Din-Tek SEMICONDUCTOR

# DTS2301B

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## P-Channel 20-V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (mΩ)(Typ.) | $I_D$ (A)[a] | $Q_g$ (Typ.) |
| -20 | 115 at $V_{GS}$ = -10 V | -3.8 | 9.5 nC |
| | 168 at $V_{GS}$ = -4.5 V | | |

### FEATURES

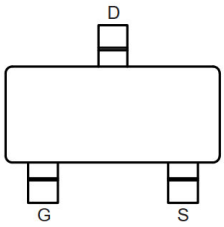
- DT-Trench Power MOSFET
- 100 % $R_g$ and UIS Tested

Pb-free
RoHS COMPLIANT

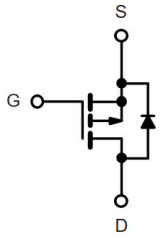
### APPLICATIONS

- Load Switches
  - Notebook PCs
  - Desktop PCs

SOT-23 Pin Configuration




Top View




P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25 °C, unless otherwise noted) | | | | |
|---|---|---|---|---|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | | $V_{DS}$ | - 20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 8 | |
| Continuous Drain Current | $T_C$ = 25 °C | $I_D$ | -3.8 | A |
| | $T_C$ = 125 °C | | -2.5 | |
| Continuous Source Current (Diode Conduction) | | $I_S$ | - 2.5 | |
| Pulsed Drain Current[a] | | $I_{DM}$ | - 10 | |
| Single Pulse Avalanche Current | L = 0.1 mH | $I_{AS}$ | - 11 | |
| Single Pulse Avalanche Energy | | $E_{AS}$ | 5 | mJ |
| Maximum Power Dissipation[a] | $T_C$ = 25 °C | $P_D$ | 2.2 | W |
| | $T_C$ = 125 °C | | 0.7 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | - 55 to + 175 | °C |

| THERMAL RESISTANCE RATINGS | | | | |
|---|---|---|---|---|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Junction-to-Ambient | PCB Mount[b] | $R_{thJA}$ | 175 | °C/W |
| Junction-to-Foot (Drain) | | $R_{thJF}$ | 75 | |

Notes:
a. Based on $T_C$ = 25 °C.
b. Maximum under Steady State conditions is 185 °C/W.

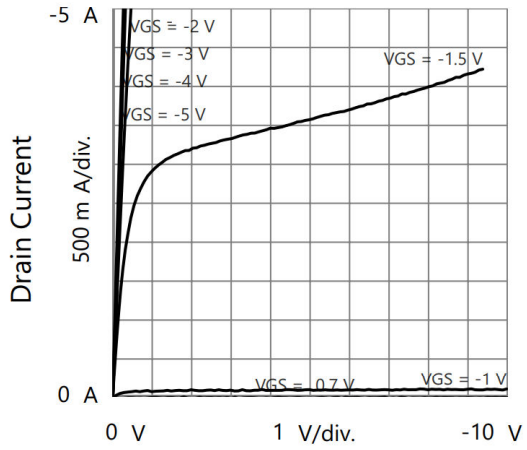
| **SPECIFICATIONS** ($T_C$ = 25 °C, unless otherwise noted) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **Static** | | | | | | | |
| Drain-Source Breakdown Voltage | $V_{DS}$ | $V_{GS}$ = 0 V, $I_D$ = - 250 µA | | - 20 | - | - | V |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = - 250 µA | | - 0.45 | - | - 0.95 | |
| Gate-Source Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 8 V | | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V | $V_{DS}$ = - 12 V | - | - | - 1 | µA |
| | | $V_{GS}$ = 0 V | $V_{DS}$ = - 12 V, $T_J$ = 125 °C | - | - | - 50 | |
| | | $V_{GS}$ = 0 V | $V_{DS}$ = - 12 V, $T_J$ = 175 °C | - | - | - 150 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{GS}$ = - 4.5 V | $V_{DS}$ ≤ - 5 V | - 4 | - | - | A |
| Drain-Source On-State Resistance[a] | $R_{DS(on)}$ | $V_{GS}$ = - 4.5 V | $I_D$ = - 3.5 A | - | 115 | 135 | mΩ |
| | | $V_{GS}$ = - 4.5 V | $I_D$ = - 1.5 A, $T_J$ = 125 °C | - | 128 | 160 | |
| | | $V_{GS}$ = - 4.5 V | $I_D$ = - 1.0 A, $T_J$ = 175 °C | - | 149 | 185 | |
| | | $V_{GS}$ = - 2.5 V | $I_D$ = - 1 A | - | 168 | 205 | |
| Forward Transconductance[b] | $g_{fs}$ | $V_{DS}$ = - 5 V, $I_D$ = - 3.5 A | | - | 3 | - | S |
| **Dynamic[b]** | | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V | $V_{DS}$ = - 6 V, f = 1 MHz | - | 542 | - | pF |
| Output Capacitance | $C_{oss}$ | | | - | 96 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | - | 77 | - | |
| Total Gate Charge[c] | $Q_g$ | $V_{GS}$ = - 4.5 V | $V_{DS}$ = - 6 V, $I_D$ = - 3.5 A | - | 9.5 | - | nC |
| Gate-Source Charge[c] | $Q_{gs}$ | | | - | 2 | - | |
| Gate-Drain Charge[c] | $Q_{gd}$ | | | - | 2.5 | - | |
| Gate Resistance | $R_g$ | f = 1 MHz | | - | 8 | - | Ω |
| Turn-On Delay Time[c] | $t_{d(on)}$ | $V_{DD}$ = - 6 V, $R_L$ = 1.6 Ω<br>$I_D$ ≅ - 3.5 A, $V_{GEN}$ = - 4.5 V, $R_g$ = 1 Ω | | - | 8 | - | ns |
| Rise Time[c] | $t_r$ | | | - | 20 | - | |
| Turn-Off Delay Time[c] | $t_{d(off)}$ | | | - | 30 | - | |
| Fall Time[c] | $t_f$ | | | - | 15 | - | |
| **Source-Drain Diode Ratings and Characteristics[b]** | | | | | | | |
| Continous Source-Drain Diode Current | $I_S$ | $T_C$ = 25 °C | | - | - 3.8 | - | A |
| Pulse Diode Forward Current | $I_{SM}$ | | | - | - 10 | - | |
| Body Diode Voltage | $V_{SD}$ | $I_S$ = - 1 A, $V_{GS}$ = 0 V | | - | -0.5 | -1 | V |

