



P3M17040K3 SiC MOS N-Channel Enhancement Mode

| | | |
|---------------------------|---|---------------|
| V_{RRM} | = | 1700V |
| I_D | = | 73 A |
| $I_D (100^\circ\text{C})$ | = | 52 A |
| $R_{DS(on)}$ | = | 40 m Ω |

SiC MOS P3M17040K3 N-Channel Enhancement Mode



Features

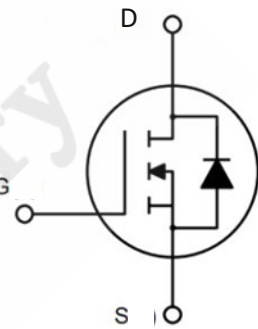
- High Blocking Voltage with Low On-Resistance
- High-Frequency Operation
- Ultra-Small Q_{gd}
- 100% UIS tested

Benefits

- Improve System Efficiency
- Increase Power Density
- Reduce Heat Sink Requirements
- Reduction of System Cost

Application

- Solar Inverters
- EV Battery Chargers
- High Voltage DC/DC Converters
- Switch Mode Power Supplies



TO-247-3

| | |
|--------|---|
| Gate | 1 |
| Drain | 2 |
| Source | 3 |



Order Information

| Part Number | Package | Marking |
|-------------|----------|------------|
| P3M17040K3 | TO-247-3 | P3M17040K3 |



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1. Maximum Ratings

At $T_J = 25^\circ\text{C}$, unless specified otherwise

| Parameter | Symbol | Value | Unit | Test Conditions |
|--|-----------------------------|-------------|------------------|---|
| Drain - Source Voltage | V_{DSmax} | 1700 | V | $V_{GS} = 0V$ $I_D = 100\mu A$ |
| Gate - Source Voltage (Dynamic) | V_{GSmax} | -8 / +19 | V | AC ($f > 1\text{Hz}$) |
| Gate - Source Voltage(static) turn-on gate voltage turn-off gate voltage | $V_{GS,on}$ $V_{GS,off}$ | +15 -3 | V | Static |
| Continuous Drain Current | I_D | 73 | A | $V_{GS} = 15V$ $T_C = 25^\circ\text{C}$ |
| | | 52 | | $V_{GS} = 15V$ $T_C = 100^\circ\text{C}$ |
| Power Dissipation | P_D | 536 | W | |
| Operating Junction Temperature | T_J | -55 To +175 | $^\circ\text{C}$ | |
| Storage Temperature | T_{stg} | -55 To +175 | $^\circ\text{C}$ | |
| Solder Temperature | T_L | 260 | $^\circ\text{C}$ | |
| Mounting Torque | M_d | 1 | Nm | M3 or 6-32 screw |
| | | 8.8 | lbf-in | |



2. Electrical Characteristics

At $T_J = 25^\circ\text{C}$, unless specified otherwise

| Parameter | Symbol | Value | | | Unit | Test Conditions |
|----------------------------------|---------------|-------|------|------|---------------|---|
| | | Min. | Typ. | Max. | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | 1700 | / | / | V | $V_{GS} = -3\text{V}$ $I_D = 100\mu\text{A}$ |
| Gate Threshold Voltage | $V_{GS(th)}$ | 1.8 | 2.2 | / | V | (tested after 30ms pulse at $V_{GS} = 15\text{V}$) $V_{DS} = V_{GS}$ $I_D = 50\text{mA}$ $T_J = 25^\circ\text{C}$ |
| | | / | 1.45 | / | V | $V_{DS} = V_{GS}$ $I_D = 50\text{mA}$ $T_J = 175^\circ\text{C}$ |
| Reverse Bias Drain Current | I_{DSS} | / | 1 | 10 | μA | $V_{GS} = -3\text{V}$ $V_{DS} = 1700\text{V}$ |
| Gate-Source Leakage Current | I_{GSS} | / | 2 | 125 | nA | $V_{GS} = 15\text{V}$ $V_{DS} = 0\text{V}$ |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | / | 40 | 60 | m Ω | $V_{GS} = 15\text{V}$ $I_D = 50\text{A}$ $T_J = 25^\circ\text{C}$ |
| | | / | 58 | / | | $V_{GS} = 15\text{V}$ $I_D = 50\text{A}$ $T_J = 125^\circ\text{C}$ |
| | | / | 75 | / | | $V_{GS} = 15\text{V}$ $I_D = 50\text{A}$ $T_J = 175^\circ\text{C}$ |



