

General Description

The WSR140N12 is the highest performance trench N-ch MOSFET with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The WSR140N12 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Features

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

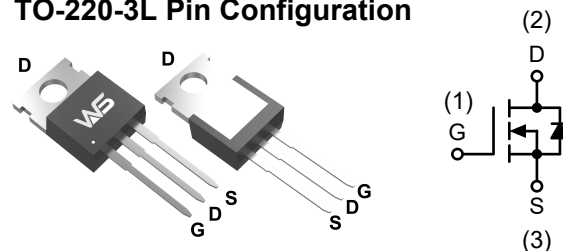
Product Summary

| BV_{DSS} | $R_{DS(on)}$ | I_D |
|------------|--------------|-------|
| 120V | 5mΩ | 140A |

Applications

- High Frequency Point-of-Load Synchronous Buck Converter
- Networking DC-DC Power System

TO-220-3L Pin Configuration



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|-----------------|--|------------|--------------|
| V_{DS} | Drain-Source Voltage | 120 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| I_D | Continuous Drain Current, $V_{GS} @ 10V(T_C=25^\circ C)$ | 140 | A |
| I_{DM} | Pulsed Drain Current | 330 | A |
| EAS | Single Pulse Avalanche Energy | 400 | mJ |
| P_D | Total Power Dissipation... $T_C=25^\circ C$ | 192 | W |
| $R_{\theta JA}$ | Thermal resistance, junction-ambient | 62 | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal resistance, junction-case | 0.65 | $^\circ C/W$ |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ C$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ C$ |

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 | $V_{GS}=0V$, $I_D=250\mu A$ | 120 | --- | --- | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance ² | $V_{GS}=10V$, $I_D=30A$ | --- | 5.0 | 6.5 | m Ω |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}$, $I_D=250\mu A$ | 2.0 | 3.0 | 4.0 | V |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=120V$, $V_{GS}=0V$, $T_J=25^{\circ}\text{C}$ | --- | --- | 1 | μA |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V$, $V_{DS}=0V$ | --- | --- | ± 100 | nA |
| Q_g | Total Gate Charge | $V_{DS}=50V$, $V_{GS}=10V$, $I_D=15A$ | --- | 68.9 | --- | nC |
| Q_{gs} | Gate-Source Charge | | --- | 18.1 | --- | |
| Q_{gd} | Gate-Drain Charge | | --- | 15.9 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}=50V$, $V_{GS}=10V$ $R_G=2\Omega$, $I_D=25A$ | --- | 30.3 | --- | ns |
| T_r | Rise Time | | --- | 33.0 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 11.7 | --- | |
| T_f | Fall Time | | --- | 59.5 | --- | |
| C_{iss} | Input Capacitance | $V_{DS}=50V$, $V_{GS}=0V$, $f=1\text{MHz}$ | --- | 5823 | --- | pF |
| C_{oss} | Output Capacitance | | --- | 778.3 | --- | |
| C_{rss} | Reverse Transfer Capacitance | | --- | 17.5 | --- | |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------|--|--|------|------|------|------|
| I_S | Continuous Source Current ^{1,6} | $V_G=V_D=0V$, Force Current | --- | --- | 150 | A |
| I_{SM} | Pulsed Source Current ^{2,6} | | --- | --- | 330 | A |
| V_{SD} | Diode Forward Voltage ² | $V_{GS}=0V$, $I_S=25A$, $T_J=25^{\circ}\text{C}$ | --- | --- | 1.3 | V |

■ Note

- 1) Repetitive rating; pulse width limited by max. junction temperature.
- 2) P_d is based on max. junction temperature, using junction-case thermal resistance.
- 3) The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_a=25^{\circ}\text{C}$.
- 4) $V_{DD}=50V$, $R_G=50\Omega$, $L=0.3\text{mH}$, starting $T_J=25^{\circ}\text{C}$.
- 5) Calculated continuous current based on maximum allowable junction temperature.

