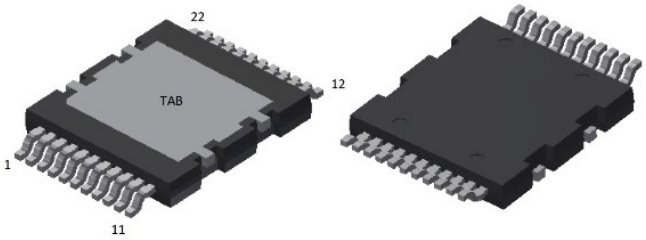
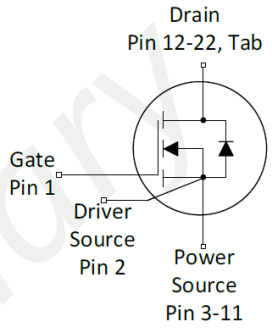
# SiC MOS P3M07008PQ
# N-Channel Enhancement Mode




## 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

PQPAK-LF-22

| | |
|---|---|
| Gate | 1 |
| Kelvin Source | 2 |
| Power Source | 3-11 |
| Drain | TAB (12-22) |

## Applications

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

RoHS

Halogen

## Order Information

| Part Number | Package | Marking |
|---|---|---|
| P3M07008PQ | PQPAK-LF-22 | P3M07008PQ |

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# 1. Maximum Ratings

At $T_J$= 25℃, unless specified otherwise

| Parameter | Symbol | Value | Unit | Test Conditions |
|---|---|---|---|---|
| Drain - Source Voltage | $V_{DSmax}$ | 750 | V | $V_{GS}$= 0V<br>$I_D$= 100μA |
| Gate - Source Voltage (dynamic) | $V_{GSmax}$ | -8 / +22 | V | AC (f>1 Hz) |
| | | -10 / +25 | | tp≤20ns, dutycycle≤1% |
| Gate - Source Voltage(static)<br>turn-on gate voltage<br>turn-off gate voltage | $V_{GS,on}$<br>$V_{GS,off}$ | +15 / +18<br>-3 | V | Static |
| Continuous Drain Current | $I_D$ | 208 | A | $V_{GS}$= 18V<br>$T_C$= 25℃ |
| | | 147 | | $V_{GS}$= 18V<br>$T_C$= 100℃ |
| Pulsed Drain Current | $I_{D(pulse)}$ | 700 | A | PW≤ 10us，<br>Duty cycle ≤ 1% |
| Power Dissipation | $P_D$ | 789 | W | |
| Operating Junction | $T_J$ | -55 To +150 | ℃ | |
| Storage Temperature | $T_{stg}$ | -55 To +175 | ℃ | |
| Solder Temperature | $T_L$ | 245 | ℃ | |

## 2. Electrical Characteristics

At $T_J$= 25℃, unless specified otherwise

| Parameter | Symbol | Value | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | 750 | / | / | V | $V_{GS}$= 0V<br>$I_D$= 2.5mA |
| Gate Threshold Voltage | $V_{GS(th)}$ | 2.0 | 2.7 | / | V | (tested after 30ms pulse at $V_{GS}$=18V)<br>$V_{DS}$= $V_{GS}$<br>$I_D$= 20mA<br>$T_J$ = 25℃ |
| | | / | 1.9 | / | V | $V_{DS}$= $V_{GS}$<br>$I_D$= 20mA<br>$T_J$ = 175℃ |
| Reverse Bias Drain Current | $I_{DSS}$ | / | 5 | 250 | μA | $V_{GS}$= 0V<br>$V_{DS}$= 750V |
| Gate-Source Leakage Current | $I_{GSS}$ | / | 5 | 250 | nA | $V_{GS}$= 18V<br>$V_{DS}$= 0V |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | / | 8 | 12 | mΩ | $V_{GS}$= 18V<br>$I_D$= 75A<br>$T_J$ = 25℃ |
| | | / | 11 | / | | $V_{GS}$= 18V<br>$I_D$= 75A<br>$T_J$ = 175℃ |
| Trans conductance | $g_{fs}$ | / | 48 | / | S | $V_{DS}$= 20V<br>$I_{DS}$= 75A<br>$T_J$ = 25℃ |
| | | / | 45 | / | | $V_{DS}$= 20V<br>$I_{DS}$= 75A<br>$T_J$= 175℃ |