P3M17040K3 SiC MOS N-Channel Enhancement Mode

| Parameter | Symbol | Value | | | Unit | Test Conditions |
|------------------------------|-----------|-------|------|------|---------|--|
| | | Min. | Typ. | Max. | | |
| Transconductance | g_{fs} | / | 21.7 | / | S | $V_{DS} = 20V$ $I_{DS} = 50A$ $T_J = 25^{\circ}C$ |
| | | / | 19.2 | / | | $V_{DS} = 20V$ $I_{DS} = 50A$ $T_J = 175^{\circ}C$ |
| Input Capacitance | C_{iss} | / | 4825 | / | pF | $V_{GS} = 0V$ $V_{DS} = 1000V$ $f = 250kHz$ $V_{AC} = 25mV$ |
| Output Capacitance | C_{oss} | / | 114 | / | | |
| Reverse Transfer Capacitance | C_{rss} | / | 8.4 | / | | |
| Coss Stored Energy | E_{oss} | / | 140 | / | μJ | |
| Gate to Source Charge | Q_{gs} | / | 52.7 | / | nC | $V_{DS} = 1200V$ $I_{DS} = 50A$ $V_{GS} = -3 \text{ to } 15V$ $I_G = 2mA$ |
| Gate to Drain Charge | Q_{gd} | / | 77.9 | / | | |
| Total Gate Charge | Q_g | / | 190 | / | | |

3. Reverse Diode Characteristics

At $T_J=25^\circ\text{C}$, unless specified otherwise

| Parameter | Symbol | Value | | Unit | Test Conditions |
|----------------------------------|----------|-------|------|------|---|
| | | Typ. | Max. | | |
| Diode Forward Voltage | V_{SD} | 5.2 | / | V | $V_{GS} = -3V$ $I_{SD} = 25A$ $T_J = 25^\circ\text{C}$ |
| | | 5.1 | / | V | $V_{GS} = -3V$ $I_{SD} = 25A$ $T_J = 175^\circ\text{C}$ |
| Continuous Diode Forward Current | I_S | 69 | / | A | $V_{GS} = -3V$ |

4. Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------|---------------------------|
| Thermal Resistance from Junction to Case | $R_{\theta JC}$ | 0.28 | $^\circ\text{C}/\text{W}$ |

