

Features

- SiC MOSFET Technology
- High Speed Switching
- High switching speed with low capacitance
- Very low switching losses
- Excellent avalanche ruggedness
- Halogen Free. "Green" Device (Note 1)
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information) (Note2)

Maximum Ratings

- Operating Junction Temperature Range : -55°C to +175°C
- Storage Temperature Range: -55°C to +175°C
- Thermal Resistance Junction to Ambient,Max^(Note 3): 40°C/W
- Thermal Resistance Junction to Case,Typ : 1.25°C/W

Applications

- Solar inverters
- Uninterrupted power supplies
- Switch mode power supplies
- Motor drives

| Parameter | Symbol | Rating | Unit |
|--|-----------------------------|-----------------|------|
| Drain-Source Voltage | V _{DS} | 1700 | V |
| Gate-Source Voltage ^(Note 4) | V _{GSm} | -10/+27 | V |
| Gate-Source Voltage | V _{GSm} | -8/+24 | |
| Gate-Source Voltage | V _{GSo} | -5/+20 | V |
| Continuous Drain Current V _{GS} =18V | Tc=25°C | I _D | A |
| | Tc=100°C | 6.8 | |
| Pulsed Drain Current ^(Note 5) | | I _{DM} | 4.8 |
| Total Power Dissipation | P _D | 21 | A |
| Avalanche Energy, Single Pulse | V _{DD} =50V, L=5mH | E _{AS} | 100 |
| | | | mJ |

Note1: Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

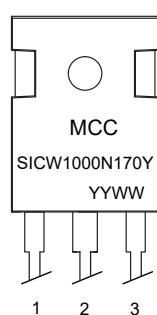
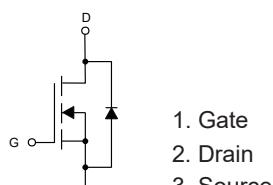
Note2: High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.

Note3: Device in a still air environment with TA=25°C.

Note4: tp ≤ 0.5us, D < 1%

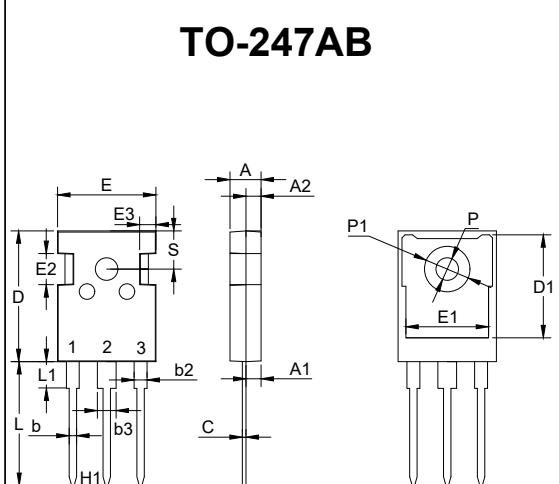
Note5: Pulse Test: Pulse Width Limited by Tjmax.

Internal Structure and Marking Code



Device Code: SICW1000N170Y
Date Code: YYWW (Year & Week)

SiC N-CHANNEL MOSFET



| DIMENSIONS | | | | | |
|------------|--------|-------|-------|-------|------|
| DIM | INCHES | | MM | | NOTE |
| | MIN | MAX | MIN | MAX | |
| A | 0.189 | 0.205 | 4.80 | 5.20 | |
| A1 | 0.087 | 0.103 | 2.21 | 2.61 | |
| A2 | 0.073 | 0.085 | 1.85 | 2.15 | |
| b | 0.039 | 0.055 | 1.00 | 1.40 | |
| b2 | 0.075 | 0.087 | 1.91 | 2.21 | |
| C | 0.020 | 0.028 | 0.50 | 0.70 | |
| D | 0.815 | 0.839 | 20.70 | 21.30 | |
| D1 | 0.640 | 0.663 | 16.25 | 16.85 | |
| E | 0.610 | 0.634 | 15.50 | 16.10 | |
| E1 | 0.512 | 0.535 | 13.00 | 13.60 | |
| E2 | 0.189 | 0.205 | 4.80 | 5.20 | |
| E3 | 0.091 | 0.106 | 2.30 | 2.70 | |
| L | 0.772 | 0.796 | 19.62 | 20.22 | |
| L1 | - | 0.177 | - | 4.50 | |
| P | 0.134 | 0.150 | 3.40 | 3.80 | Φ |
| P1 | | 0.287 | - | 7.30 | Φ |
| S | 0.242 | | 6.15 | | TYP |
| H1 | 0.214 | | 5.44 | | TYP |
| b3 | 0.110 | 0.126 | 2.80 | 3.20 | |