Typical Operating Characteristics

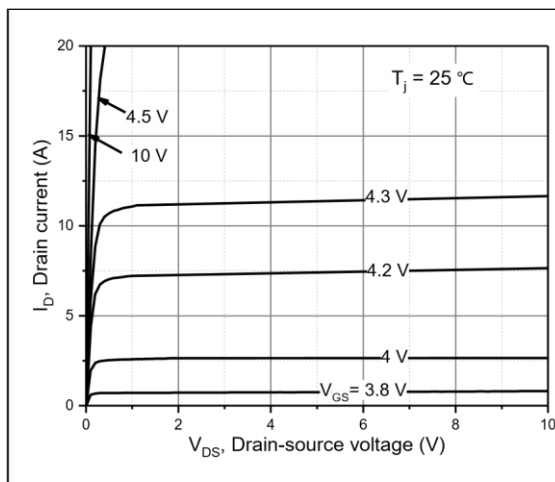


Figure 1, Typ. output characteristics

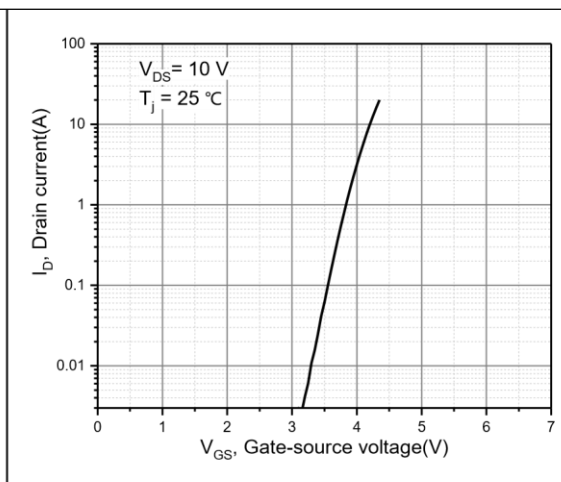


Figure 2, Typ. transfer characteristics

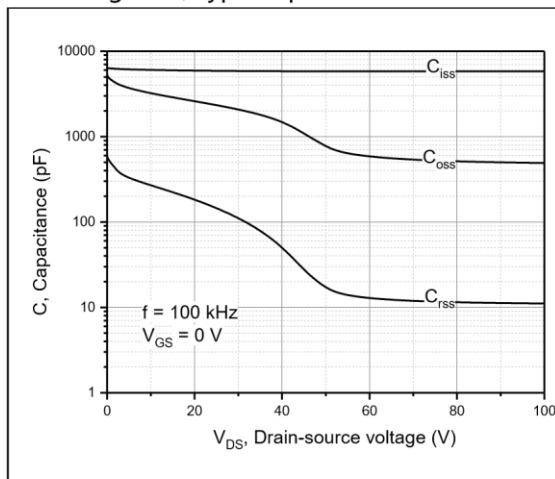


Figure 3, Typ. capacitances

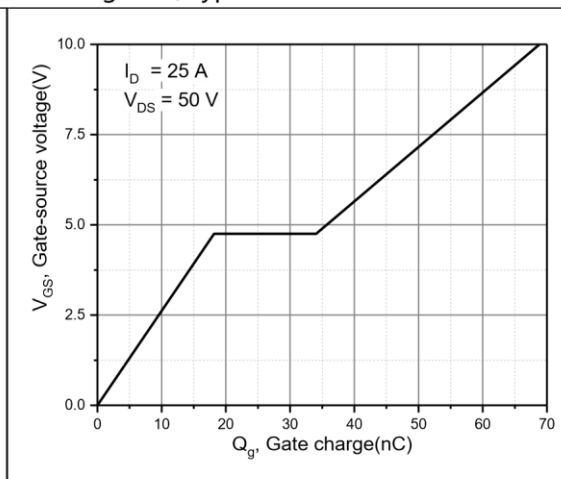


Figure 4, Typ. gate charge

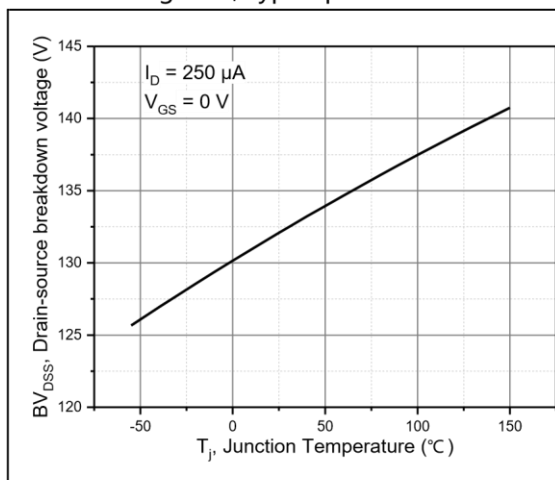


Figure 5, Drain-source breakdown voltage

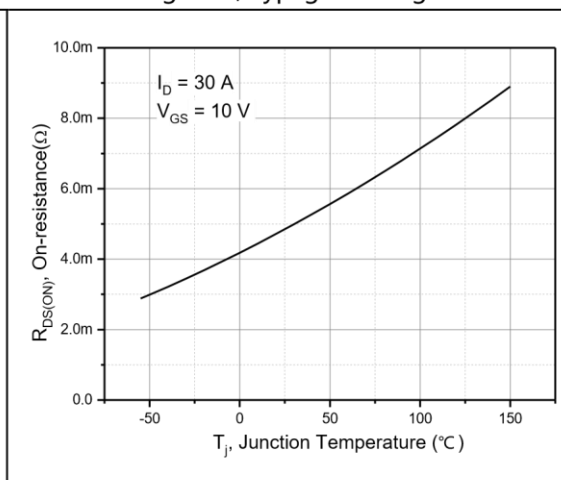


Figure 6, Drain-source on-state resistance

Typical Operating Characteristics