5. Typical Performance

At $T_J=25^\circ\text{C}$, unless specified otherwise

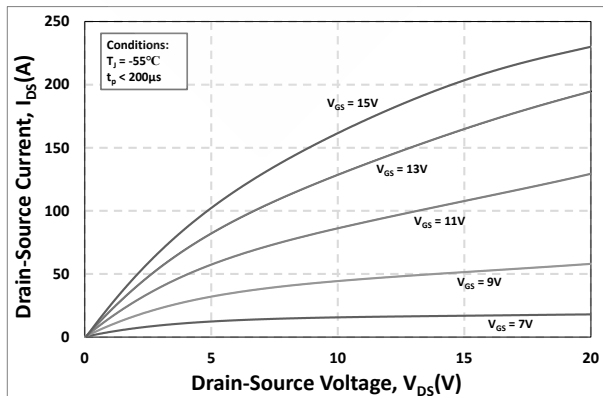


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

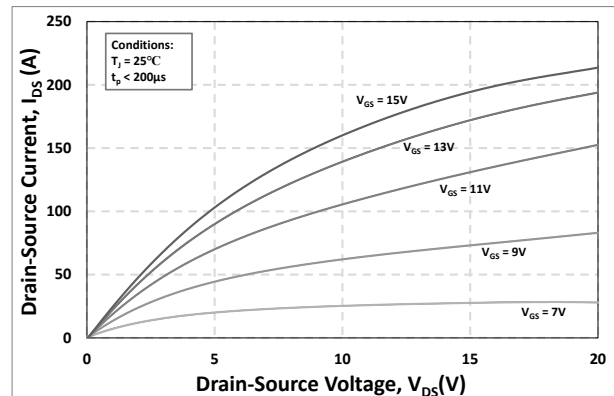


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

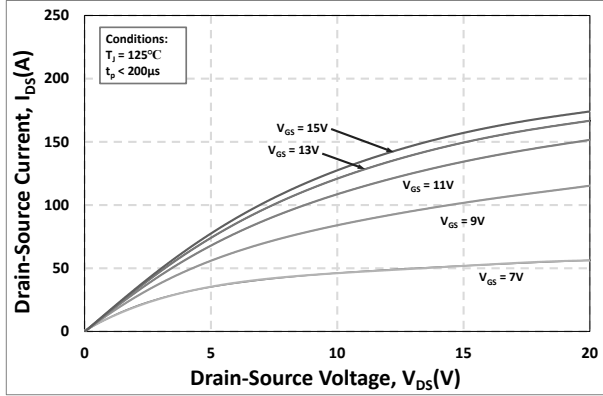


Figure 3. Output Characteristics $T_j = 125^\circ\text{C}$

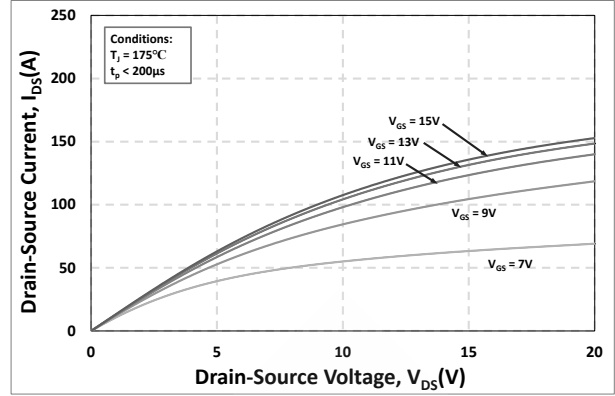


Figure 4. Output Characteristics $T_j = 175^\circ\text{C}$

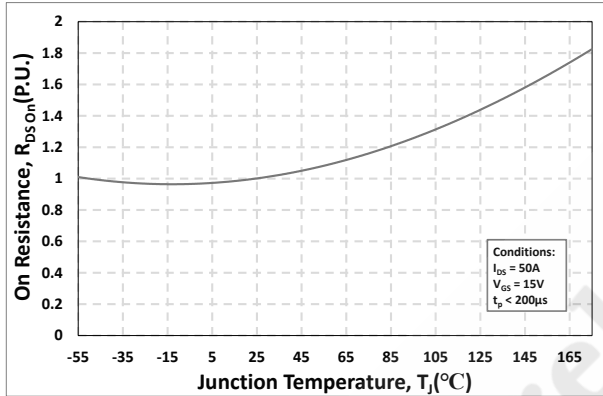