**Notes**

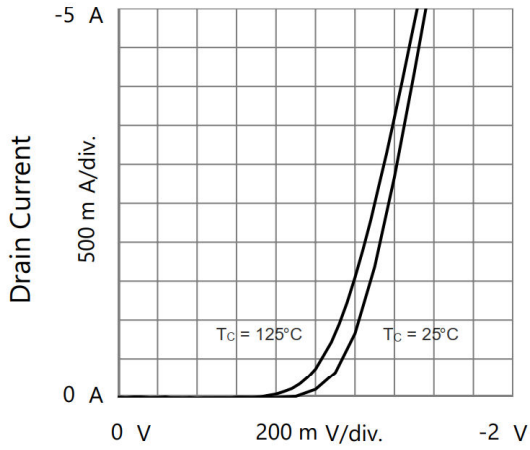
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

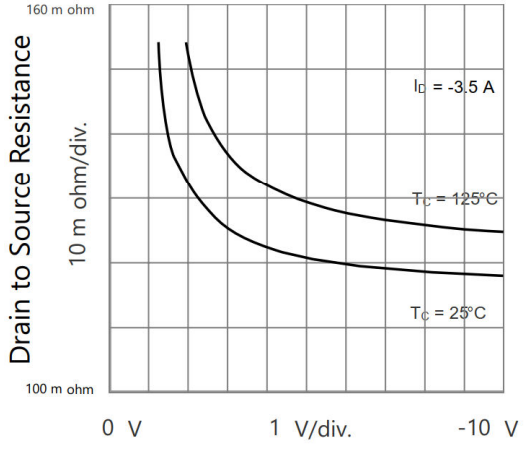
**TYPICAL CHARACTERISTICS** (25 C, unless otherwise noted)



