



## 100V N-Channel Power MOSFET

### DESCRIPTION

The TW180N10 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

### Application

- Power switching application
- Hard switched and High frequency circuits
- Uninterruptible power supply

### KEY CHARACTERISTICS

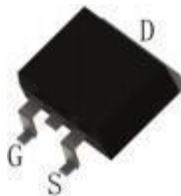
- $V_{DS} = 100V, I_D = 180A$   
 $R_{DS(ON)} < 6m\Omega @ V_{GS}=10V$
- Special process technology for high ESD capability
- High density cell design for lower  $R_{Dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS
- Excellent package for good heat dissipation

**100% UIS TESTED!**

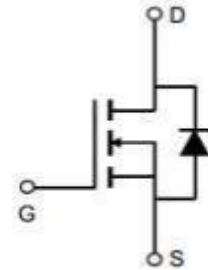
**100% DVDS TESTED!**



TO-220 Top View



TO-263 Top View



Schematic diagram

### Package Marking And Ordering Information

| Device Marking | Ordering Codes | Package | Product Code | Packing |
|----------------|----------------|---------|--------------|---------|
| TW180N10       | TW180N10       | TO-220  | TW180N10     | Tube    |
| TW180N10       | TW180N10       | TO-263  | TW180N10     | Reel    |

### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

| Parameter  | Symbol         | Limit      | Unit       |
|--|----------------|------------|------------|
| Drain-Source Voltage                             | $V_{DS}$       | 100        | V          |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$   | V          |
| Drain Current-Continuous                         | $I_D$          | 330        | A          |
| Drain Current-Pulsed (Note 1)                    | $I_{DM}$       | 720        | A          |
| Maximum Power Dissipation( $T_c=25^\circ C$ )    | $P_D$          | 211        | W          |
| Single pulse avalanche energy(Note 2)            | $E_{AS}$       | 1200       | mJ         |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 175 | $^\circ C$ |

### Thermal Characteristic

|                                     |                 |      |              |
|-------------------------------------|-----------------|------|--------------|
| Thermal Resistance,Junction-to-Case | $R_{\theta JC}$ | 0.36 | $^\circ C/W$ |
|-------------------------------------|-----------------|------|--------------|

**Electrical Characteristics (TA=25°C unless otherwise noted)**

| Parameter  | Symbol       | Condition   | Min | Typ  | Max       | Unit       |
|--|--------------|---|-----|------|-----------|------------|
| <b>Off Characteristics</b>                           |              |   |     |      |           |            |
| Drain-Source Breakdown Voltage                       | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                               | 100 | -    | -         | V          |
| Zero Gate Voltage Drain Current                      | $I_{DSS}$    | $V_{DS}=100V, V_{GS}=0V$                                | -   | -    | 1         | $\mu A$    |
| Gate-Body Leakage Current                            | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                             | -   | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b>                            |              |   |     |      |           |            |
| Gate Threshold Voltage                               | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                           | 2   | 3    | 4         | V          |
| Drain-Source On-State Resistance <sup>(Note 3)</sup> | $R_{DS(on)}$ | $V_{GS}=10V, I_D=50A$                                   | -   | 5    | 6         | m $\Omega$ |
| Forward Transconductance                             | $g_{FS}$     | $V_{DS}=10V, I_D=40A$                                   | 170 | -    | -         | S          |
| <b>Dynamic Characteristics</b>                       |              |   |     |      |           |            |
| Input Capacitance                                    | $C_{iss}$    | $V_{DS}=25V, V_{GS}=0V,$<br>$f=1.0MHz$                  | -   | 6600 | -         | pF         |
| Output Capacitance                                   | $C_{oss}$    |   | -   | 590  | -         | pF         |
| Reverse Transfer Capacitance                         | $C_{riss}$   |   | -   | 210  | -         | pF         |
| <b>Switching Characteristics</b> <sup>(Note 4)</sup> |              |   |     |      |           |            |
| Turn-on Delay Time                                   | $t_{d(on)}$  | $V_{DD}=50V, I_D=20A,$<br>$V_{GS}=10V, R_{GEN}=3\Omega$ | -   | 29   | -         | nS         |
| Turn-on Rise Time                                    | $t_r$        |   | -   | 23   | -         | nS         |
| Turn-Off Delay Time                                  | $t_{d(off)}$ |   | -   | 44   | -         | nS         |
| Turn-Off Fall Time                                   | $t_f$        |   | -   | 15   | -         | nS         |
| Total Gate Charge                                    | $Q_g$        | $V_{DS}=50V, I_D=30A$<br>$V_{GS}=10V$                   | -   | 108  | -         | nC         |
| Gate-Source Charge                                   | $Q_{gs}$     |   | -   | 29   | -         | nC         |
| Gate-Drain Charge                                    | $Q_{gd}$     |   | -   | 40   | -         | nC         |
| <b>Drain-Source Diode Characteristics</b>            |              |   |     |      |           |            |
| Diode Forward Voltage                                | $V_{SD}$     | $V_{GS}=0V, I_S=50A$                                    | -   | -    | 1.2       | V          |