Figure 5. Normalized On-Resistance vs. Temperature

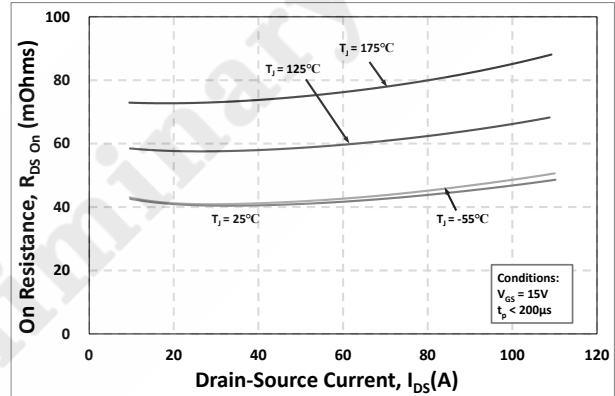


Figure 6. On-Resistance vs. Drain Current Various Temperatures

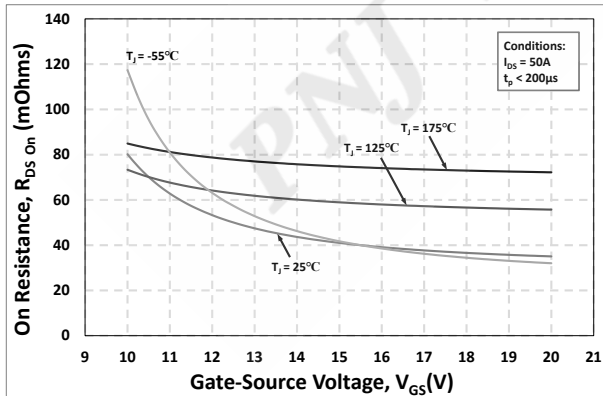


Figure 7. On-Resistance vs. Gate-Source Voltage

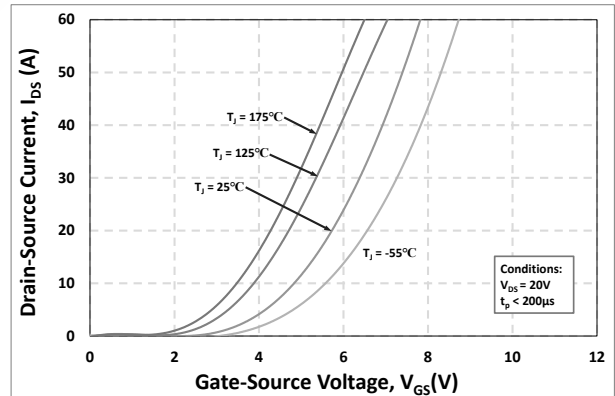


Figure 8. Transfer Characteristic for Various Junction Temperatures

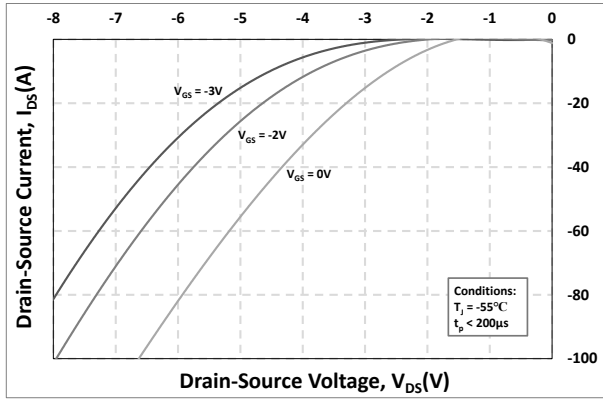


Figure 9. Body Diode Characteristic at -55°C

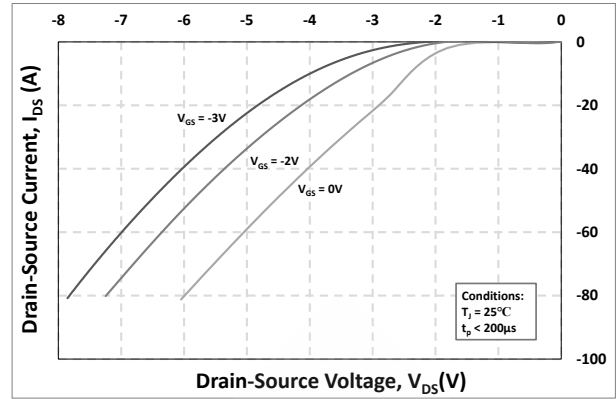