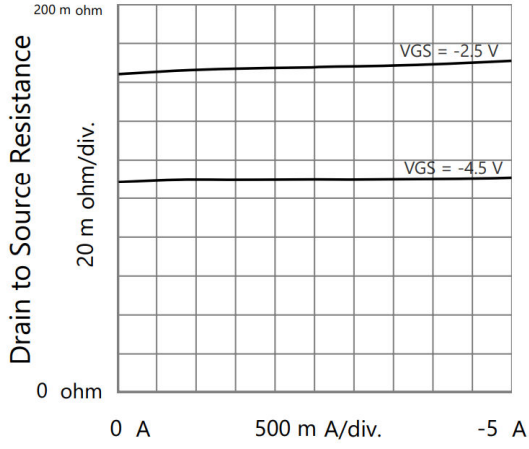

Drain to Source Voltage
Output Characteristics



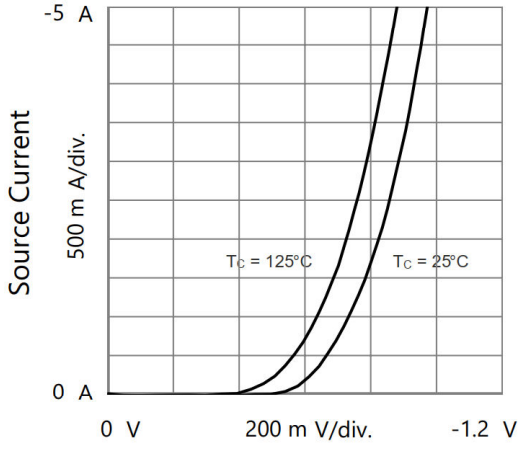

Gate to Source Voltage
Transfer Characteristics



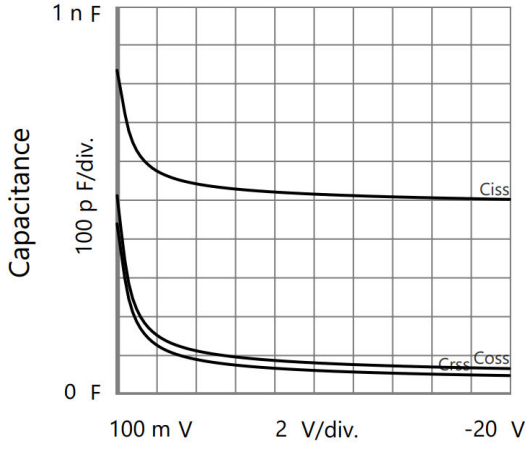

Gate to Source Voltage
Drain to Source Resistance vs. Gate to Source Voltage




Drain Current
Drain to Source Resistance vs. Drain Current

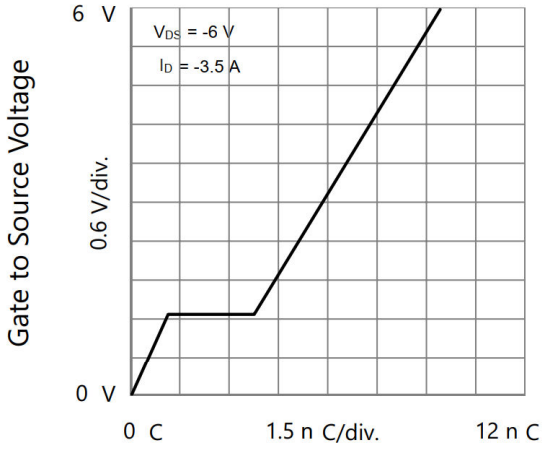



Source to Drain Voltage
Body Diode Forward Characteristics

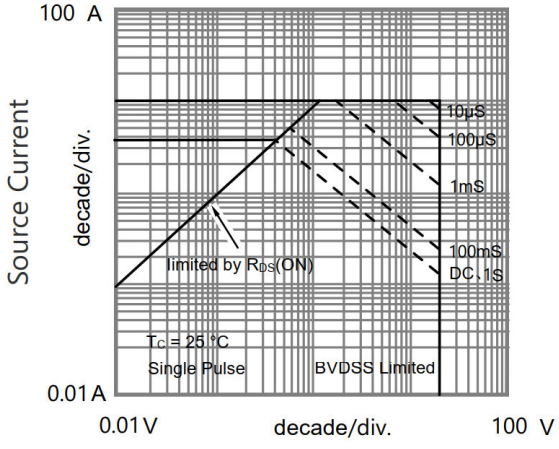



Drain to Source Voltage
Capacitances

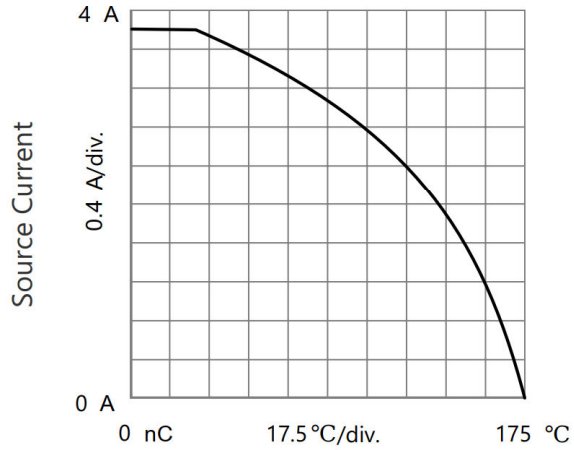
**TYPICAL CHARACTERISTICS** (25 C, unless otherwise noted)



