# P-Channel Trench Power MOSFET

## General Description

The CSD40P310 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as -4.5V. This device is suitable for use as a wide variety of applications.

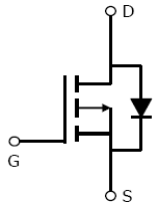
## Features

- $V_{DS}$ = -40V,ID =-20A
  $R_{DS(ON)}$ < 42mΩ @ $V_{GS}$ =-10V
  $R_{DS(ON)}$ < 78mΩ @ $V_{GS}$ =-4.5V
- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

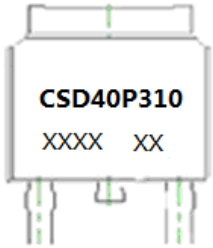
## Application

- PWM applications
- Load switch
- Power management

***100% UIS TESTED!***
***100% ΔVds TESTED!***




**Schematic Diagram**




**Marking and pin Assignment**

**TO-252(DPAK) top view**

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| CSD40P310 | CSD40P310 | TO-252 | 325mm | 16mm | 2500 |

## Table 1. Absolute Maximum Ratings ($T_A$=25℃)

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage ($V_{GS}$=0V) | -40 | V |
| $V_{GS}$ | Gate-Source Voltage ($V_{DS}$=0V) | ±20 | V |
| $I_D$ | Drain Current-Continuous($T_C$=25℃) | -20 | A |
| | Drain Current-Continuous($T_C$=100℃) | -14 | A |
| $I_{DM\ (pluse)}$ | Drain Current-Continuous@ Current-Pulsed **(Note 1)** | -80 | A |
| $P_D$ | Maximum Power Dissipation($T_C$=25℃) | 37.5 | W |
| | Maximum Power Dissipation($T_C$=100℃) | 19 | W |
| $T_J$,$T_{STG}$ | Operating Junction and Storage Temperature Range | -55 To 175 | ℃ |

## Table 2. Thermal Characteristic

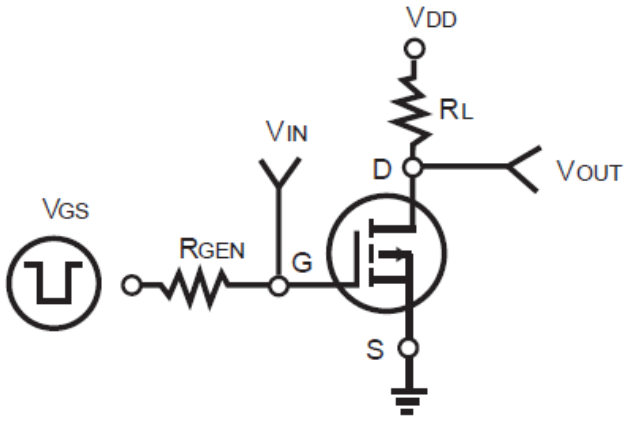
| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance,Junction-to-Case | 4 | ℃/W |