Figure 10. Body Diode Characteristic at 25°C

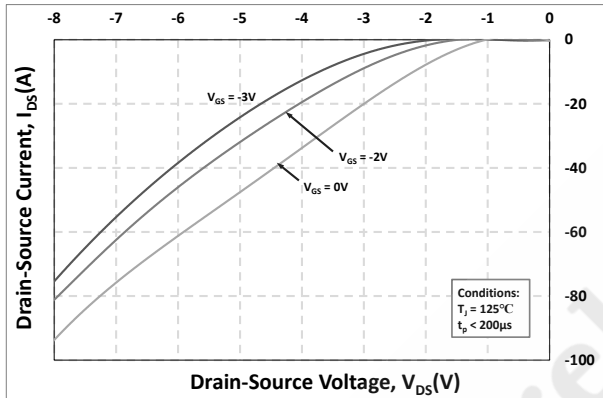


Figure 11. Body Diode Characteristic at 125°C

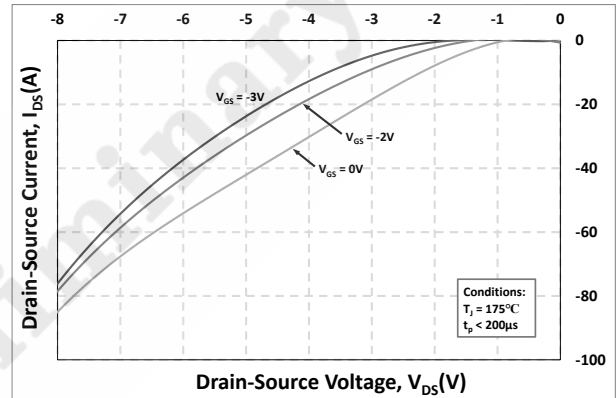


Figure 12. Body Diode Characteristic at 175°C

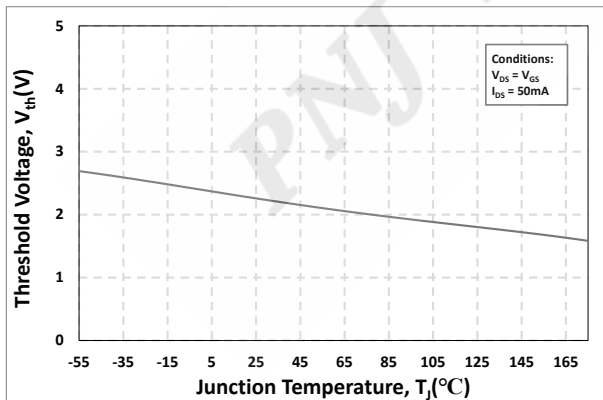


Figure 13. Threshold Voltage vs. Temperatures

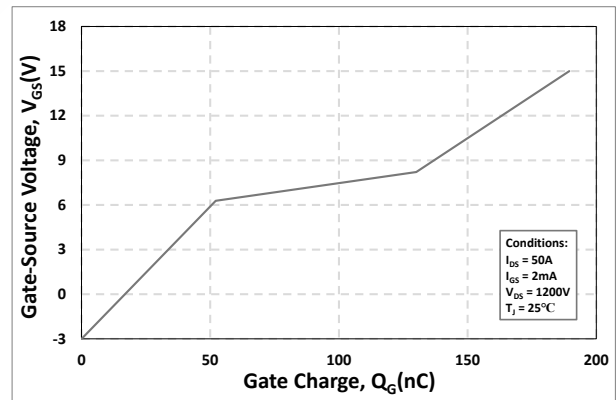


Figure 14. Gate Charge Characteristics

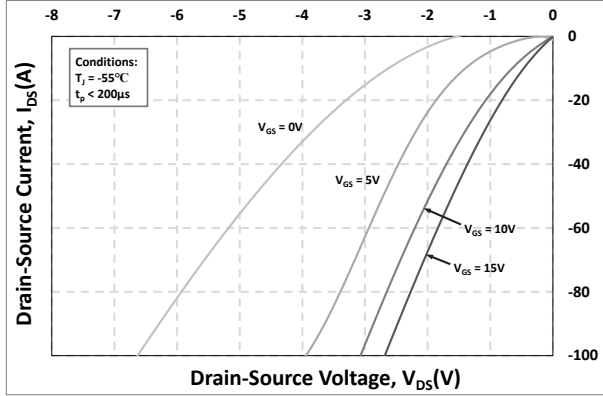


Figure 15. 3rd Quadrant Characteristic at -55°C

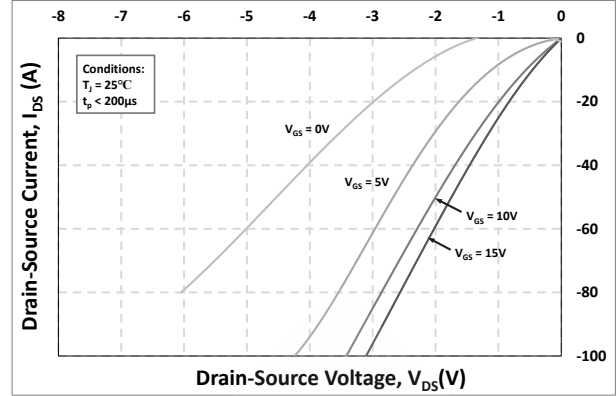


