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

## Product Summary

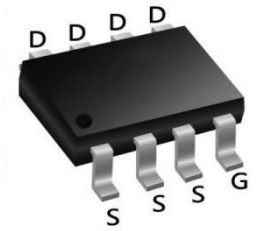
| BVDSS | RDSON | ID |
|---|---|---|
| -20V | 15mΩ | -20A |

## Description

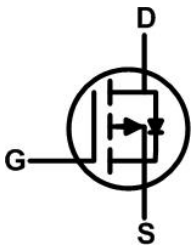
The ZX 20P02 is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The ZX 20P02 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

## SOP8 Pin Configuration




pin assignment




Schematic diagram

## Package Marking and Ordering Information

| Product | Package | Marking | Packing | Min Unit Quantity |
|---|---|---|---|---|
| ZX 20P02 | SOP8 | * | 3000PCS/Reel | 3000PCS |

## Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | -20 | V |
| $V_{GS}$ | Gate-Source Voltage | ±12 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ -4.5V[1] | -20 | A |
| $I_D$@$T_C$=70℃ | Continuous Drain Current, $V_{GS}$ @ -4.5V[1] | -18 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | -68 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[3] | 18 | W |
| $P_D$@$T_C$=70℃ | Total Power Dissipation[3] | 12 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |

## Thermal Data

| Symbol | Parameter | Max. | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | 75 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] (t ≤10s) | 40 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | 4.2 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=-250uA | -20 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=-1mA | --- | -0.012 | --- | V/℃ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=-4.5V , $I_D$=-10A | --- | 15 | 19 | mΩ |
| | | $V_{GS}$=-2.5V , $I_D$=-8A | --- | 19 | 23 | |
| | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | -0.4 | -0.7 | -1.0 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 2.94 | --- | mV/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=-15V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±12 V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=-5V , $I_D$=-10A | --- | 43 | --- | S |
| $Q_g$ | Total Gate Charge (-4.5V) | $V_{DS}$=-10V , $V_{GS}$=-4.5V , $I_D$=-10A | --- | 35 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 5.0 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 10 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=-10V , $V_{GS}$=-4.5V , $R_G$=3.3Ω, $I_D$=-10A | --- | 12.0 | --- | ns |
| $T_r$ | Rise Time | | --- | 40.0 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 30 | --- | |
| $T_f$ | Fall Time | | --- | 10 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-15V , $V_{GS}$=0V , f=1MHz | --- | 2800 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 690 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 590 | --- | |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,4] | $V_G$=$V_D$=0V , Force Current | --- | --- | -20.0 | A |
| $I_{SM}$ | Pulsed Source Current[2,4] | | --- | --- | — | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=-1A , $T_J$=25℃ | --- | --- | -1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | IF=-10A , dI/dt=100A/μs , $T_J$ =25℃ | --- | 27 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 17.8 | --- | nC |

Note :
1. The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3. The power dissipation is limited by 150℃ junction temperature
4. The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation.