| Parameter | Symbol | Value | | | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Input Capacitance | $C_{iss}$ | / | 7698 | / | pF | $V_{GS}$= 0V<br>$V_{DS}$= 500V<br>f= 500kHz<br>$V_{AC}$= 25mV |
| Output Capacitance | $C_{oss}$ | / | 516 | / | | |
| Reverse Transfer Capacitance | $C_{rss}$ | / | 40 | / | | |
| Coss Stored Energy | $E_{oss}$ | / | 112 | / | μJ | |
| Turn-on Energy | $E_{on}$ | / | 664 | / | μJ | $V_{DS}$= 500V<br>$V_{GS}$= -3/18V<br>$I_D$= 75A<br>$R_G$= 1Ω |
| Turn-off Energy | $E_{off}$ | / | 194 | / | | |
| Turn-On Delay Time | $t_{d(on)}$ | / | 24.8 | / | | $V_{DS}$= 500V<br>$V_{GS}$= -3/18V<br>$I_D$= 75A<br>$R_G$= 1Ω |
| Rise Time | $t_r$ | / | 39 | / | | |
| Turn-Off Delay Time | $t_{d(off)}$ | / | 82 | / | | |
| Fall Time | $t_f$ | / | 8.6 | / | | |
| Internal Gate Resistance | $R_{G(int)}$ | / | 1.5 | / | Ω | f= 1MHz<br>$V_{AC}$= 25mV |
| Gate to Source Charge | $Q_{gs}$ | / | 245 | / | nC | $V_{DS}$= 500V<br>$I_{DS}$= 75A<br>$V_{GS}$= -3/18V<br>$I_G$= 20mA |
| Gate to Drain Charge | $Q_{gd}$ | / | 85 | / | | |
| Total Gate Charge | $Q_g$ | / | 407 | / | | |

## 3. Reverse Diode Characteristics

At $T_J$= 25℃, unless specified otherwise

| Parameter | Symbol | Value | | Unit | Test Conditions |
|---|---|---|---|---|---|
| | | Typ. | Max. | | |
| Diode Forward Voltage | $V_{SD}$ | 5.2 | / | V | $V_{GS}$= -3V<br>$I_{SD}$= 38A<br>$T_J$ = 25℃ |
| | | 4.6 | / | V | $V_{GS}$= -3V<br>$I_{SD}$= 38A<br>$T_J$= 175℃ |
| Continuous Diode Forward Current | $I_S$ | 68 | / | A | $V_{GS}$= -3V |
| Reverse Recover Time | $t_{rr}$ | 21 | / | ns | $V_{GS}$= -3/18V<br>$I_{SD}$= 75A<br>$V_R$= 500V<br>$d_{if}/d_t$= 4200A/μs<br>$T_J$= 25℃ |
| Reverse Recovery Charge | $Q_{rr}$ | 926 | / | nC | |
| Peak Reverse Recovery Current | $I_{rrm}$ | 74 | / | A | |

