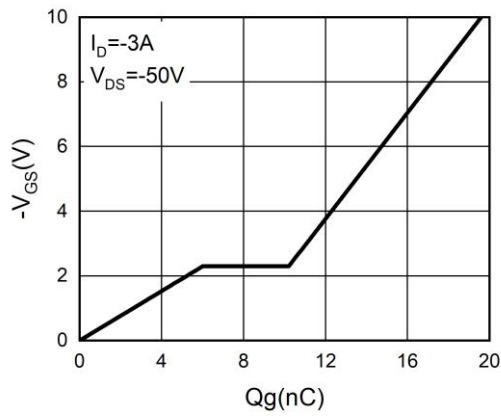


Figure 8. Capacitance

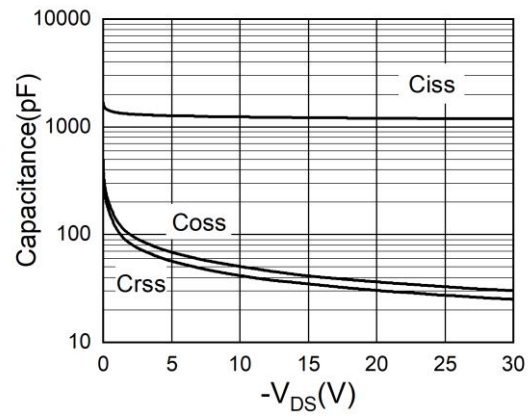


Figure 9. Body-Diode Characteristics

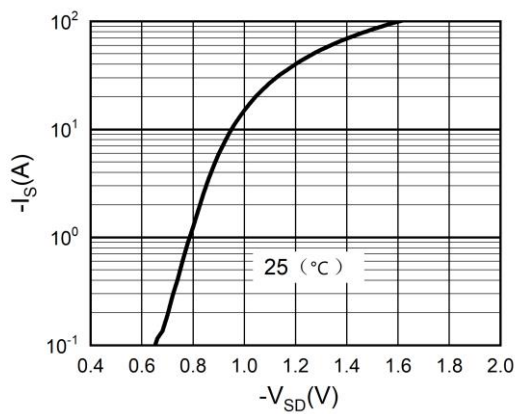
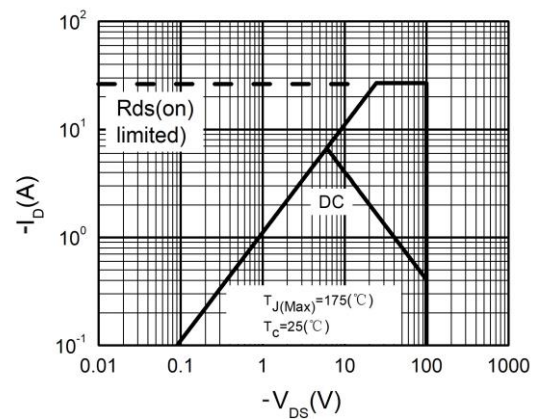


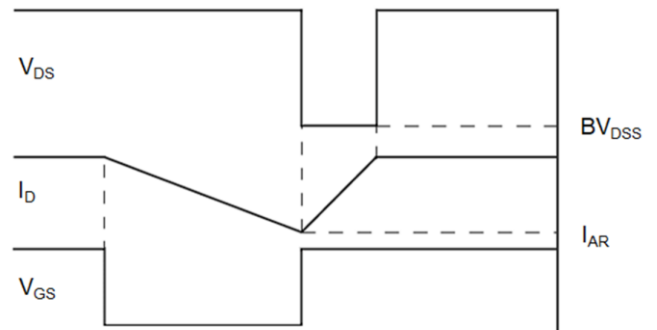
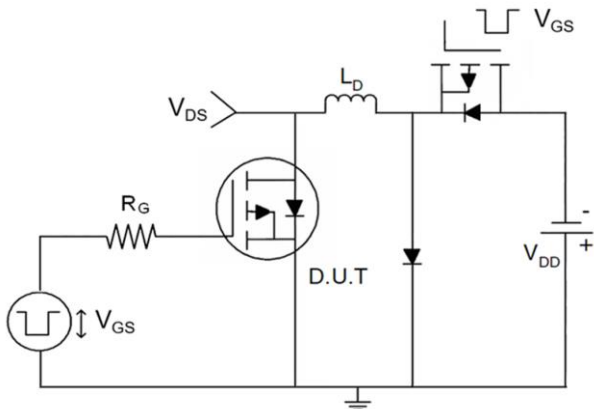
Figure 10. Maximum Safe Operating Area



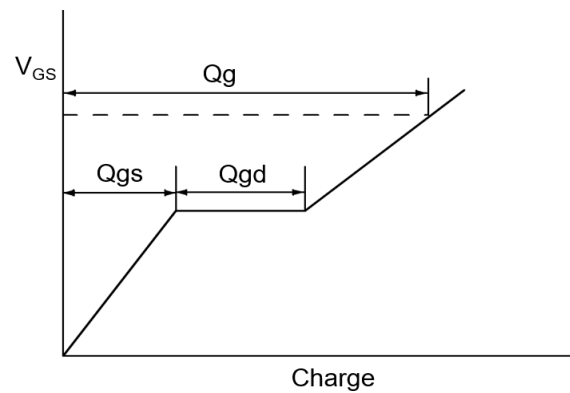
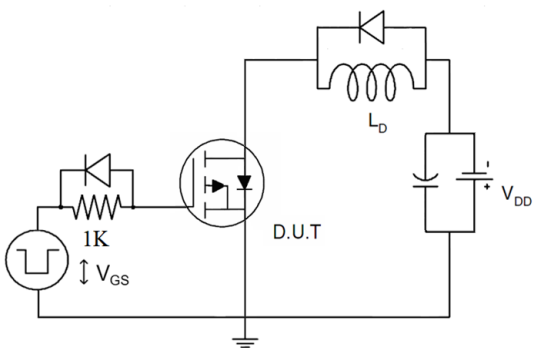
## Test Circuit