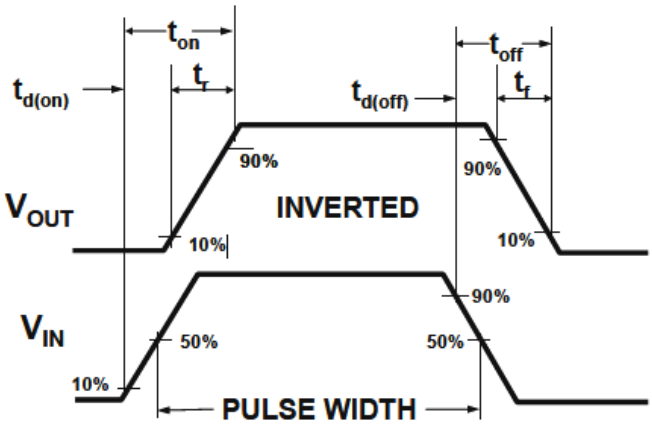
**Table 3. Electrical Characteristics (TA=25℃unless otherwise noted)**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **On/Off States** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V $I_D$=-250μA | -40 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=-32V,$V_{GS}$=0V | | | -1 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$=±20V,$V_{DS}$=0V | | | ±100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$,$I_D$=-250μA | -1 | -2 | -3 | V |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=-5V,$I_D$=-10A | | 25 | | S |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance | $V_{GS}$=-10V, $I_D$=-20A | | 32 | 42 | mΩ |
| | | $V_{GS}$=-4.5V, $I_D$=-10A | | 53 | 78 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-25V,$V_{GS}$=0V, f=1.0MHz | | 840 | | pF |
| $C_{oss}$ | Output Capacitance | | | 92 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 60 | | pF |
| **Switching Times** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{GS}$=-10V, $V_{DS}$=-20V, $R_L$=1.6Ω,$R_{GEN}$=3Ω | | 5 | | nS |
| $t_r$ | Turn-on Rise Time | | | 12 | | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 20 | | nS |
| $t_f$ | Turn-Off Fall Time | | | 4.5 | | nS |
| $Q_g$ | Total Gate Charge | $V_{GS}$=-10V, $V_{DS}$=-20V, $I_D$=-15A | | 20 | | nC |
| $Q_{gs}$ | Gate-Source Charge | | | 2.5 | | nC |
| $Q_{gd}$ | Gate-Drain Charge | | | 4.5 | | nC |
| **Source-Drain Diode Characteristics** | | | | | | |
| $I_{SD}$ | Source-Drain Current(Body Diode) | | | | -20 | A |
| $V_{SD}$ | Forward on Voltage | $V_{GS}$=0V,$I_S$=-20A | | | -1.2 | V |