## 4. Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance from Junction to Case | $R_{\theta JC}$ | 0.19 | ℃/W |

# 5. Typical Performance

At $T_J$= 25℃, unless specified otherwise

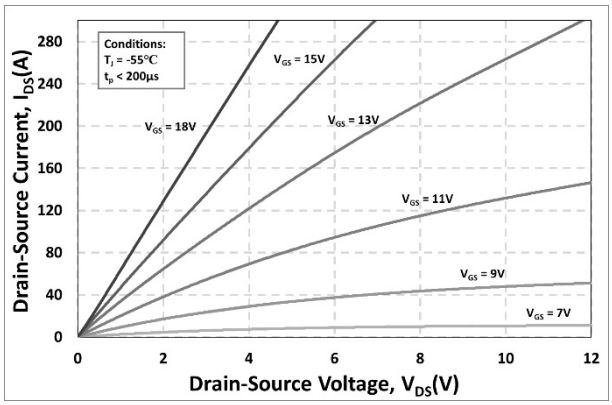



Figure 1. Output Characteristics $T_J$ = -55℃

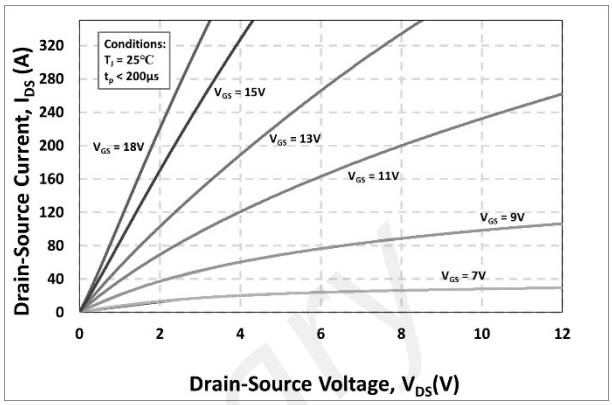



Figure 2. Output Characteristics $T_J$ = 25℃

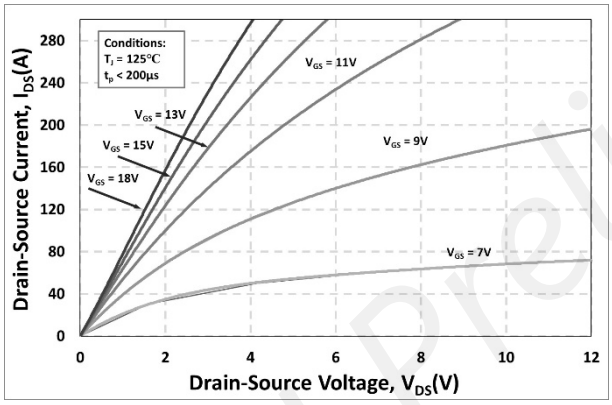



