

1700V SiC N-Channel MOSFET

DESCRIPTION :

- High Blocking Voltage with Low On-Resistance
- $R_{DS(ON),typ.}=45m\Omega @ V_{GS}=18V \ T_j=25^{\circ}C$
- Low Capacitances
- Avalanche Ruggednes
- RoHS compliant.

| | |
|-------------------|--------------|
| BV_{DSS} | 1700V |
| I_D | 45A |
| $R_{DS(ON) typ.}$ | 45m Ω |

TYPICAL APPLICATIONS :

- Solar inverters
- Battery Chargers
- Switch mode power supplies
- High Voltage DC-DC Converters



TO-247

MAXIMUM RATINGS (at $T_C = 25^{\circ}C$, unless otherwise specified)

| Characteristic | Condition | Symbol | Value | Unit |
|--------------------------------|---|---------------|----------|-------------|
| Drain-Source Voltage | | V_{DSS} | 1700 | V |
| Gate-Source Operation Voltage | | V_{GSS} | -5/+18 | V |
| Continuous Drain Current | $T_C=25^{\circ}C$ $T_C=100^{\circ}C$ | I_D | 45 35 | A |
| Pulsed Drain Current | $T_C=25^{\circ}C$, t_p limited by T_{jmax} | $I_{D PULSE}$ | 120 | A |
| Total power dissipation | | P_D | 284 | W |
| Operation Junction temperature | | T_j | -55~+175 | $^{\circ}C$ |
| Storage temperature | | T_{STG} | -55~+175 | $^{\circ}C$ |

THERMAL CHARACTERISTICS

| Characteristic | Condition | Symbol | Typical | Unit |
|--|-----------|---------------|---------|---------------|
| Thermal resistance, junction - case | | $R_{th(j-C)}$ | 0.53 | $^{\circ}C/W$ |
| Thermal resistance, junction - Ambient | | $R_{th(j-A)}$ | 40 | $^{\circ}C/W$ |

ELECTRICAL CHARACTERISTICS (at $T_J = 25^\circ\text{C}$, unless otherwise specified)

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|---|--------------|------|-----------|-----------|---------------|
| Drain-Source Breakdown Voltage $V_{GS} = 0\text{V}$, $I_D = 100\mu\text{A}$ | BV_{DSS} | 1700 | | | V |
| Zero Gate Voltage Drain Current $V_{DS} = 1700\text{V}$, $V_{GS} = 0\text{V}$ | I_{DSS} | | 10 | 100 | μA |
| Forward Gate-Source Leakage Current $V_{GS} = 22\text{V}$, $V_{DS} = 0\text{V}$ | I_{GSSF} | | | 100 | nA |
| Reverse Gate-Source Leakage Current $V_{GS} = -8\text{V}$, $V_{DS} = 0\text{V}$ | I_{GSSR} | -100 | | | nA |
| Gate-Source Threshold Voltage $V_{DS} = V_{GS}$, $I_D = 10\text{mA}$ | $V_{GS(th)}$ | 2.2 | 3.2 | 4.2 | V |
| Drain-Source On-State Resistance $V_{GS} = 18\text{V}$, $I_D = 40\text{A}$ $T_J=25^\circ\text{C}$ $V_{GS} = 18\text{V}$, $I_D = 40\text{A}$ $T_J=175^\circ\text{C}$ | $R_{DS(on)}$ | | 45 107 | 60 143 | m Ω |
| Transconductance $I_D = 35\text{A}$, $V_{DS} = 10\text{V}$ | G_{fs} | | 16.8 | | S |
| Gate Resistance $f=1\text{MHz}$, $V_{AC}=25\text{mV}$, $V_{GS} = 0\text{V}$ | R_G | | 1.3 | | Ω |
| Input capacitance $f=1\text{MHz}$, $V_{AC}=25\text{mV}$, $V_{DS}=1000\text{V}$, $V_{GS}=0\text{V}$ | C_{iss} | | 3200 | | pF |
| Output capacitance $f=1\text{MHz}$, $V_{AC}=25\text{mV}$, $V_{DS}=1000\text{V}$, $V_{GS}=0\text{V}$ | C_{oss} | | 90 | | pF |
| Reverse transfer capacitance $f=1\text{MHz}$, $V_{AC}=25\text{mV}$, $V_{DS}=1000\text{V}$, $V_{GS}=0\text{V}$ | C_{rss} | | 7 | | pF |
| Total Gate Charge $V_{DD}=1200\text{V}$, $I_D=35\text{A}$, $V_{GS}= -5/15\text{V}$, turn-on pulse | Q_G | | 106 | | nC |
| Gate to Source Charge $V_{DD}=1200\text{V}$, $I_D=35\text{A}$, $V_{GS}= -5/15\text{V}$, turn-on pulse | Q_{GS} | | 33 | | nC |
| Gate to Drain Charge $V_{DD}=1200\text{V}$, $I_D=35\text{A}$, $V_{GS}= -5/15\text{V}$, turn-on pulse | Q_{GD} | | 37 | | nC |
| Turn-on delay time $V_{DD}=1200\text{V}$, $I_D=35\text{A}$, $V_{GS}= -5/15\text{V}$, $R_G=1\Omega$ (inductive load) | $t_{d(ON)}$ | | 23 | | ns |
| Rise time $V_{DD}=1200\text{V}$, $I_D=35\text{A}$, $V_{GS}= -5/15\text{V}$, $R_G=1\Omega$ (inductive load) | t_r | | 17 | | ns |