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

**Switch Time Test Circuit and Switching Waveforms:**




**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)**

**Figure1. Power Dissipation**

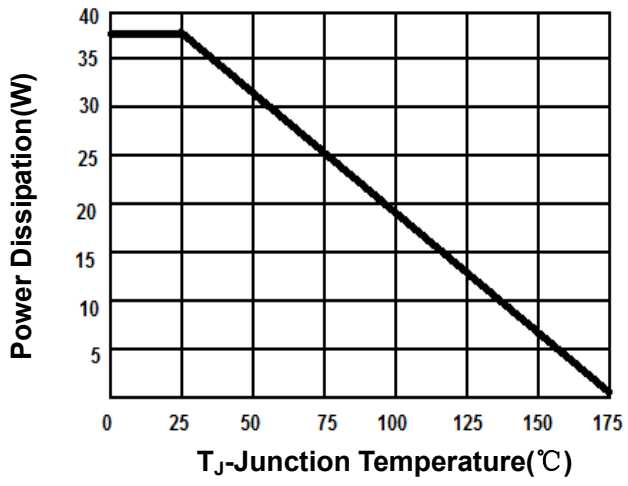



**Figure2. Drain Current**

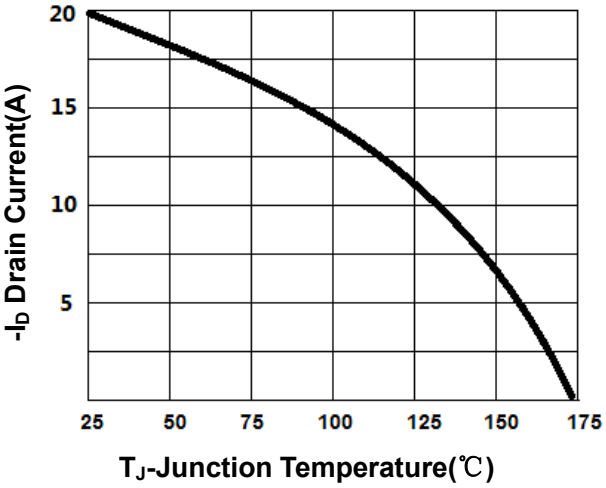



**Figure3. Output Characteristics**

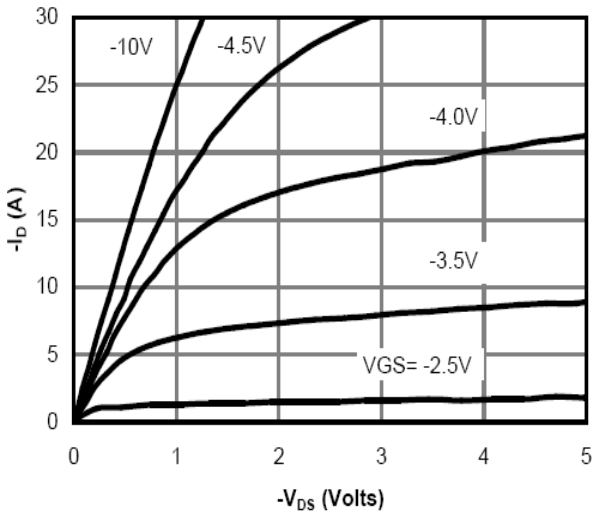



**Figure4. Transfer Characteristics**

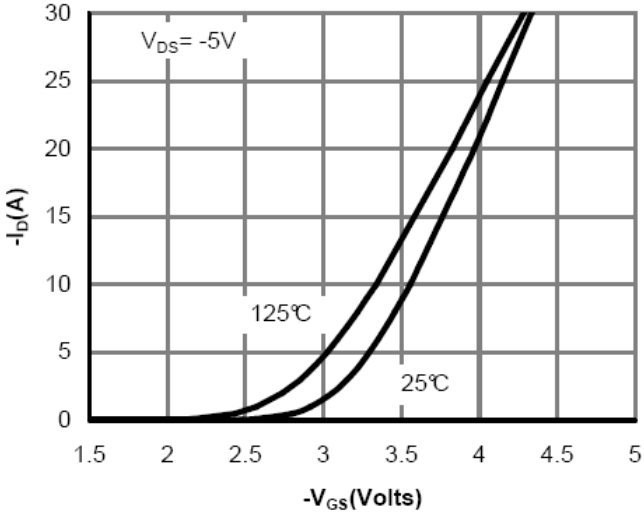