Figure 3. Output Characteristics $T_J$ = 125℃

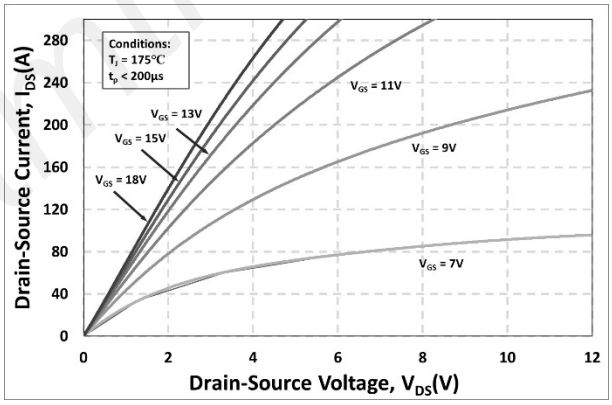



Figure 4. Output Characteristics $T_J$ = 175℃

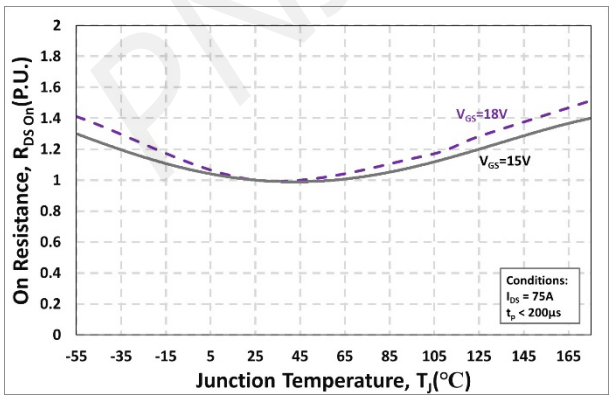



Figure 5. Normalized On-Resistance vs. Temperature

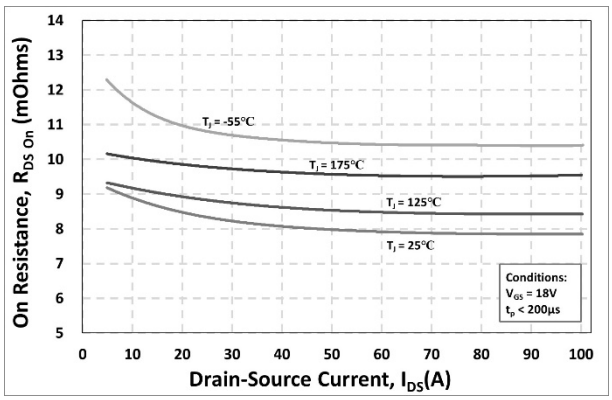



Figure 6. On-Resistance vs. Drain Current Various Temperatures

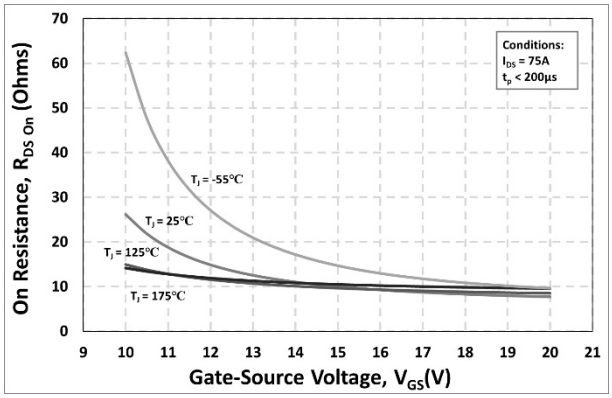



Figure 7. On-Resistance vs. Gate-Source Voltage