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. EAS condition:  $T_j=25^\circ C, V_{DD}=50V, V_G=10V, L=1mH, R_g=25\Omega$
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production.



Characteristics Curves

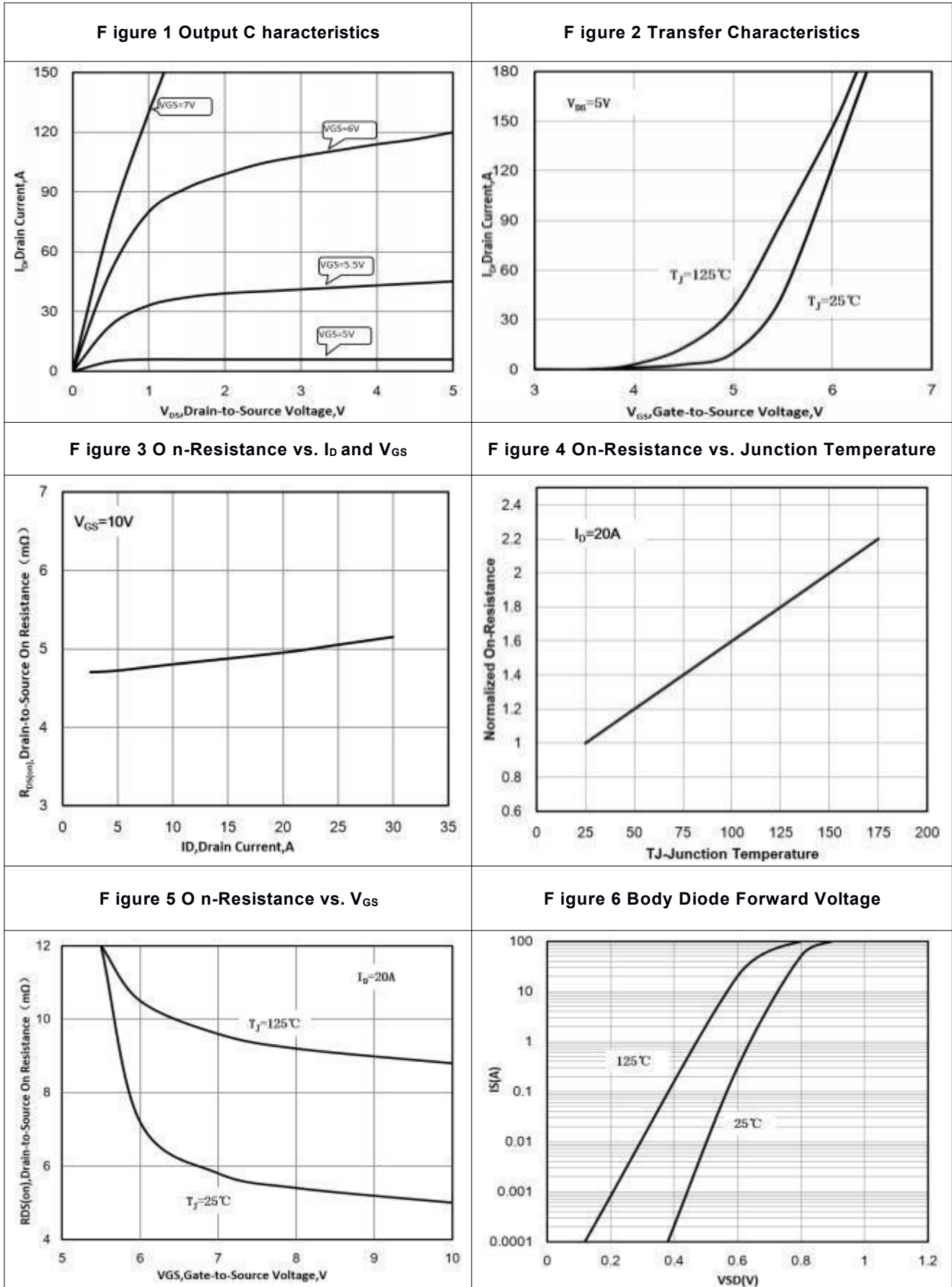




Figure 7 Gate-C charge C characteristics

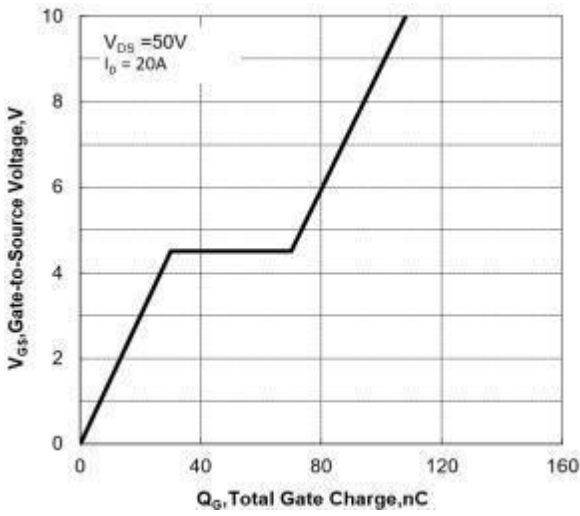


Figure 8 Capacitance Characteristics

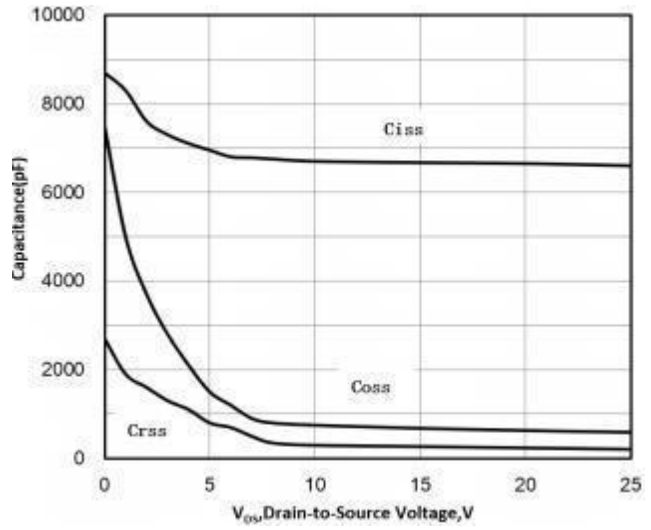