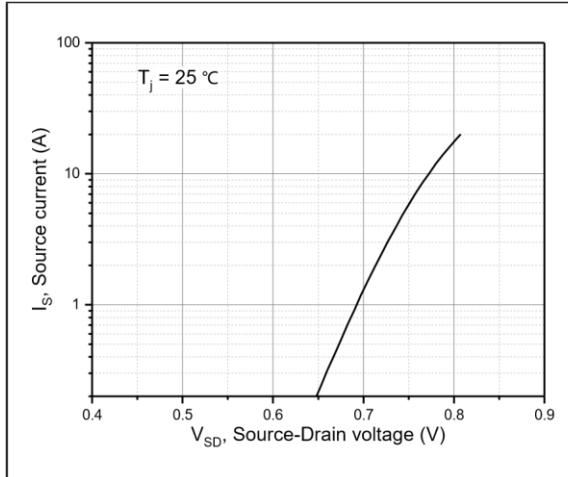


Figure 7, Forward characteristic of body diode

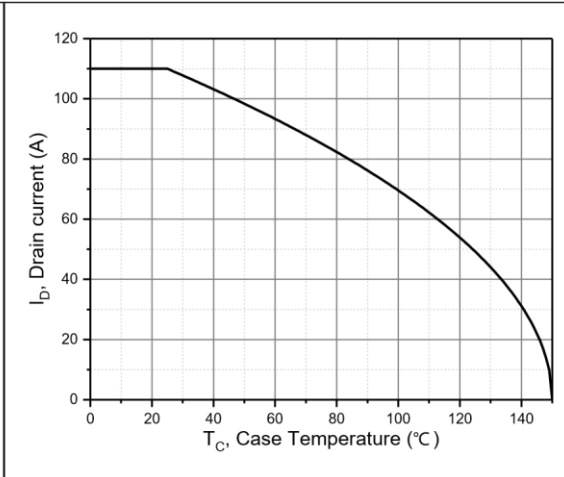


Figure 8, Drain current

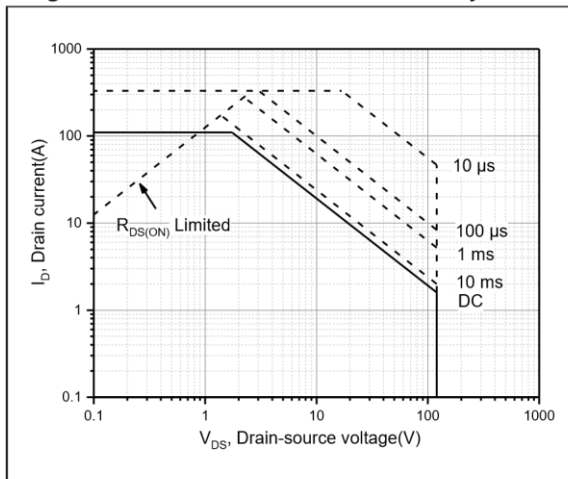
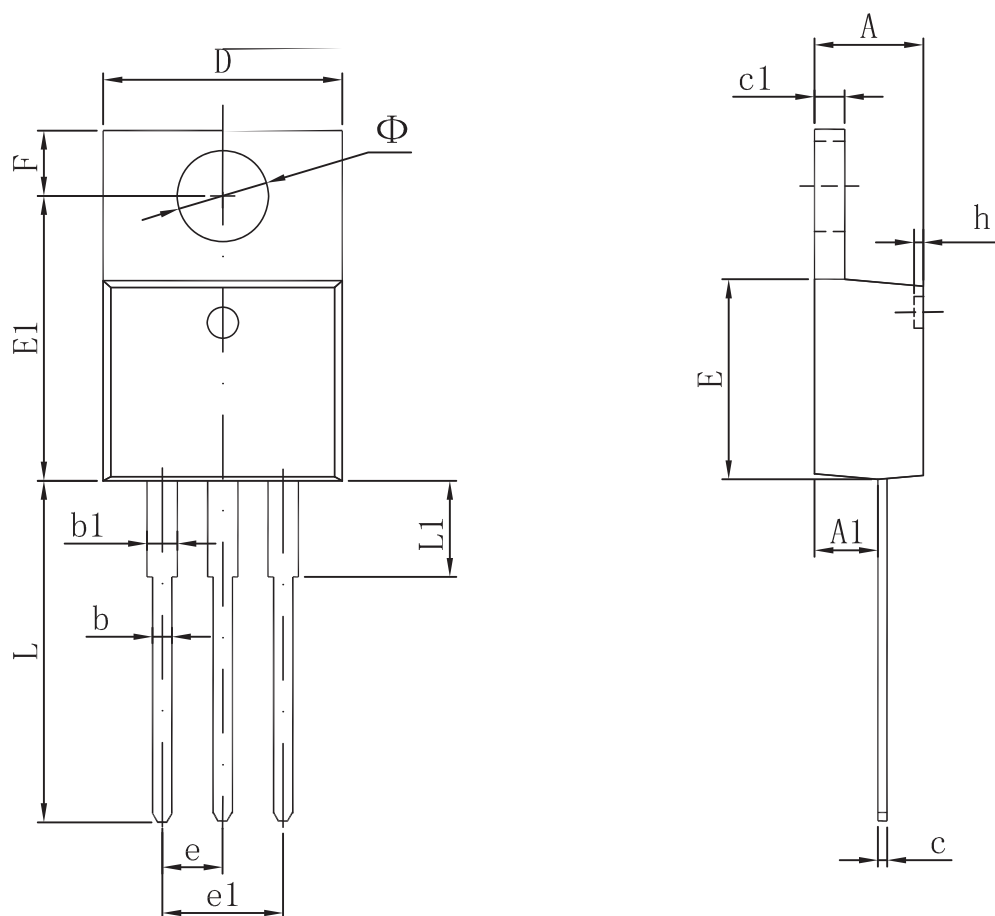


Figure 9, Safe operation area $T_C = 25\text{ }^{\circ}\text{C}$

Packaging information


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 4.470 | 4.670 | 0.176 | 0.184 |
| A1 | 2.520 | 2.820 | 0.099 | 0.111 |
| b | 0.710 | 0.910 | 0.028 | 0.036 |
| b1 | 1.170 | 1.370 | 0.046 | 0.054 |
| c | 0.310 | 0.530 | 0.012 | 0.021 |
| c1 | 1.170 | 1.370 | 0.046 | 0.054 |
| D | 10.010 | 10.310 | 0.394 | 0.406 |
| E | 8.500 | 8.900 | 0.335 | 0.350 |
| E1 | 12.060 | 12.460 | 0.475 | 0.491 |
| e | 2.540 TYP | | 0.100 TYP | |
| e1 | 4.980 | 5.180 | 0.196 | 0.204 |
| F | 2.590 | 2.890 | 0.102 | 0.114 |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| L | 13.400 | 13.800 | 0.528 | 0.543 |
| L1 | 3.560 | 3.960 | 0.140 | 0.156 |
| Φ | 3.735 | 3.935 | 0.147 | 0.155 |

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