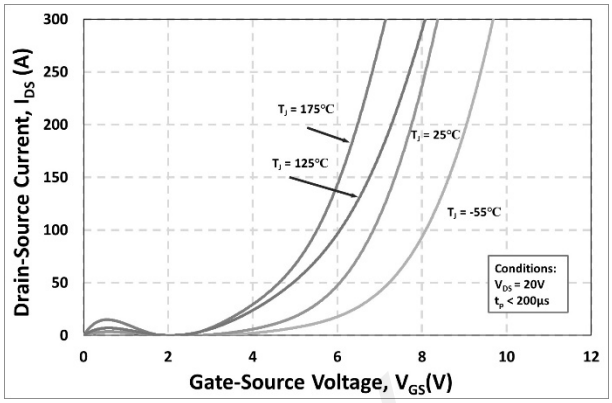



Figure 8. Transfer Characteristic for Various Junction Temperatures

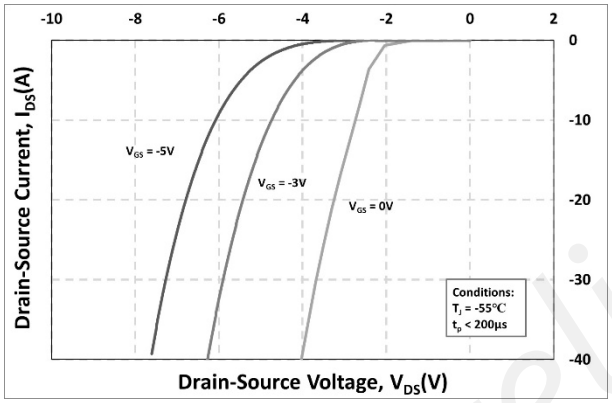



Figure 9. Body Diode Characteristic at -55°C

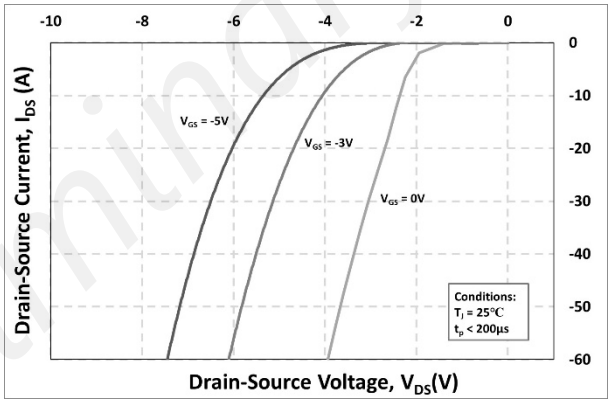



Figure 10. Body Diode Characteristic at 25°C

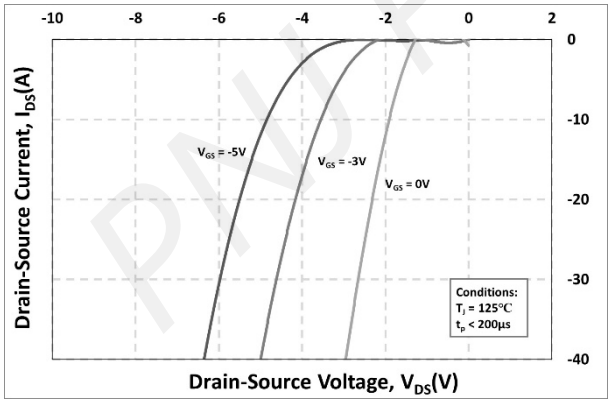



Figure 11. Body Diode Characteristic at 125°C

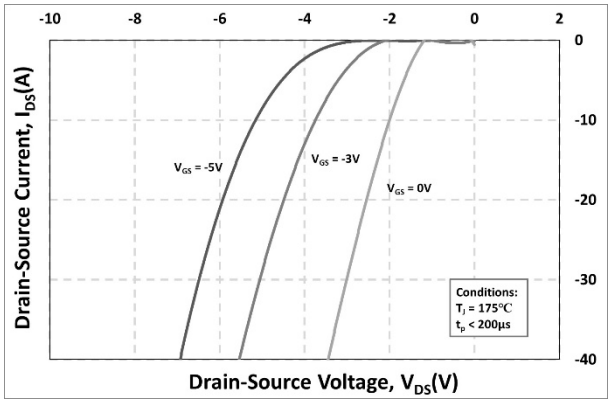