Figure 9 Maximum Forward Biased Safe Operation Area

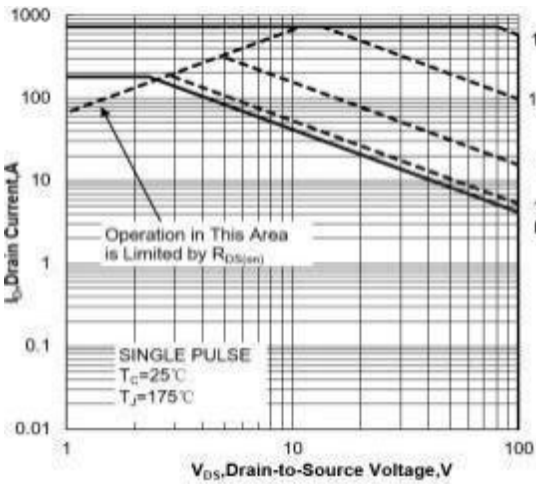


Figure 10 Single Pulse Power Rating Junction-to-Ambient

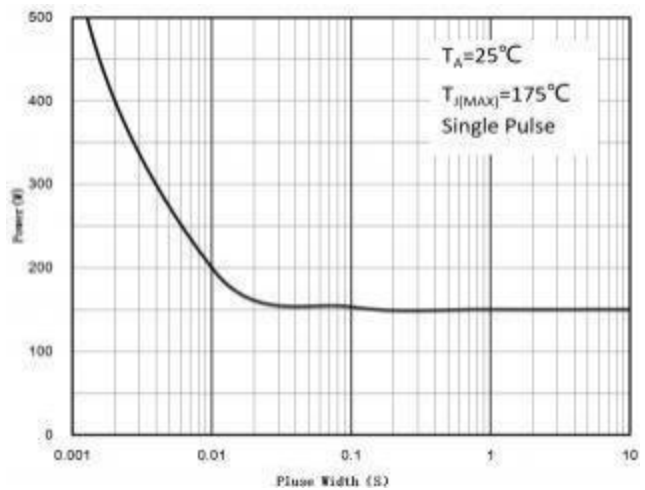
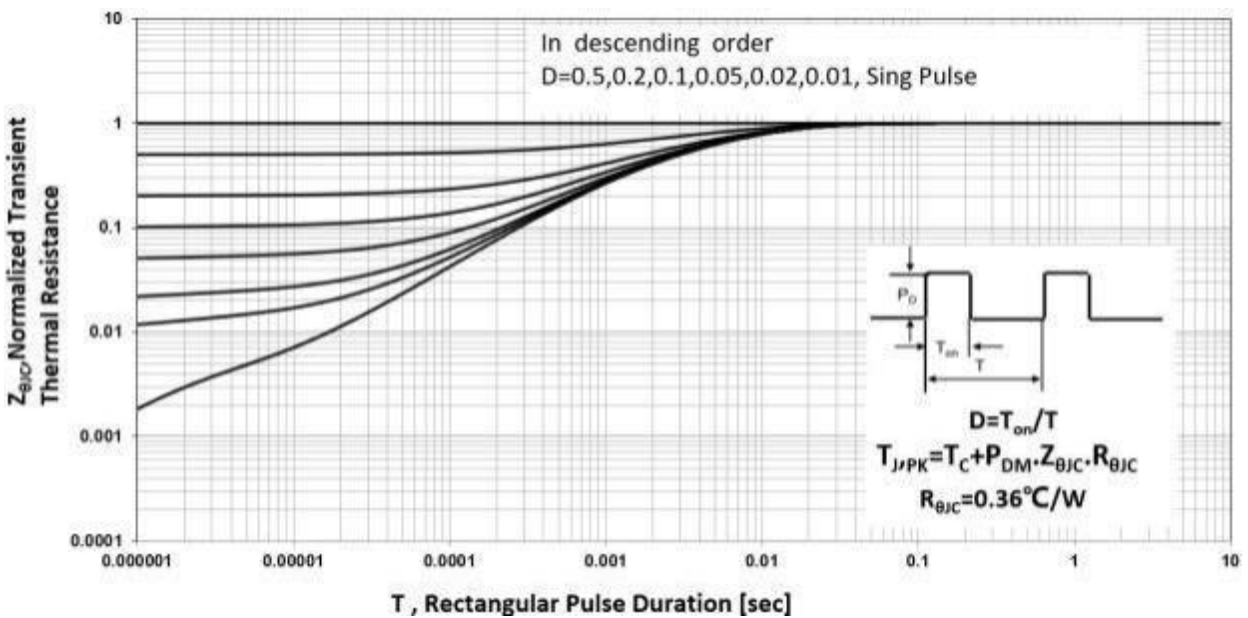