| | | | | | |
|---|--------------|--|-----|--|----|
| Turn-off delay time VDD=1200 V, ID=35A, VGS= -5/15V, RG=1Ω (inductive load) | $t_{d(OFF)}$ | | 15 | | ns |
| Fall time VDD=1200 V, ID=35A, VGS= -5/15V, RG=1Ω (inductive load) | t_f | | 11 | | ns |
| Turn-on Switching Energy VDD=1200 V, ID=35A, VGS= -5/15V, RG=1Ω, L=60μH | $E_{(ON)}$ | | 481 | | μJ |
| Turn-off Switching Energy VDD=1200 V, ID=35A, VGS= -5/15V, RG=1Ω, L=60μH | $E_{(OFF)}$ | | 237 | | μJ |

Body Diode

ELECTRICAL CHARACTERISTICS (at $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|--|-----------|------|------------|------------|------|
| Diode Forward Voltage VGS = -5V, ISD = 20A $T_J=25^{\circ}\text{C}$ VGS = -5V, ISD = 20A $T_J=175^{\circ}\text{C}$ | V_{SD} | | 3.7 3.0 | 4.5 3.8 | V |
| Revers Recovery Time VR=1200 V, ISD=35A, VGS= -5V, $di/dt = 2200\text{A}/\mu\text{s}$ | T_{rr} | | 31 | | ns |
| Revers Recovery Charge VR=1200 V, ISD=35A, VGS= -5V, $di/dt = 2200\text{A}/\mu\text{s}$ | Q_{rr} | | 305 | | nC |
| Peak Revers Recovery Current VR=1200 V, ISD=35A, VGS= -5V, $di/dt = 2200\text{A}/\mu\text{s}$ | I_{rrm} | | 8 | | A |