## Typical Characteristics

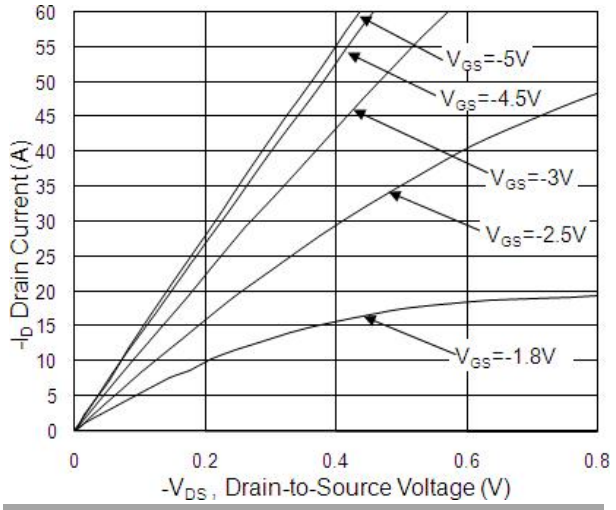



Fig.1 Typical Output Characteristics

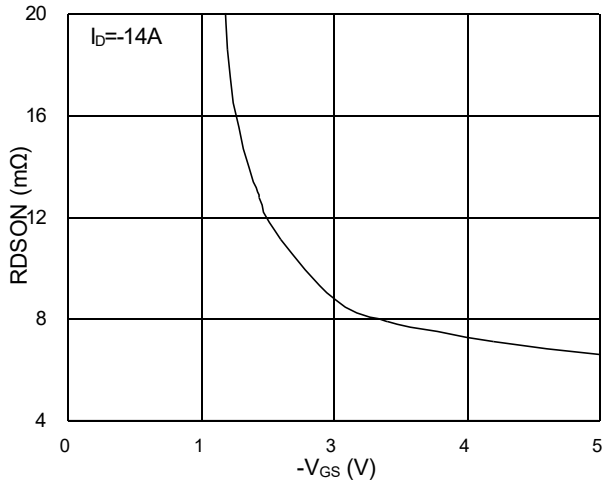



Fig.2 On-Resistance vs. G-S Voltage

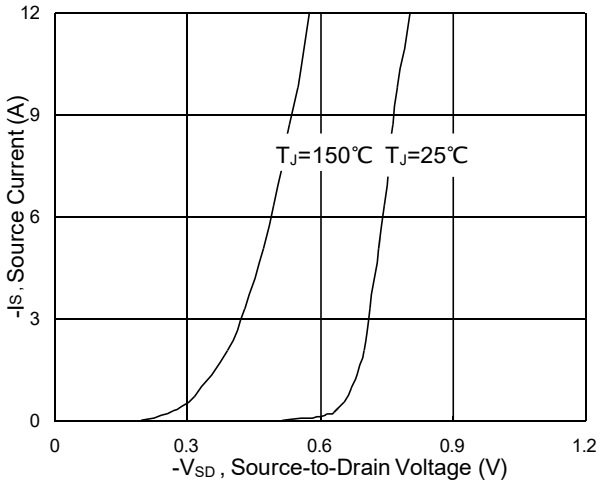



Fig.3 Forward Characteristics of Reverse

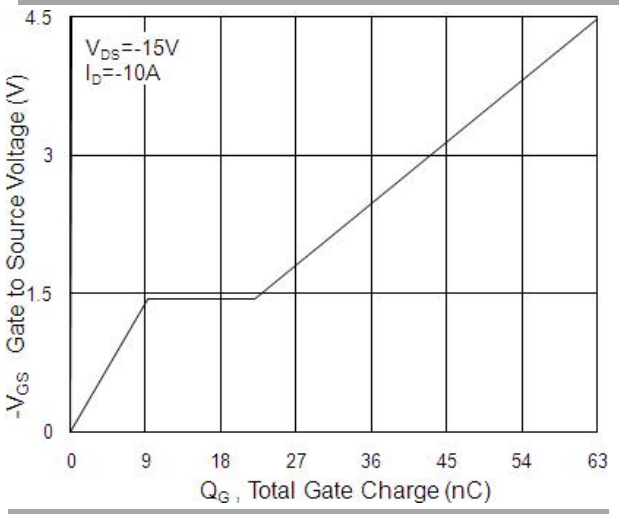



Fig.4 Gate-charge Characteristics