Figure 16. 3rd Quadrant Characteristic at 25°C

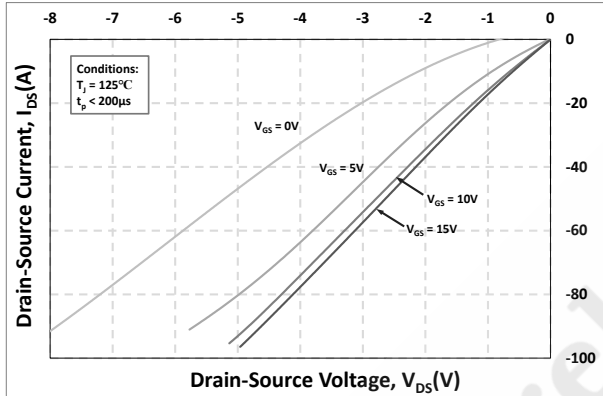


Figure 17. 3rd Quadrant Characteristic at 125°C

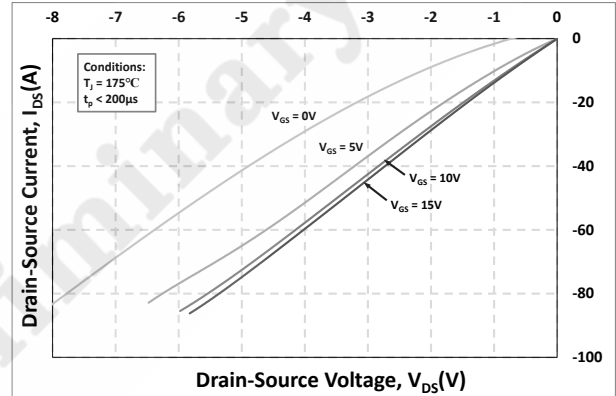


Figure 18. 3rd Quadrant Characteristic at 175°C

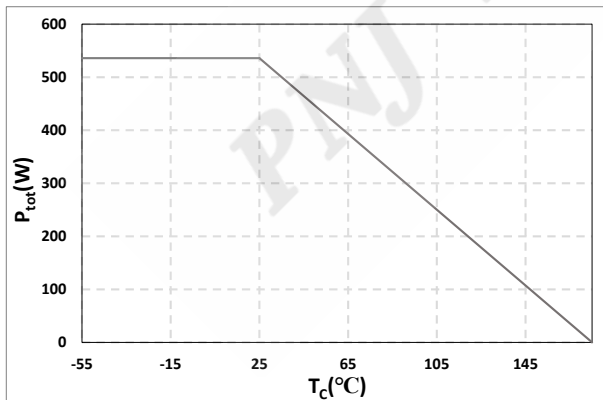


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

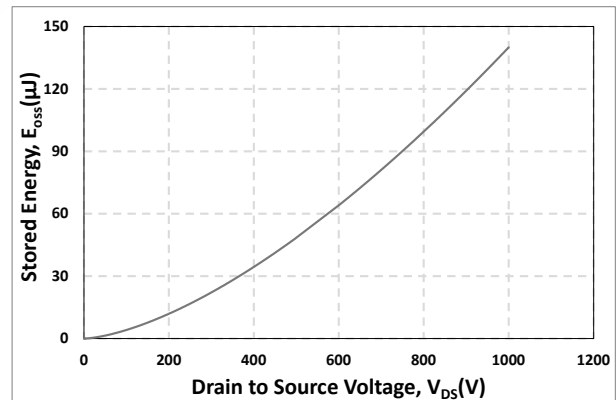


Figure 20. Output Capacitor Stored Energy

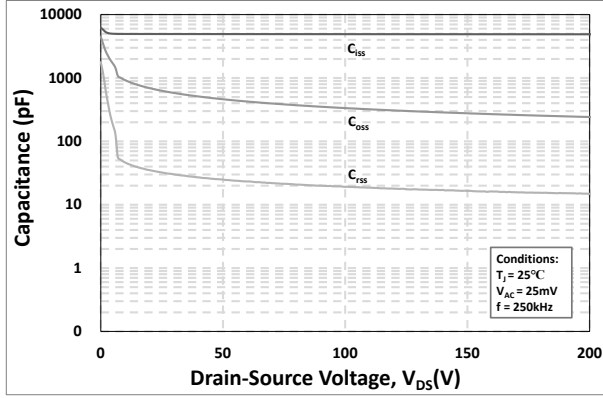


Figure 21. Capacitances vs. Drain-Source Voltage (0-200V)