Typical Characteristics

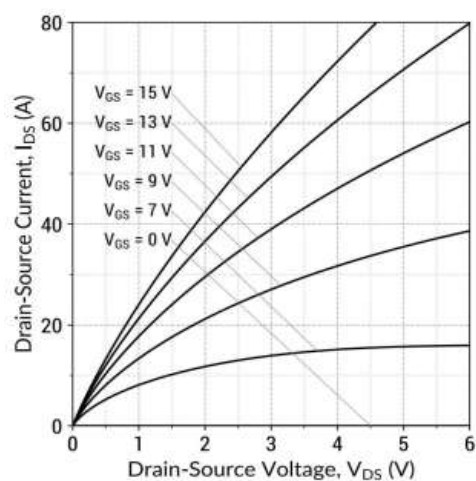
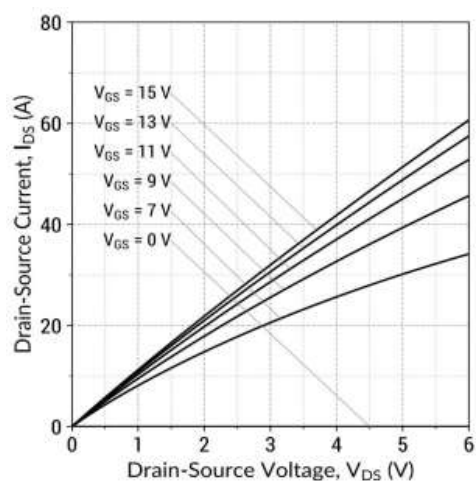
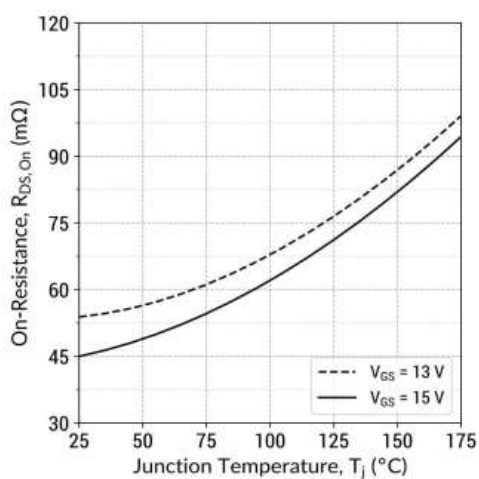
Figure 1. Typical output characteristics ($T_j=25^\circ\text{C}$)Figure 2. Typical output characteristics ($T_j=175^\circ\text{C}$)