Figure 12. Body Diode Characteristic at 175°C

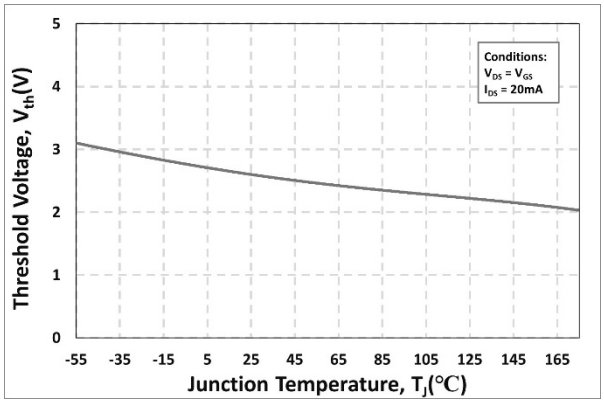



Figure 13. Threshold Voltage vs. Temperature

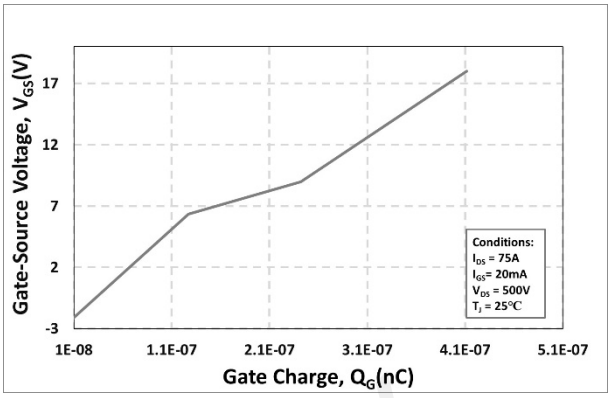



Figure 14. Gat Charge Characteristics

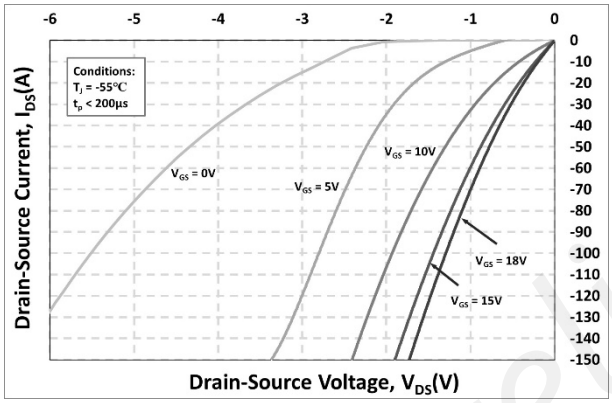



Figure 15. 3rd Quadrant Characteristic at -55°C

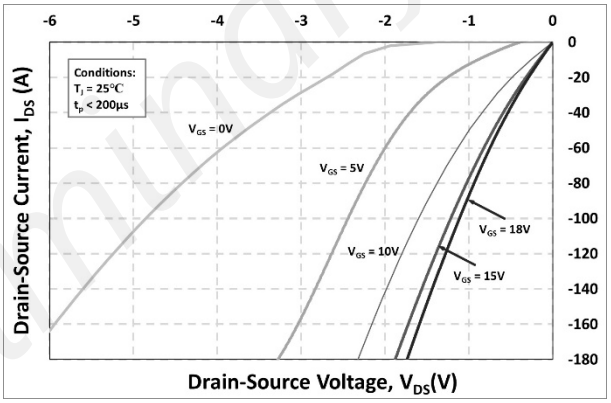



Figure 16. 3rd Quadrant Characteristic at 25°C

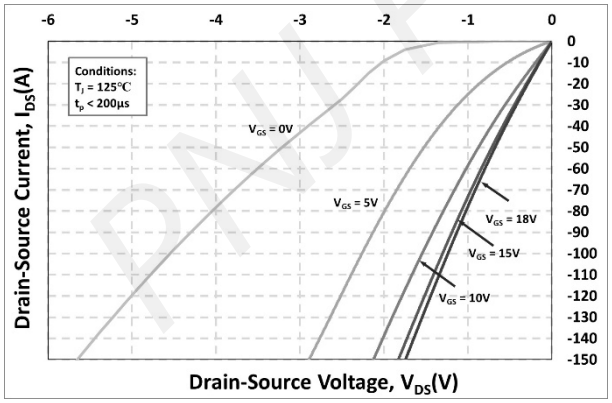