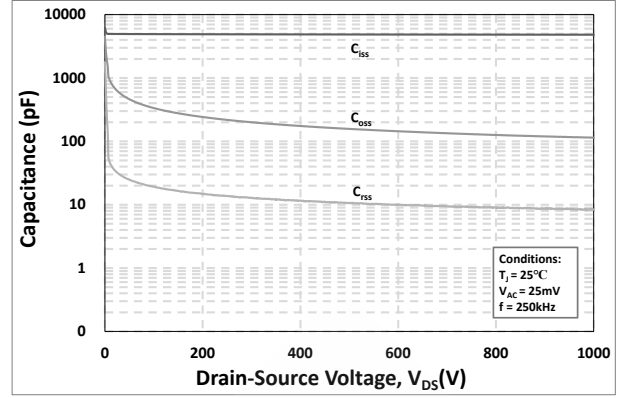
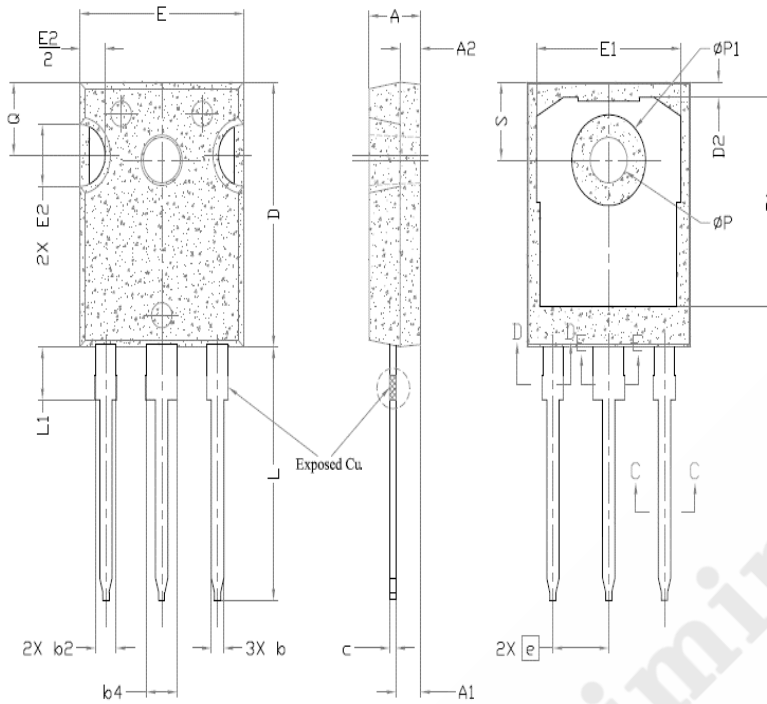


Figure 22. Capacitances vs. Drain-Source Voltage (0-1000V)

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6. Package Outlines



| SYMBOL | DIMENSIONS | | | NOTES |
|-----------|------------|-------|-------|-------|
| | MIN. | NOM. | MAX. | |
| A | 4.83 | 5.02 | 5.21 | |
| A1 | 2.29 | 2.41 | 2.55 | |
| A2 | 1.50 | 2.00 | 2.49 | |
| b | 1.12 | 1.20 | 1.33 | |
| b1 | 1.12 | 1.20 | 1.28 | |
| b2 | 1.91 | 2.00 | 2.39 | 6 |
| b3 | 1.91 | 2.00 | 2.34 | |
| b4 | 2.87 | 3.00 | 3.22 | 6, 8 |
| b5 | 2.87 | 3.00 | 3.18 | |
| c | 0.55 | 0.60 | 0.69 | 6 |
| c1 | 0.55 | 0.60 | 0.65 | |
| D | 20.80 | 20.95 | 21.10 | 4 |
| D1 | 16.25 | 16.55 | 17.65 | 5 |
| D2 | 0.51 | 1.19 | 1.35 | |
| E | 15.75 | 15.94 | 16.13 | 4 |
| E1 | 13.46 | 14.02 | 14.16 | 5 |
| E2 | 4.32 | 4.91 | 5.49 | 3 |
| e | 5.44BSC | | | |
| L | 19.81 | 20.07 | 20.32 | |
| L1 | 4.10 | 4.19 | 4.40 | 6 |
| ϕP | 3.56 | 3.61 | 3.65 | 7 |
| $\phi P1$ | 7.19REF. | | | |
| Q | 5.39 | 5.79 | 6.20 | |
| S | 6.04 | 6.17 | 6.30 | |

Drawing and Dimensions

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