Figure 3. Typical On-State Resistance v/s Temperature

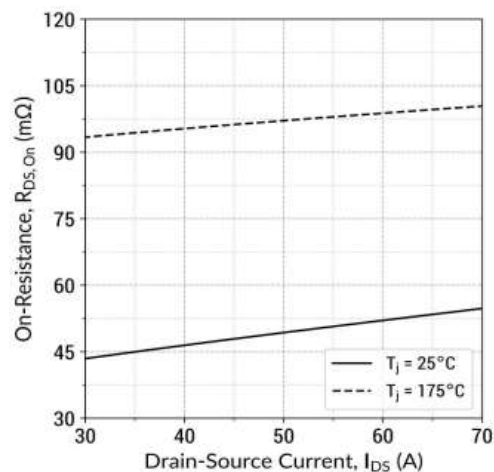


Figure 4. Typical On-State Resistance v/s Drain Current

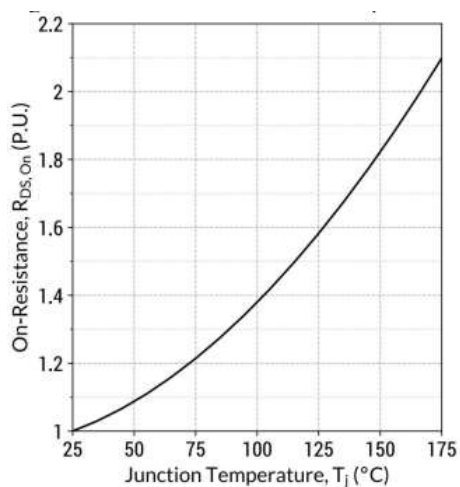


Figure 5. Typical Normalized On-State Resistance v/s Temperature

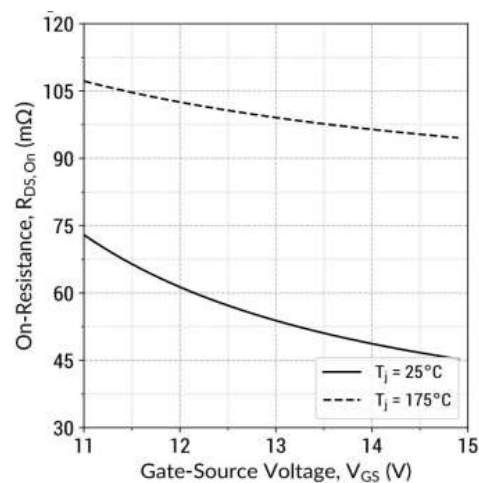


Figure 6. Typical On-State Resistance v/s Gate Voltage

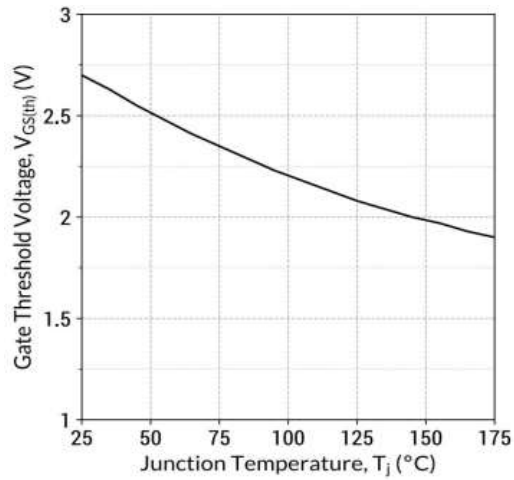


Figure 7. Typical Threshold Voltage Characteristics

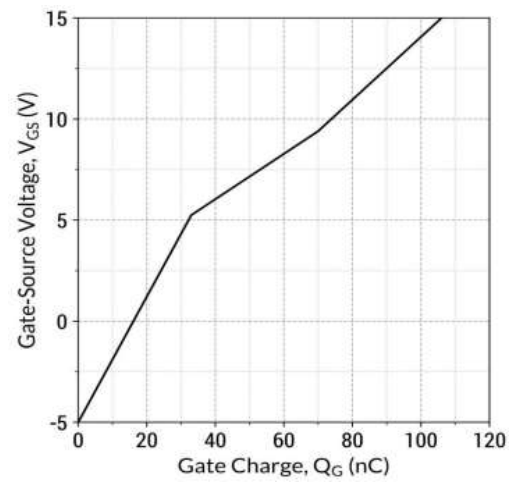


Figure 8. Typical Gate Charge Characteristics

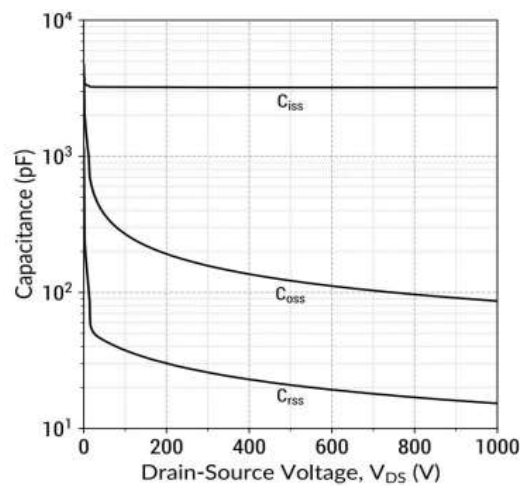


Figure 9. Typical Capacitance v/s Drain-Source Voltage

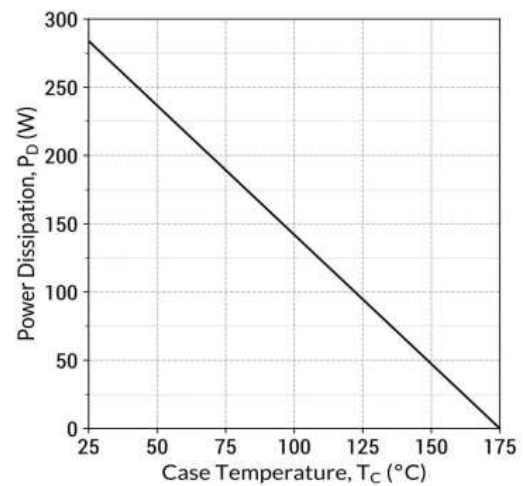


Figure 10. Typical Power De-rating Curve

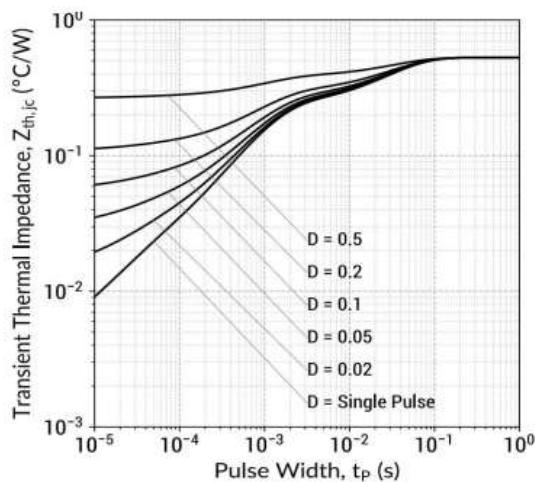
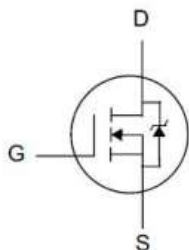