Figure 11 Normalized Maximum Transient Thermal Impedance

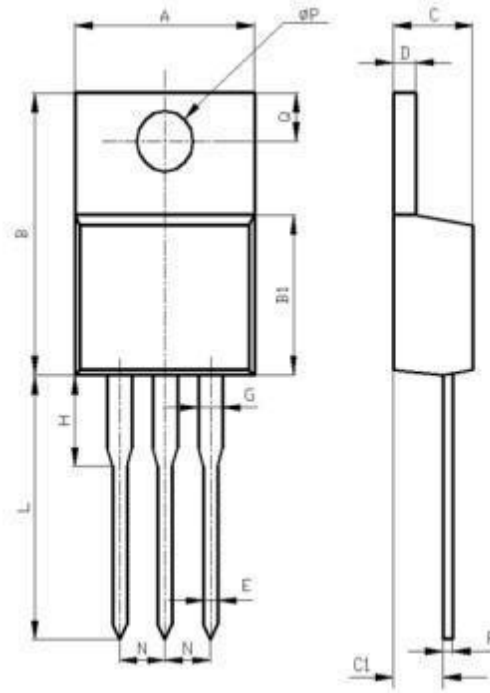


## Test Circuit and Waveform

|   |   |
|---|---|
| <p style="text-align: center;"><b>Gate Charge Test Circuit</b></p>                          | <p style="text-align: center;"><b>Gate Charge Test Waveform</b></p>                           |
| <p style="text-align: center;"><b>Resistive Switching Test Circuit</b></p>                  | <p style="text-align: center;"><b>Resistive Switching Test Waveforms</b></p>                  |
| <p style="text-align: center;"><b>U nclamped Inductive Switching (UIS) Test Circuit</b></p> | <p style="text-align: center;"><b>U nclamped Inductive Switching (UIS) Test Waveforms</b></p> |
| <p style="text-align: center;"><b>Diode Recovery Test Circuit</b></p>                       | <p style="text-align: center;"><b>Diode Recovery Test Waveforms</b></p>                       |

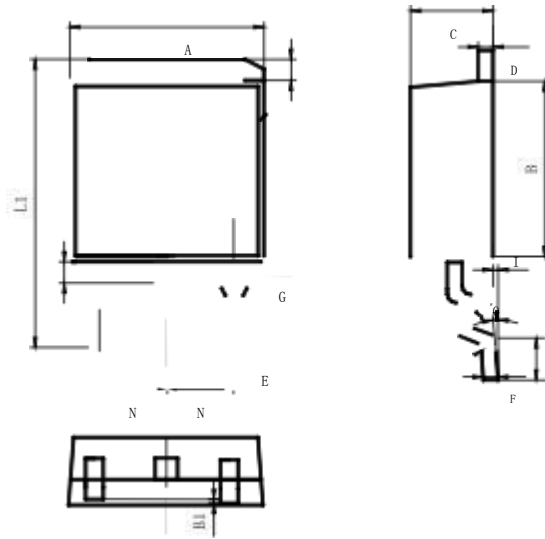


Package Description



| Items    | Values(mm) |      |
|----------|------------|------|
|          | MIN        | MAX  |
| A        | 9.60       | 10.6 |
| B        | 15.0       | 16.0 |
| B1       | 8.90       | 9.50 |
| C        | 4.30       | 4.80 |
| C1       | 2.30       | 3.10 |
| D        | 1.20       | 1.40 |
| E        | 0.70       | 0.90 |
| F        | 0.30       | 0.60 |
| G        | 1.17       | 1.37 |
| H        | 2.70       | 3.80 |
| L        | 12.6       | 14.8 |
| N        | 2.34       | 2.74 |
| Q        | 2.40       | 3.00 |
| $\phi P$ | 3.50       | 3.90 |

TO-220 Package



| Items | Values(mm) |       |
|-------|------------|-------|
|       | MIN        | MAX   |
| A     | 9.80       | 10.40 |
| B     | 8.90       | 9.50  |
| B1    | 0          | 0.10  |
| C     | 4.40       | 4.80  |
| D     | 1.16       | 1.37  |
| E     | 0.70       | 0.95  |
| F     | 0.30       | 0.60  |
| G     | 1.07       | 1.47  |
| H     | 1.30       | 1.80  |
| K     | 0.95       | 1.37  |
| L1    | 14.50      | 16.50 |
| L2    | 1.60       | 2.30  |
| I     | 0          | 0.2   |
| Q     | 0°         | 8°    |
| R     | 0.4        |       |
| N     | 2.39       | 2.69  |

TO-263 Package