## P-Ch 100V Fast Switching MOSFETs

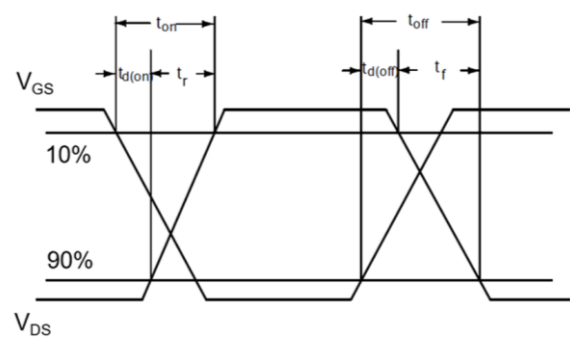
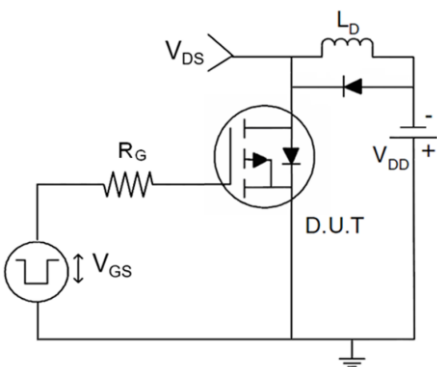
### 1) $E_{AS}$ Test Circuits



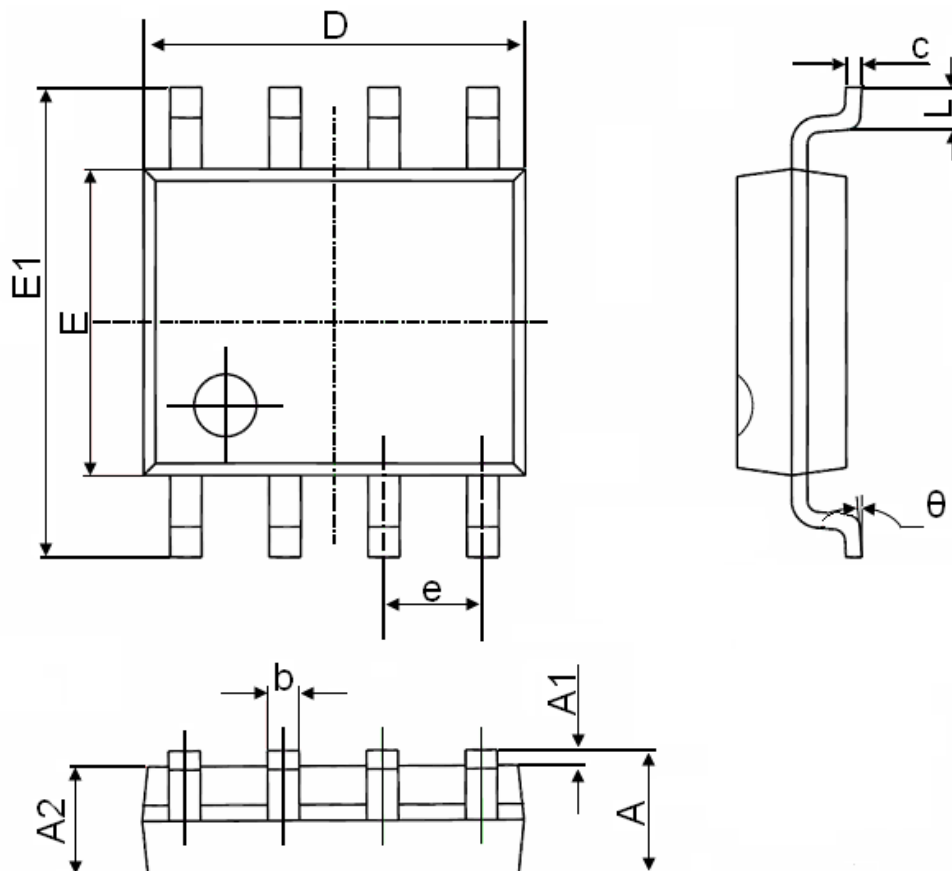
### 2) Gate Charge Test Circuit



### 3) Switch Time Test Circuit



### SOP-8 Package Information



| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min.                      | Max.  | Min.                 | Max.  |
| A        | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1       | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2       | 1.350                     | 1.550 | 0.053                | 0.061 |
| b        | 0.330                     | 0.510 | 0.013                | 0.020 |
| c        | 0.170                     | 0.250 | 0.006                | 0.010 |
| D        | 4.700                     | 5.100 | 0.185                | 0.200 |
| E        | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1       | 5.800                     | 6.200 | 0.228                | 0.244 |
| e        | 1.270(BSC)                |       | 0.050(BSC)           |       |
| L        | 0.400                     | 1.270 | 0.016                | 0.050 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |