

XM12040T4

N-Channel SiC Power MOSFET

| | | |
|-------------------|---|--------|
| V_{DS} | = | 1200 V |
| $R_{DS(on)}$ | = | 40 mΩ |
| $I_D@25^{\circ}C$ | = | 60 A |

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive

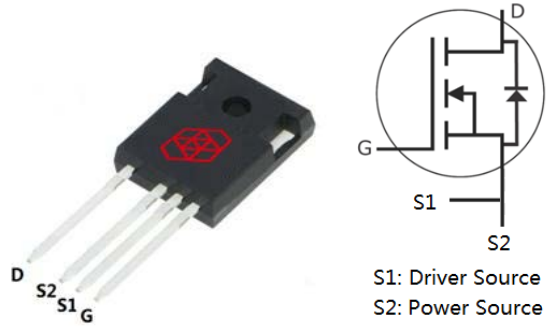
Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Power Supplies
- High Voltage DC/DC Converters
- Motor Drives
- Switch Mode Power Supplies
- Pulsed Power applications

Package



| Part Number | Package |
|-------------|----------|
| XM12040T4 | TO-247-4 |

Maximum Ratings ($T_c=25^{\circ}C$ unless otherwise specified)

| Symbol | Parameter | Value | Unit | Test Conditions | Note |
|----------------|--|-------------|-------------|---|------|
| V_{DSmax} | Drain-Source Voltage | 1200 | V | $V_{GS}=0V, I_D=100\mu A$ | |
| V_{GSmax} | Gate-Source Voltage | -10/+25 | V | Absolute maximum values | |
| V_{GSop} | Gate-Source Voltage | -5/+20 | V | Recommended operational values | |
| I_D | Continuous Drain Current | 60 | A | $V_{GS}=20V, T_c=25^{\circ}C$ | |
| | | 40 | | $V_{GS}=20V, T_c=100^{\circ}C$ | |
| $I_{D(pulse)}$ | Pulsed Drain Current | 160 | A | Pulse width t_p limited by T_{Jmax} | |
| P_D | Power Dissipation | 330 | W | $T_c=25^{\circ}C, T_J=150^{\circ}C$ | |
| T_J, T_{STG} | Operating Junction and Storage Temperature | -55 to +150 | $^{\circ}C$ | | |

Electrical Characteristics (T_c=25°C unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Test Conditions | Note |
|----------------------|----------------------------------|------|------|------|------|--|------------|
| V _{(BR)DSS} | Drain-Source Breakdown Voltage | 1200 | / | / | V | V _{GS} =0V, I _D =100μA | |
| V _{GS(th)} | Gate Threshold Voltage | 1.9 | 2.5 | 4.0 | V | V _{DS} =V _{GS} , I _D =10mA | Fig. 11 |
| | | / | 1.8 | / | | V _{DS} =V _{GS} , I _D =10mA, T _J =150°C | |
| I _{DSS} | Zero Gate Voltage Drain Current | / | 1 | 100 | μA | V _{DS} =1200V, V _{GS} =0V | |
| I _{GSS+} | Gate-Source Leakage Current | / | 10 | 250 | nA | V _{DS} =0V, V _{GS} =25V | |
| I _{GSS-} | Gate-Source Leakage Current | / | 10 | 250 | nA | V _{DS} =0V, V _{GS} =-10V | |
| R _{DS(on)} | Drain-Source On-State Resistance | / | 40 | 55 | mΩ | V _{GS} =20V, I _D =40A | Fig. 4,5,6 |
| | | / | 80 | / | | V _{GS} =20V, I _D =40A, T _J =150°C | |
| C _{iss} | Input Capacitance | / | 2946 | / | pF | V _{GS} =0V | Fig. 15,16 |
| C _{oss} | Output Capacitance | / | 167 | / | | V _{DS} =1000V | |
| C _{rss} | Reverse Transfer Capacitance | / | 6.6 | / | | f=1MHz | |
| E _{oss} | C _{oss} Stored Energy | / | 92 | / | μJ | V _{AC} =25mV | |
| E _{ON} | Turn-On Switching Energy | / | 1.1 | / | mJ | V _{DS} =800V, V _{GS} =-5V/20V | |
| E _{OFF} | Turn-Off Switching Energy | / | 0.85 | / | | I _D =40A, R _{G(ext)} =2.5Ω, L=100μH | |
| t _{d(on)} | Turn-On Delay Time | / | 12 | / | ns | V _{DS} =800V, V _{GS} =-5V/20V, I _D =40A R _{G(ext)} =2.5Ω, R _L =20Ω | |
| t _r | Rise Time | / | 10 | / | | | |
| t _{d(off)} | Turn-Off Delay Time | / | 25 | / | | | |
| t _f | Fall Time | / | 6.2 | / | | | |
| R _{G(int)} | Internal Gate Resistance | / | 2.3 | / | Ω | f=1MHz, V _{AC} =25mV | |
| Q _{GS} | Gate to Source Charge | / | 37 | / | nC | V _{DS} =800V | |
| Q _{GD} | Gate to Drain Charge | / | 18 | / | | V _{GS} =-5V/20V | |
| Q _G | Total Gate Charge | / | 142 | / | | I _D =40A | |

Reverse Diode Characteristics

| Symbol | Parameter | Typ. | Max. | Unit | Test Conditions | Note |
|------------------|----------------------------------|------|------|------|---|-------------|
| V _{SD} | Diode Forward Voltage | 4.5 | / | V | V _{GS} =-5V, I _{SD} =20A | Fig. 8,9,10 |
| | | 4.2 | / | | V _{GS} =-5V, I _{SD} =20A, T _J =150°C | |
| I _S | Continuous Diode Forward Current | / | 62 | A | T _C =25°C | |
| t _{rr} | Reverse Recover Time | 41 | / | ns | V _R =800V, I _{SD} =40A | |
| Q _{rr} | Reverse Recovery Charge | 142 | / | nC | | |
| I _{rrm} | Peak Reverse Recovery Current | 6 | / | A | | |

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit | Test Conditions | Note |
|------------------|---|------|------|------|-----------------|------|
| R _{θJC} | Thermal Resistance from Junction to Case | 0.34 | / | °C/W | | |
| R _{θJA} | Thermal Resistance from Junction to Ambient | / | 40 | | | |

Typical Performance

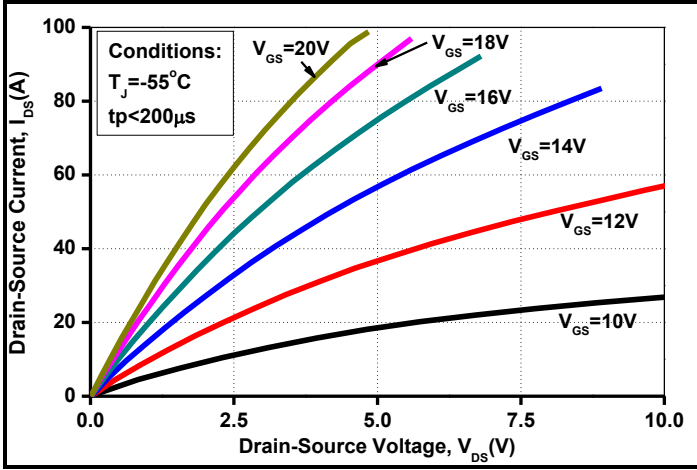


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

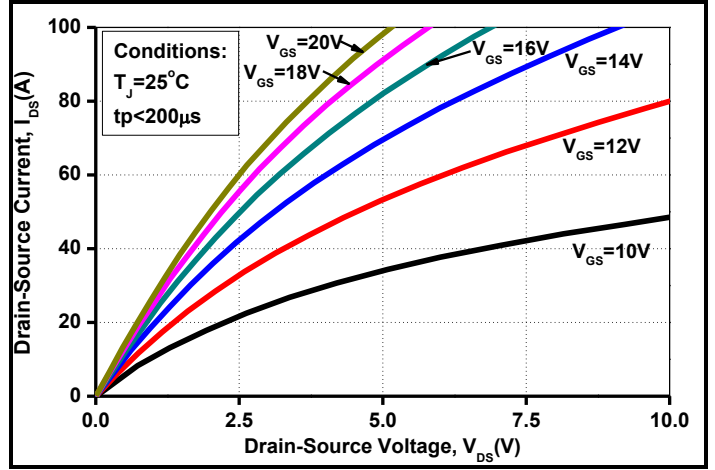


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

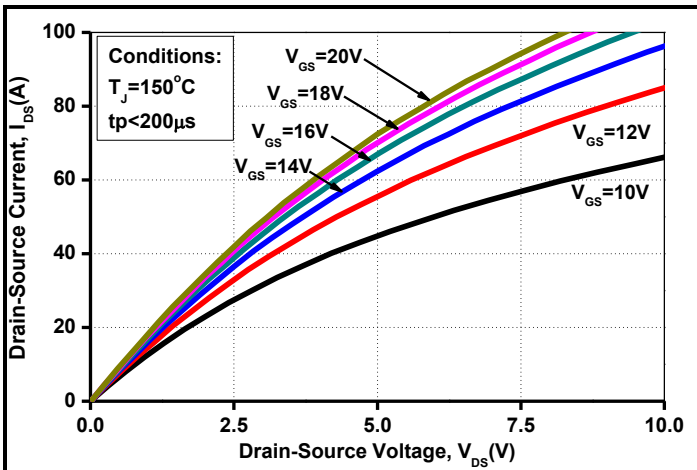


Figure 3. Output Characteristics $T_J = 150^\circ\text{C}$

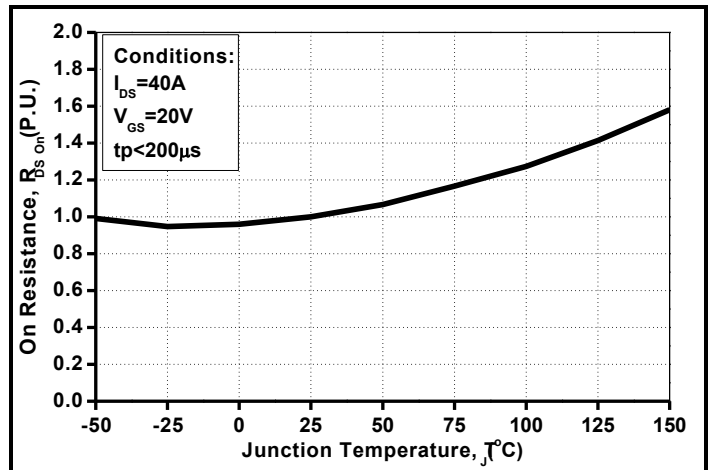


Figure 4. Normalized On-Resistance vs. Temperature

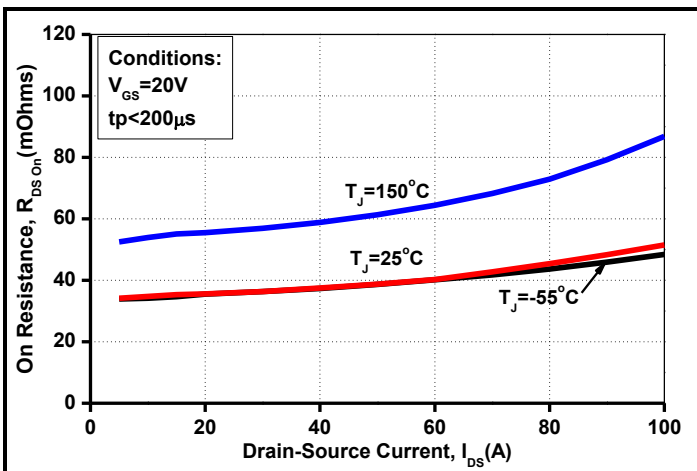


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

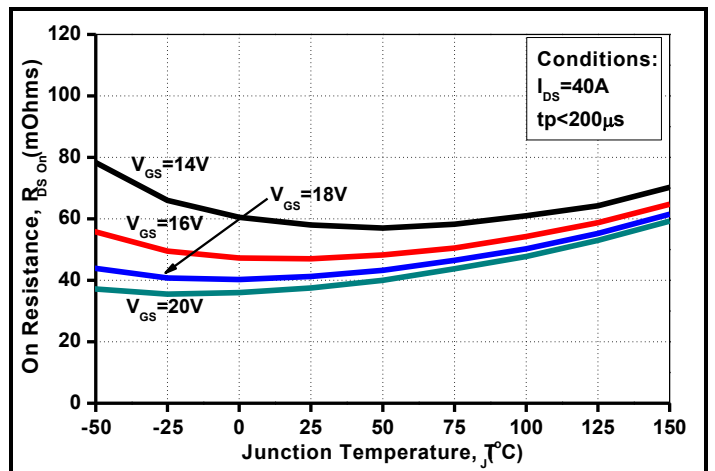


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Performance

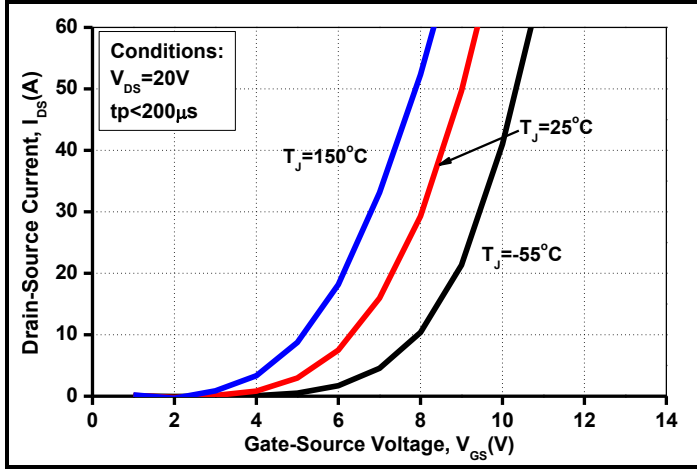


Figure 7. Transfer Characteristic for Various Junction Temperatures

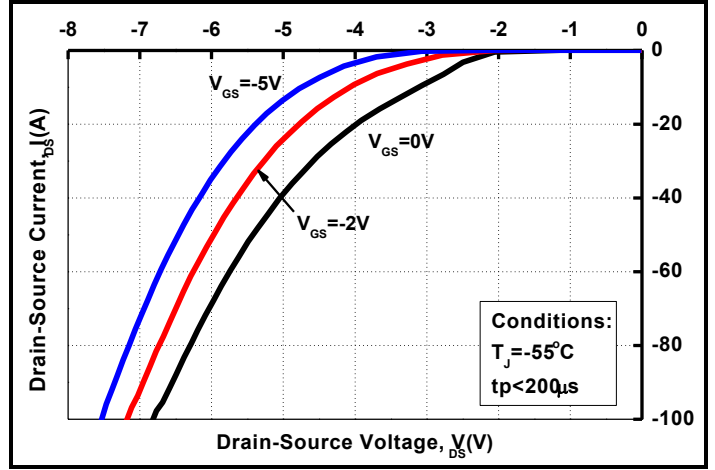


Figure 8. Body Diode Characteristic at -55 °C

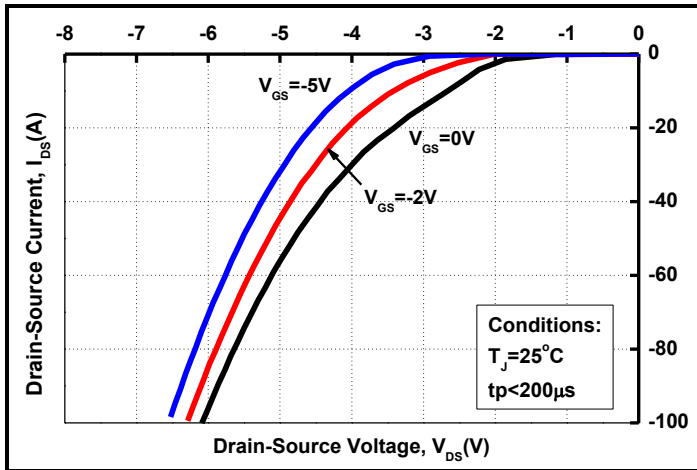


Figure 9. Body Diode Characteristic at 25 °C

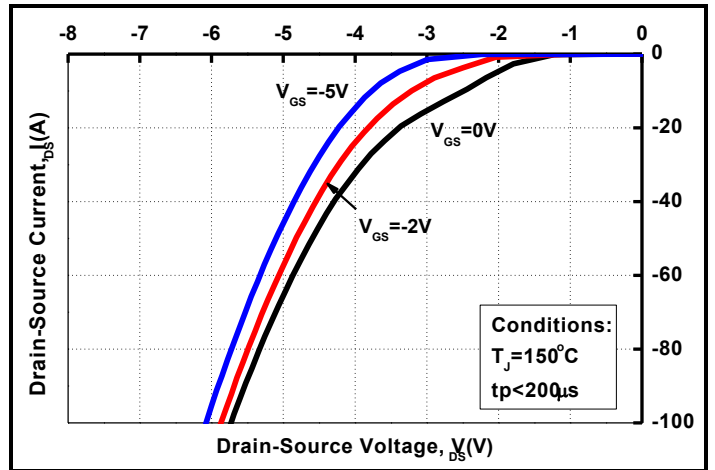


Figure 10. Body Diode Characteristic at 150 °C

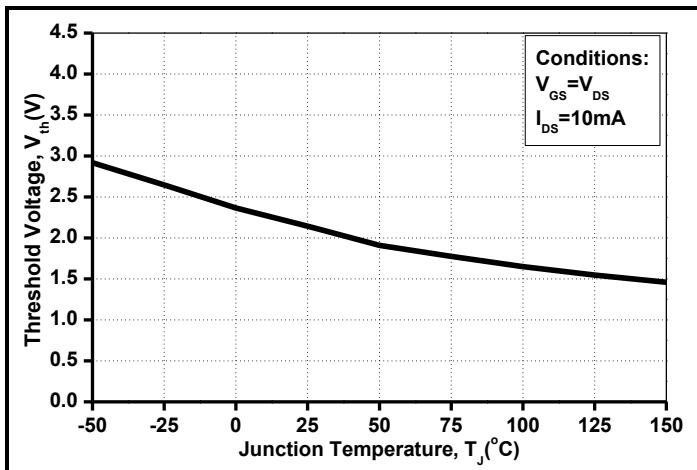


Figure 11. Threshold Voltage vs. Temperature

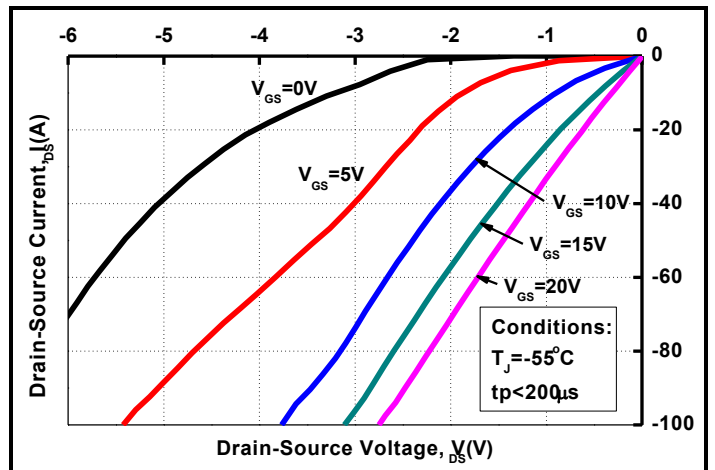


Figure 12. 3rd Quadrant Characteristic at -55 °C

Typical Performance

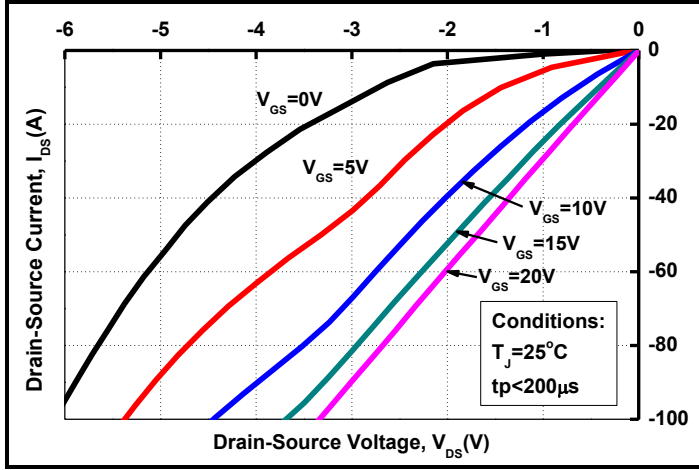


Figure 13. 3rd Quadrant Characteristic at 25 °C

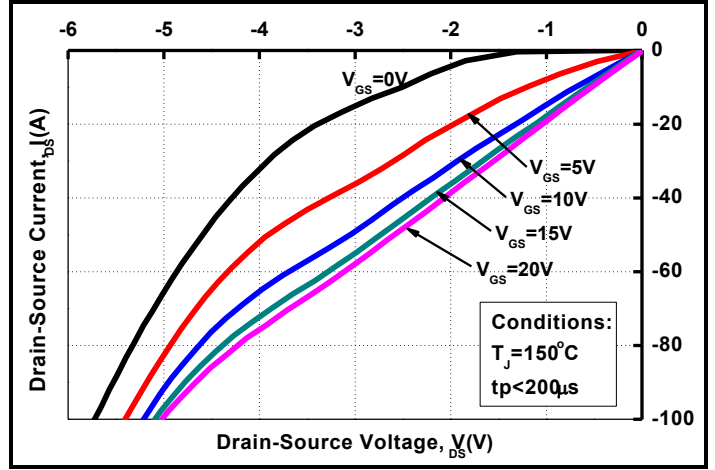


Figure 14. 3rd Quadrant Characteristic at 150 °C

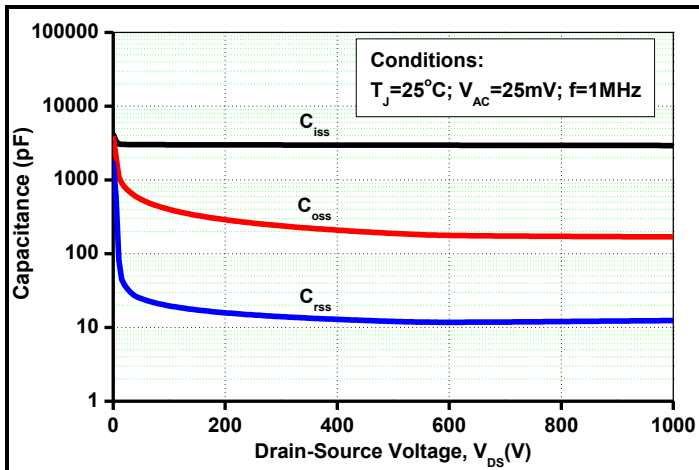


Figure 15. Capacitances vs. Drain-Source Voltage (0 - 200V)