**Figure5. Capacitance**

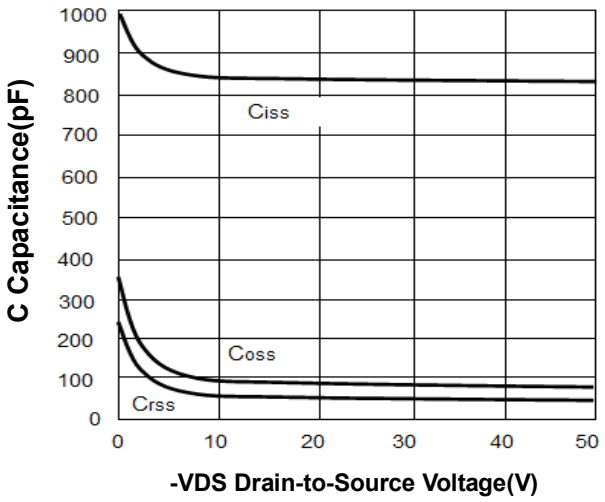



**Figure6. $R_{DS(ON)}$ vs Junction Temperature**

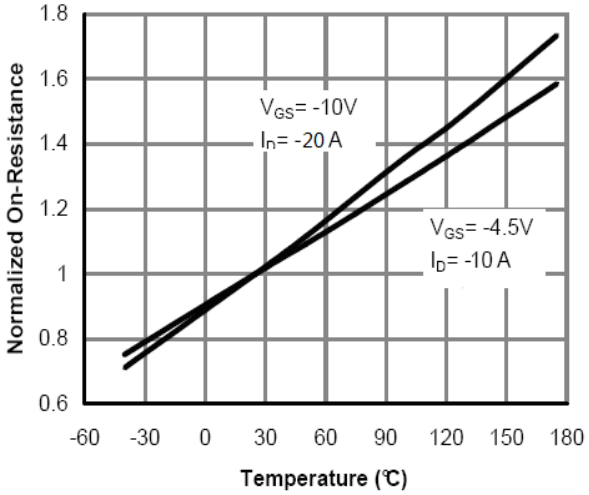



**Figure7. $V_{GS(th)}$ vs Junction Temperature**

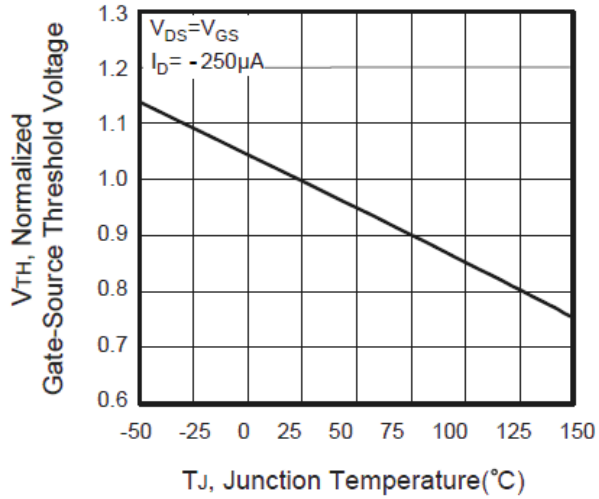



**Figure8. Gate Charge Waveforms**

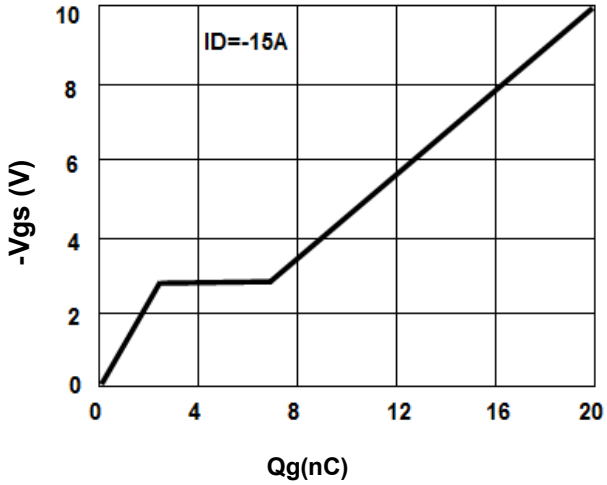
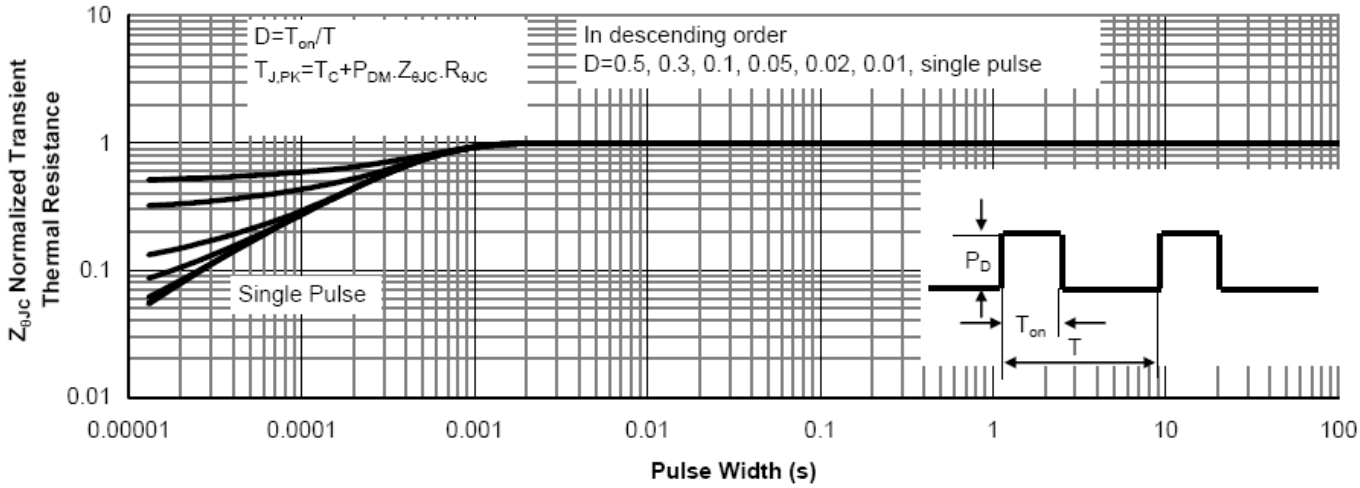
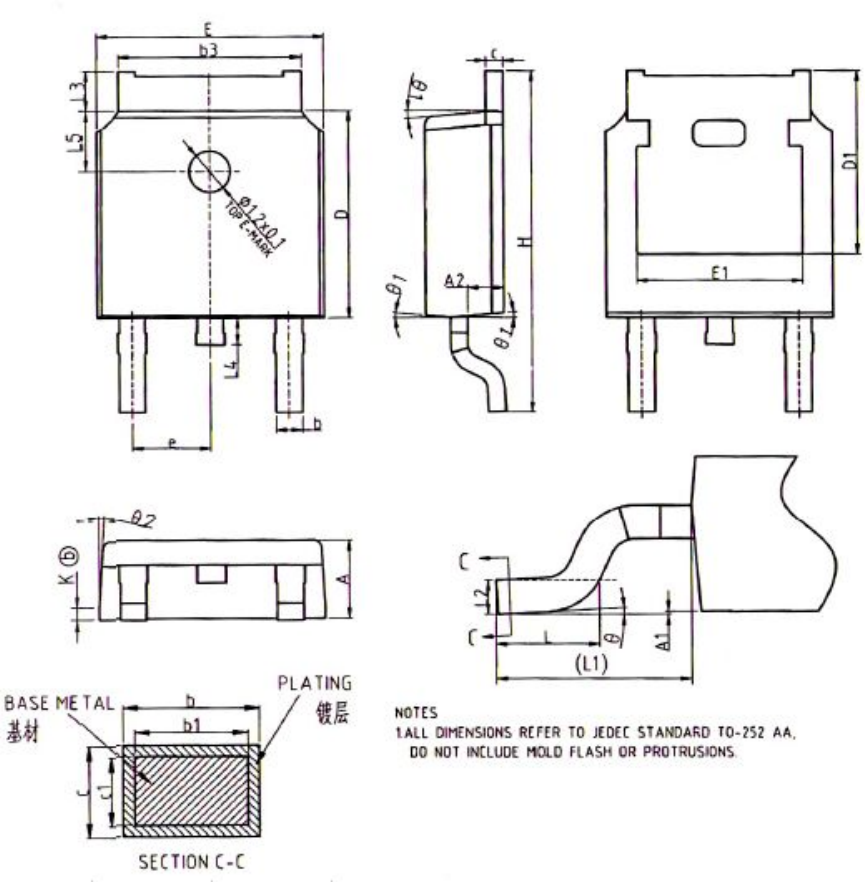