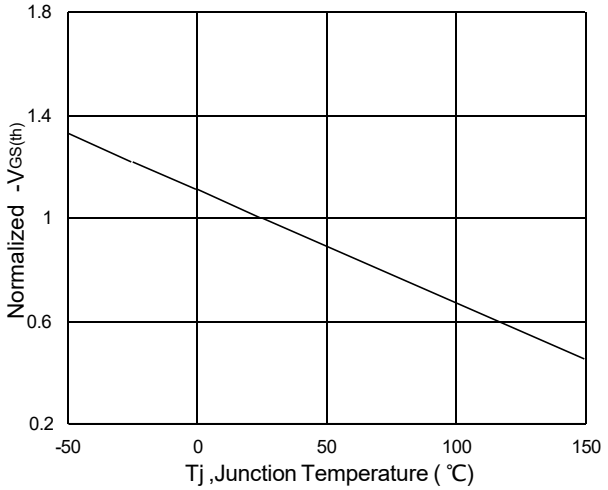



Fig.5 Normalized $V_{GS(th)}$ vs. $T_J$

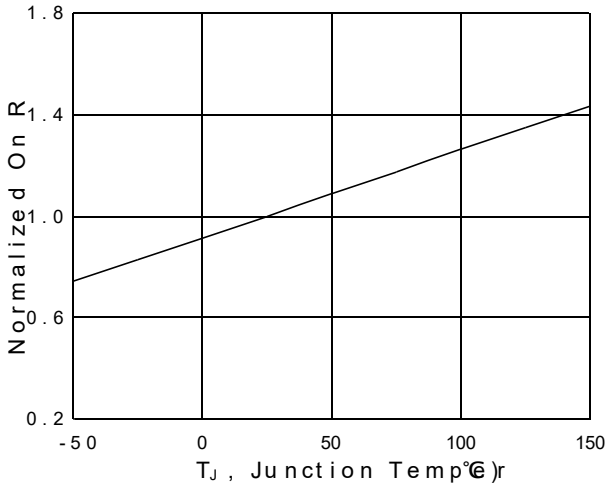



Fig.6 Normalized $R_{DSON}$ vs. $T_J$

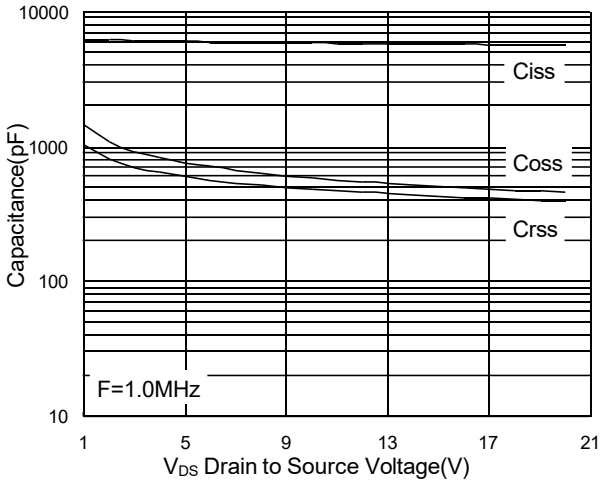



**Fig.7 Capacitance**

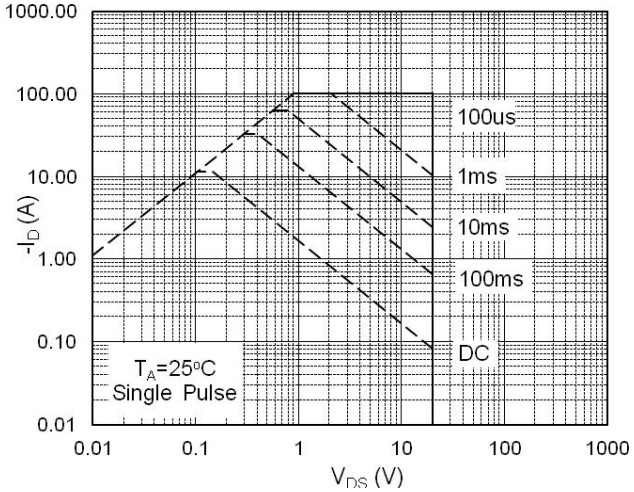



**Fig.8 Safe Operating Area**

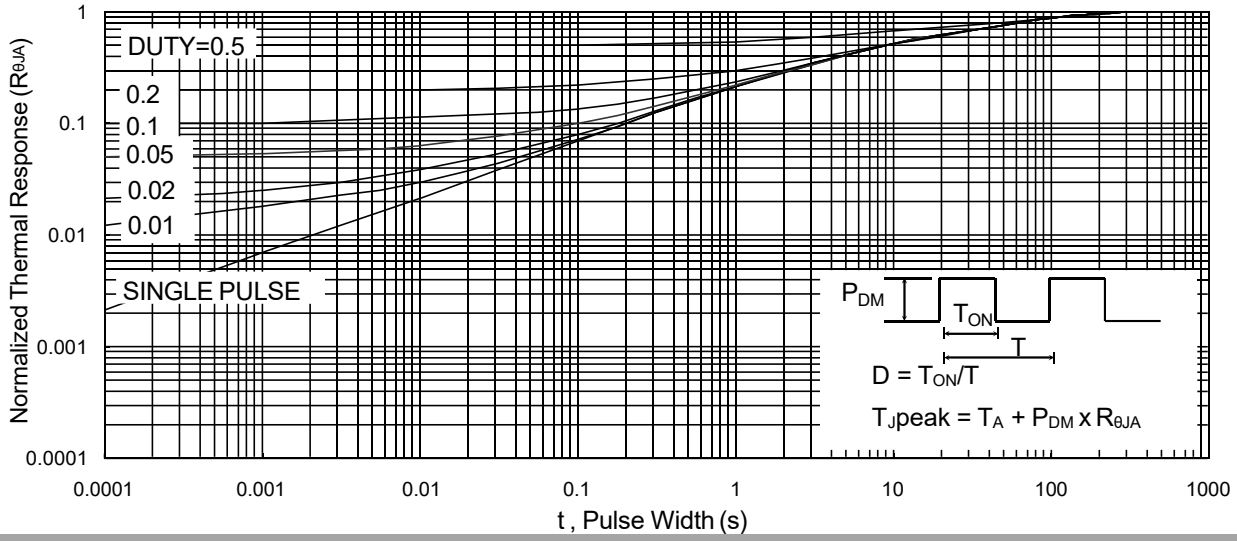