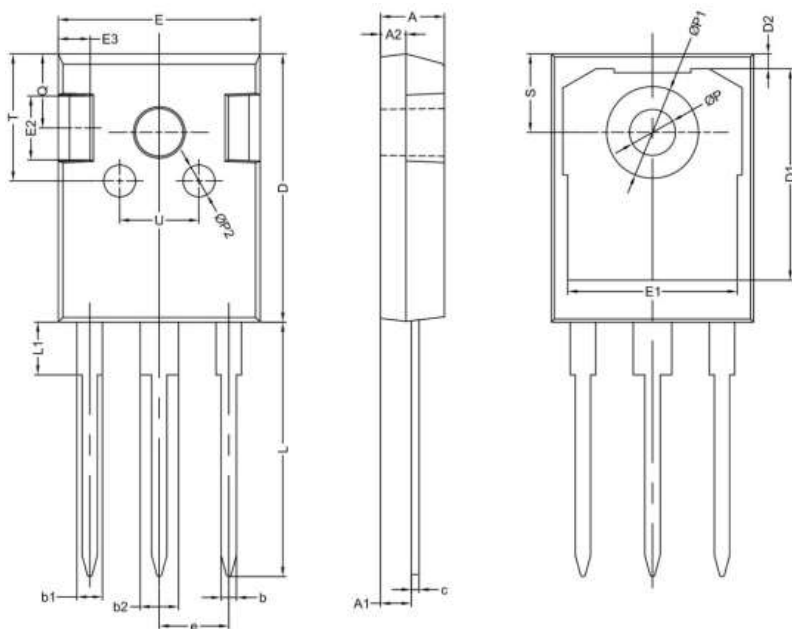


Figure 11. Typical Transient Thermal Impedance

- Circuit diagram



- TO-247 Package outlines : Dimensions in (mm)



| DIM | MILLIMETERS | | |
|-----|-------------|-------|-------|
| | MIN | TYP. | MAX |
| A | 4.80 | 5.00 | 5.20 |
| A1 | 2.21 | 2.41 | 2.61 |
| A2 | 1.90 | 2.00 | 2.10 |
| b | 1.10 | 1.20 | 1.35 |
| b1 | | 2.00 | |
| b2 | | 3.00 | |
| c | 0.55 | 0.60 | 0.75 |
| D | 20.80 | 21.00 | 21.20 |
| D1 | | 16.55 | |
| D2 | | 1.20 | |
| E | 15.60 | 15.80 | 16.00 |
| E1 | | 13.30 | |
| E2 | | 5.00 | |
| E3 | | 2.50 | |
| e | | 5.44 | |
| L | 19.42 | 19.92 | 20.42 |
| L1 | | 4.13 | |
| P | 3.50 | 3.60 | 3.70 |
| P1 | -- | -- | 7.40 |
| P2 | | 2.50 | |
| Q | | 5.80 | |
| S | 6.05 | 6.15 | 6.25 |
| T | | 10.00 | |
| U | | 6.20 | |

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