Figure 17. 3rd Quadrant Characteristic at 125°C

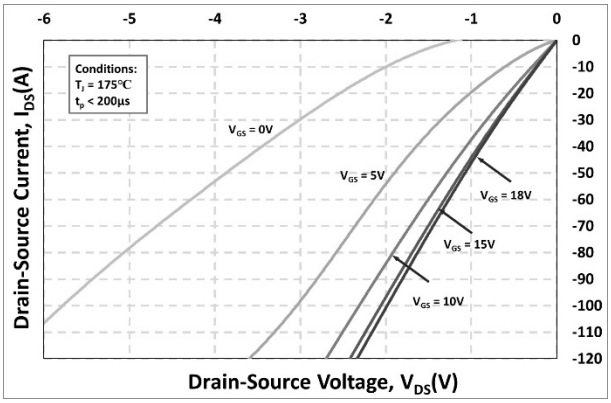



Figure 18. 3rd Quadrant Characteristic at 175ºC

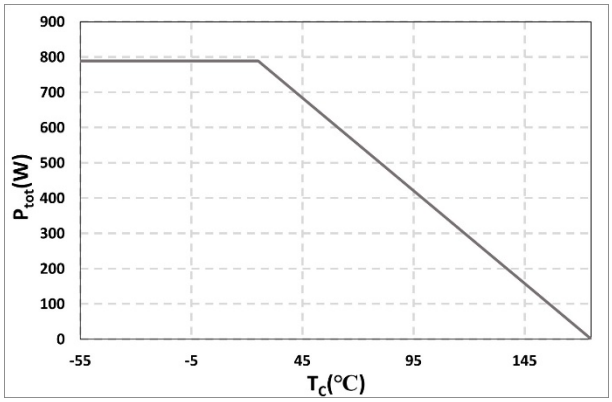



Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

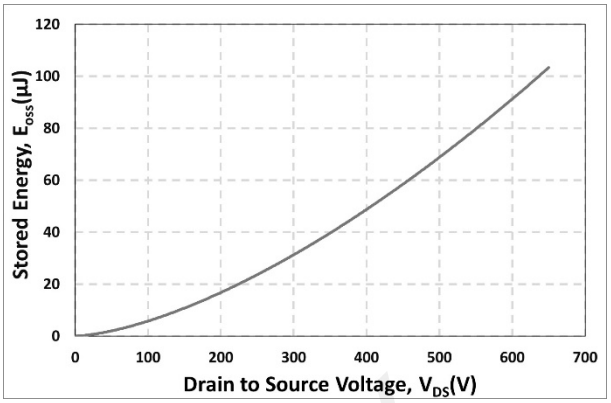



Figure 20. Output Capacitor Stored Energy

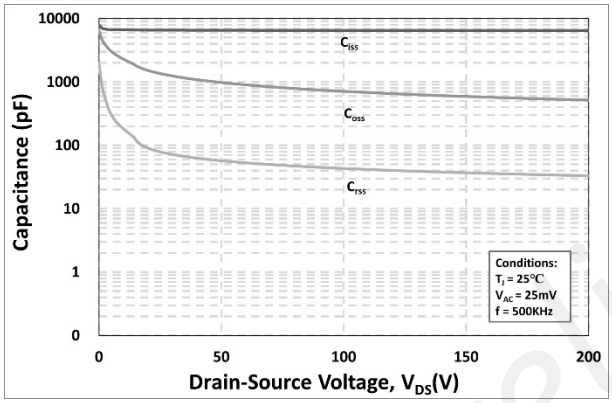



Figure 21. Capacitances vs. Drain-Source Voltage (0 - 200V)