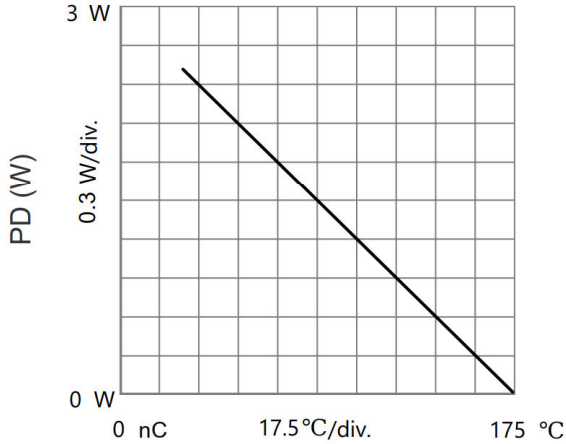

Gate Charge
Gate to Source Voltage vs. GateCharge




Source to Drain Voltage
Safe Operating Area, Junction-to-Ambient

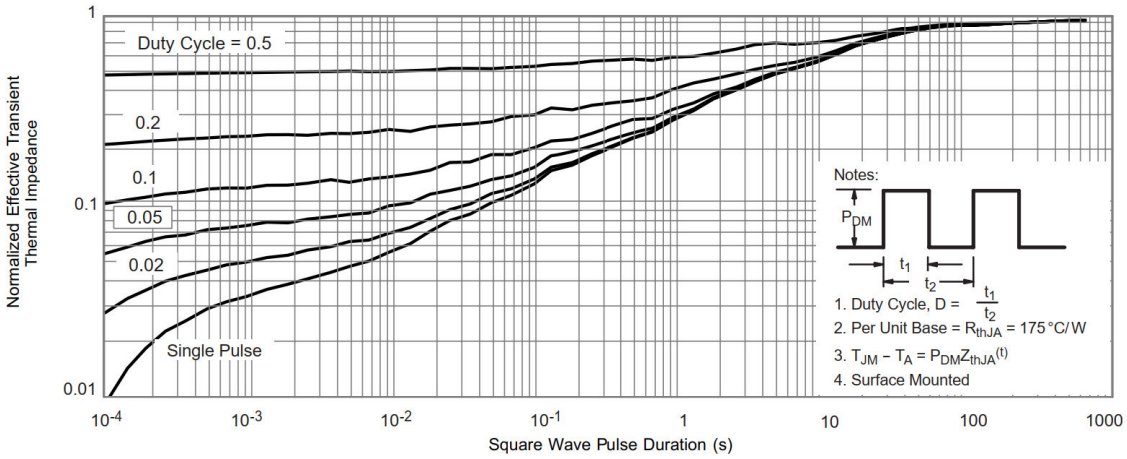



TC - Case Temperature
Current Derating

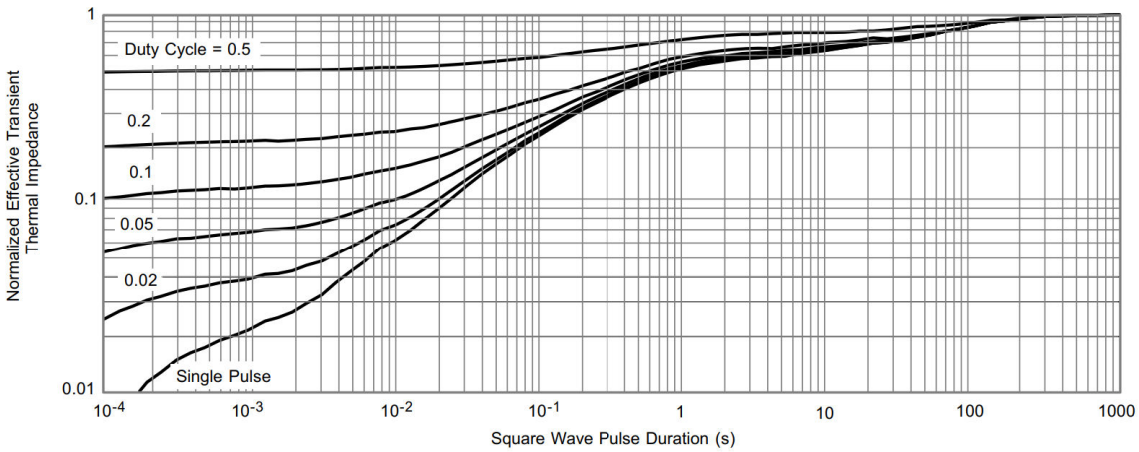



TC - Case Temperature
Power Derating

## THERMAL RATINGS ($T_A$ = 25 °C, unless otherwise noted)




**Normalized Thermal Transient Impedance, Junction-to-Foot**




**Normalized Thermal Transient Impedance, Junction-to-Ambient**

**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Foot (25 ℃)

  are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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