**Fig.9 Normalized Maximum Transient Thermal Impedance**

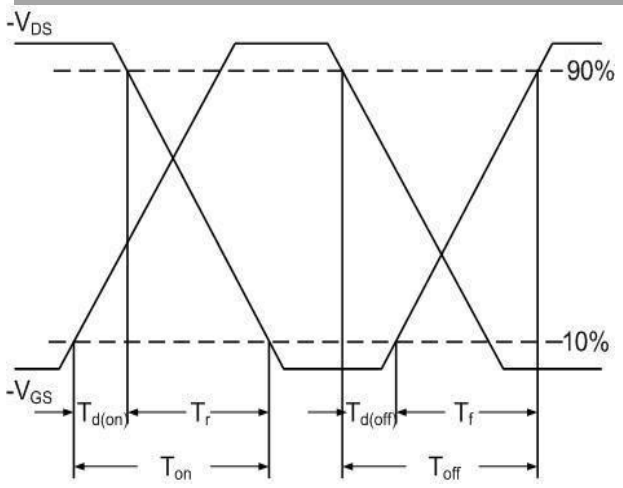



**Fig.10 Switching Time Waveform**

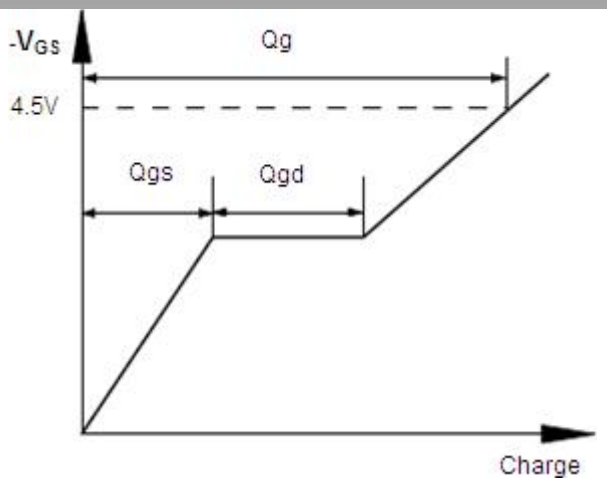
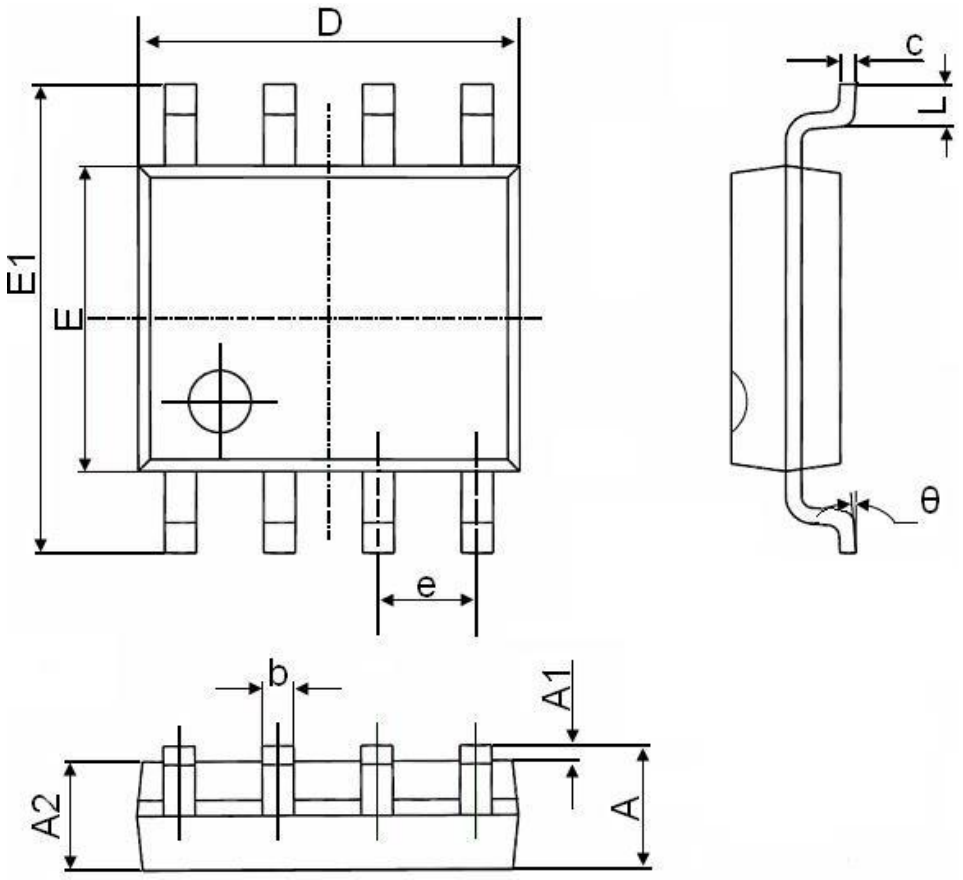



**Fig.11 Gate Charge Waveform**

## 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 |
| θ | 0° | 8° | 0° | 8° |