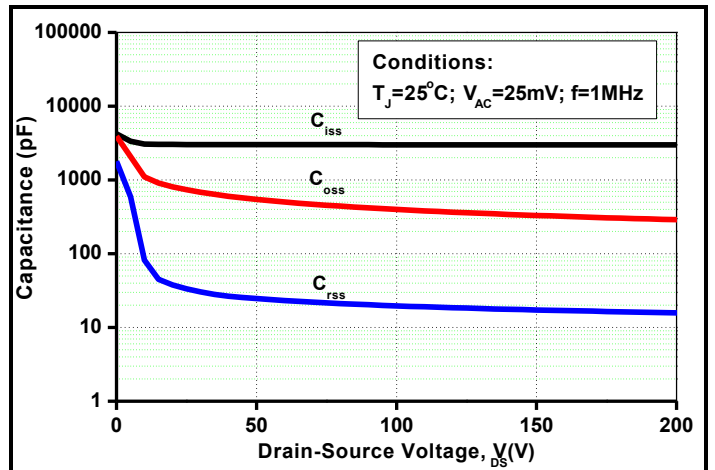
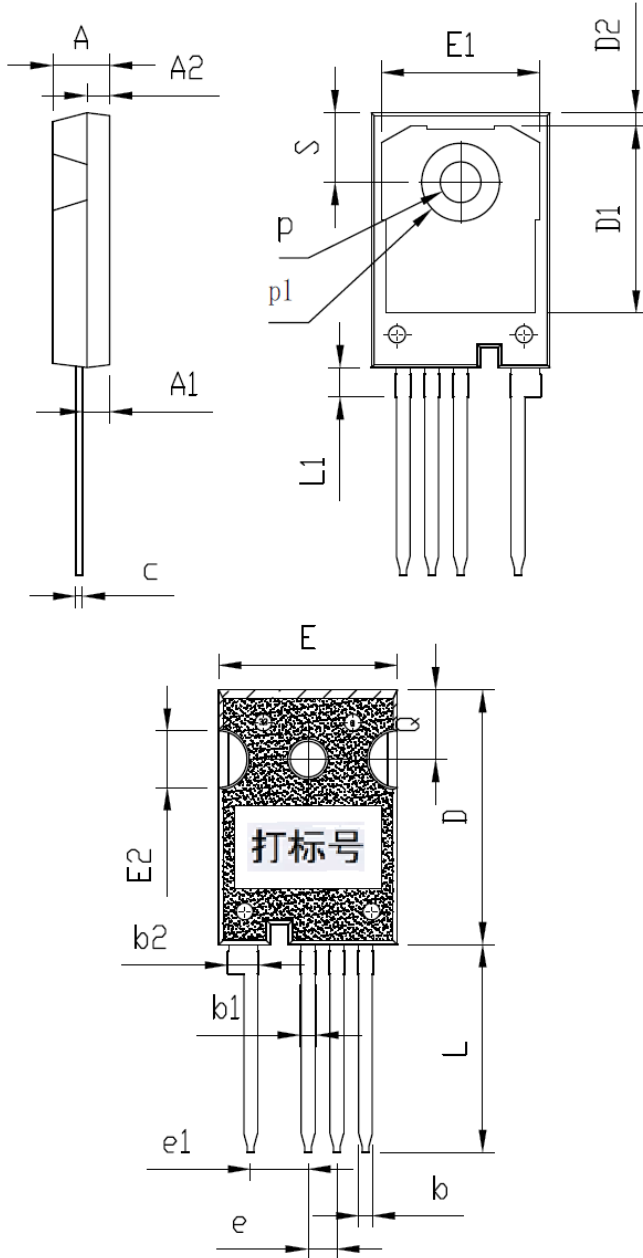


Figure 16. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Package Dimensions

Package TO-247-4



| SYMBOLS | DIMENSIONS IN MILLIMETERS | | |
|---------|---------------------------|-------|-----|
| | MIN | NOM | MAX |
| A | | 5.00 | |
| A1 | | 2.40 | |
| A2 | | 2.00 | |
| b | | 1.20 | |
| b1 | | 1.30 | |
| b2 | | 2.65 | |
| c | | 0.6 | |
| D | | 22.54 | |
| D1 | | 16.50 | |
| D2 | | 1.17 | |
| e | | 2.54 | |
| e1 | | 5.08 | |
| E | | 15.80 | |
| E1 | | 14.00 | |
| E2 | | 5.00 | |
| L | | 18.38 | |
| L1 | | 2.58 | |
| p | | 3.60 | |
| p1 | | 6.80 | |
| Q | | 6.15 | |
| S | | 6.15 | |

Notes

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