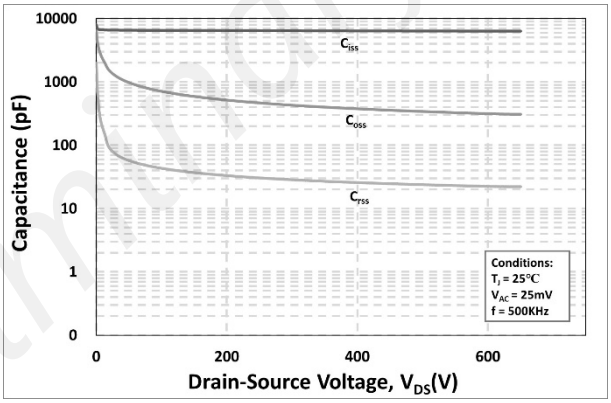
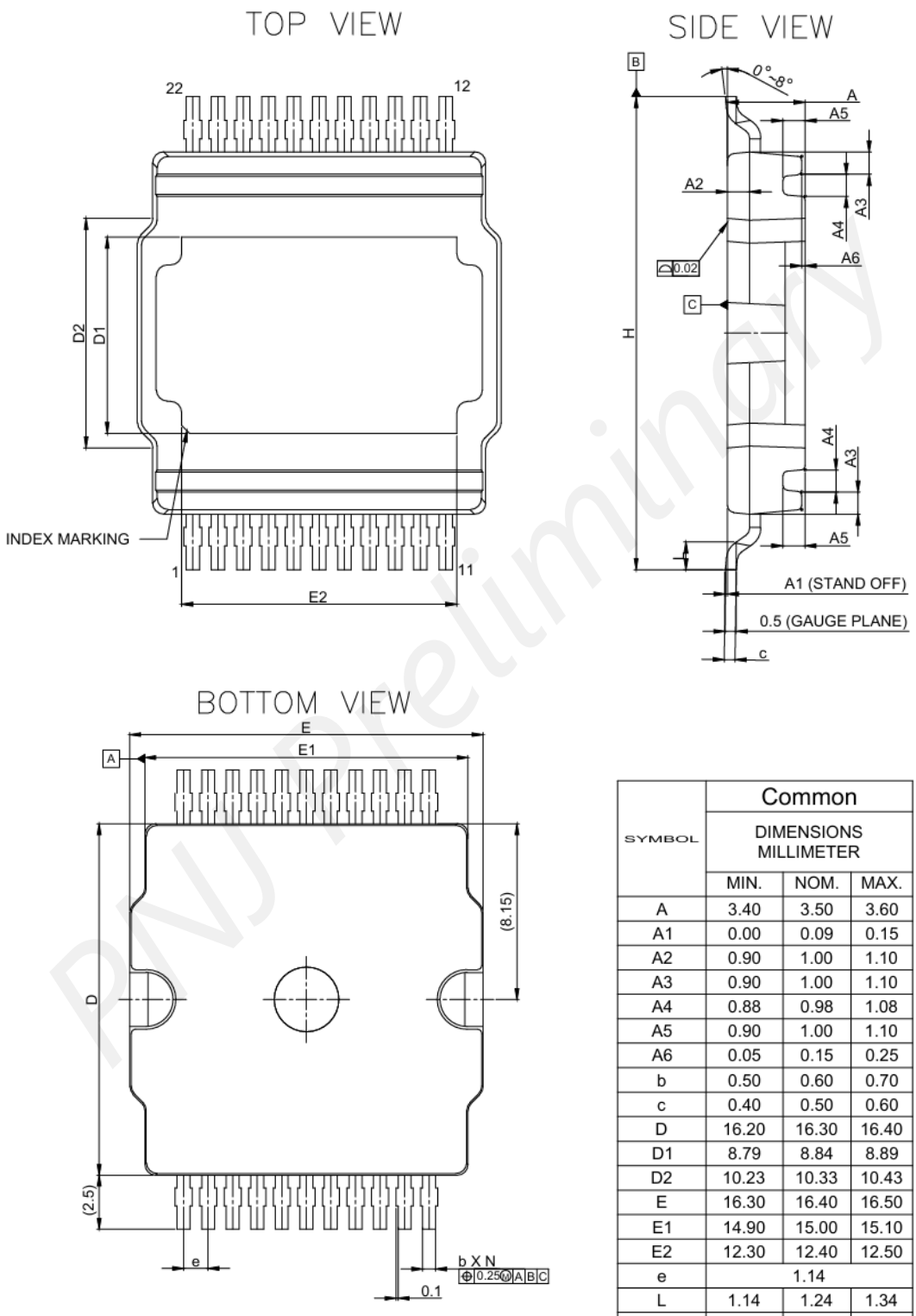



Figure 22. Capacitances vs. Drain-Source Voltage (0 - 750V)

## 6. Package Outlines




| SYMBOL | Common | | |
|---|---|---|---|
| | DIMENSIONS MILLIMETER | | |
| | MIN. | NOM. | MAX. |
| A | 3.40 | 3.50 | 3.60 |
| A1 | 0.00 | 0.09 | 0.15 |
| A2 | 0.90 | 1.00 | 1.10 |
| A3 | 0.90 | 1.00 | 1.10 |
| A4 | 0.88 | 0.98 | 1.08 |
| A5 | 0.90 | 1.00 | 1.10 |
| A6 | 0.05 | 0.15 | 0.25 |
| b | 0.50 | 0.60 | 0.70 |
| c | 0.40 | 0.50 | 0.60 |
| D | 16.20 | 16.30 | 16.40 |
| D1 | 8.79 | 8.84 | 8.89 |
| D2 | 10.23 | 10.33 | 10.43 |
| E | 16.30 | 16.40 | 16.50 |
| E1 | 14.90 | 15.00 | 15.10 |
| E2 | 12.30 | 12.40 | 12.50 |
| e | 1.14 | | |
| L | 1.14 | 1.24 | 1.34 |
| H | 21.20 | 21.30 | 21.40 |
| N | 22 | | |

Drawing and Dimensions

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