**Figure9. Normalized Maximum Transient Thermal Impedance**



# TO-252 Package Information




NOTES
1.ALL DIMENSIONS REFER TO JEDEC STANDARD TO-252 AA.
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

| COMMON DIMENSIONS | | | |
|---|---|---|---|
| SYMBOL | mm | | |
| | MIN | NOM | MAX |
| A | 2.20 | 2.30 | 2.38 |
| A1 | 0.00 | - | 0.10 |
| A2 | 0.97 | 1.07 | 1.17 |
| b | 0.72 | 0.78 | 0.85 |
| b1 | 0.71 | 0.76 | 0.81 |
| b3 | 5.23 | 5.33 | 5.46 |
| c | 0.47 | 0.53 | 0.58 |
| c1 | 0.46 | 0.51 | 0.56 |
| D | 6.00 | 6.10 | 6.20 |
| D1 | | 5.30REF | |
| E | 6.50 | 6.60 | 6.70 |
| E1 | 4.70 | 4.83 | 4.92 |
| e | | 2.286BSC | |
| H | 9.90 | 10.10 | 10.30 |
| L | 1.40 | 1.50 | 1.70 |
| L1 | | 2.90REF | |
| L2 | | 0.51BSC | |
| L3 | 0.90 | - | 1.25 |
| L4 | 0.60 | 0.80 | 1.00 |
| L5 | 1.70 | 1.80 | 1.90 |
| θ | 0° | - | 8° |
| θ1 | 5° | 7° | 9° |
| θ2 | 5° | 7° | 9° |
| K | | 0.40REF | |