Electrical Characteristics @ $T_j=25^\circ\text{C}$ (Unless Otherwise Specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---------------------------------|-----------------------------|---|------|------|-----|---------------|
| Static Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{V}, I_{\text{D}}=100\mu\text{A}$ | 1700 | | | V |
| Gate-Source Leakage Current | I_{GSS} | $V_{\text{DS}}=0\text{V}, V_{\text{GS}}=20\text{V}$ | | | 250 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{\text{DS}}=1700\text{V}, V_{\text{GS}}=0\text{V}$ | | | 100 | μA |
| Gate-Threshold Voltage | $V_{\text{GS}(\text{th})}$ | $V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=0.5\text{mA}$ | 2 | 2.6 | 4.0 | V |
| | | $V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=0.5\text{mA}, T_j=175^\circ\text{C}$ | | | | |
| Drain-Source On-Resistance | $R_{\text{DS}(\text{on})}$ | $V_{\text{GS}}=20\text{V}, I_{\text{D}}=2\text{A}$ | | 1.0 | 1.2 | Ω |
| | | $V_{\text{GS}}=20\text{V}, I_{\text{D}}=2\text{A}, T_j=175^\circ\text{C}$ | | 1.5 | | Ω |
| Internal Gate Resistance | R_g | $f=1\text{MHz}, V_{\text{AC}}=25\text{mV}$ | | 6 | | Ω |
| Transconductance | g_{FS} | $V_{\text{DS}}=20\text{V}, I_{\text{D}}=2\text{A}$ | | 1.0 | | S |
| | | $V_{\text{DS}}=20\text{V}, I_{\text{D}}=2\text{A}, T_j=175^\circ\text{C}$ | | 1.2 | | |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{iss} | $V_{\text{DS}}=1000\text{V}, V_{\text{GS}}=0\text{V}, f=1\text{MHz}, V_{\text{AC}}=25\text{mV}$ | | 227 | | pF |
| Output Capacitance | C_{oss} | | | 12.5 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 2 | | |
| Cross Stored Energy | E_{oss} | | | 7.7 | | μJ |
| Total Gate Charge | Q_g | $V_{\text{DS}}=1200\text{V}, V_{\text{GS}}=-5/+20\text{V}, I_{\text{D}}=2\text{A}, I_{\text{GS}}=1\text{mA}$ | | 16.7 | | nC |
| Gate-Source Charge | Q_{gs} | | | 1.67 | | |
| Gate-Drain Charge | Q_{gd} | | | 9.2 | | |
| Turn-On Delay Time | $t_{\text{d}(\text{on})}$ | $V_{\text{DD}}=1200\text{V}, V_{\text{GS}}=-5/+20\text{V}, R_G=12\Omega, I_{\text{D}}=2\text{A}, L=1364\mu\text{H}$ | | 18 | | ns |
| Rise Time | t_r | | | 16 | | |
| Turn-Off Delay Time | $t_{\text{d}(\text{off})}$ | | | 24 | | |
| Fall Time | t_f | | | 79 | | |
| Turn-On switching energy | E_{on} | $V_{\text{DD}}=1200\text{V}, V_{\text{GS}}=-5/+20\text{V}, R_G=12\Omega, I_{\text{D}}=2\text{A}, L=1364\mu\text{H}$ | | 63 | | μJ |
| Turn-Off switching energy | E_{off} | | | 29 | | |

Electrical Characteristics @ $T_j=25^\circ\text{C}$ (Unless Otherwise Specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-------------------------------|-----------|---|-----|------|-----|------|
| Diode Characteristics | | | | | | |
| Continuous Body Diode Current | I_S | $V_{GS}=-5\text{V}$, $T_C=25^\circ\text{C}$ | | | 5 | A |
| Diode Forward Voltage | V_{SD} | $V_{GS}=-5\text{V}$, $I_{SD}=1\text{A}$ | | 3.6 | | V |
| | | $V_{GS}=-5\text{V}$, $I_{SD}=1\text{A}$, $T_j=175^\circ\text{C}$ | | 3.2 | | |
| Reverse Recovery Time | t_{rr} | $V_{GS}=-5\text{V}$, $I_{SD}=2\text{A}$, $V_R=1200\text{V}$, $dI_F/dt=0.19\text{KA}/\mu\text{s}$ | | 34 | | ns |
| Reverse Recovery Charge | Q_{rr} | | | 0.04 | | uC |
| Peak Reverse Recovery Current | I_{rrm} | | | 1.85 | | A |
| Reverse Recovery Time | t_{rr} | $V_{GS}=-5\text{V}$, $I_{SD}=2\text{A}$, $V_R=1200\text{V}$, $dI_F/dt=0.19\text{KA}/\mu\text{s}$, $T_j=175^\circ\text{C}$ | | 39 | | ns |
| Reverse Recovery Charge | Q_{rr} | | | 0.08 | | uC |
| Peak Reverse Recovery Current | I_{rrm} | | | 3.57 | | A |

Curve Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Figure 1. Output characteristics at $T_j = -55^\circ\text{C}$

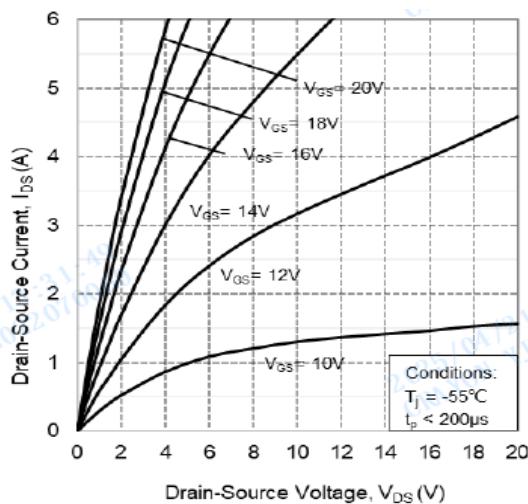


Figure 3. Output characteristics at $T_j = 175^\circ\text{C}$

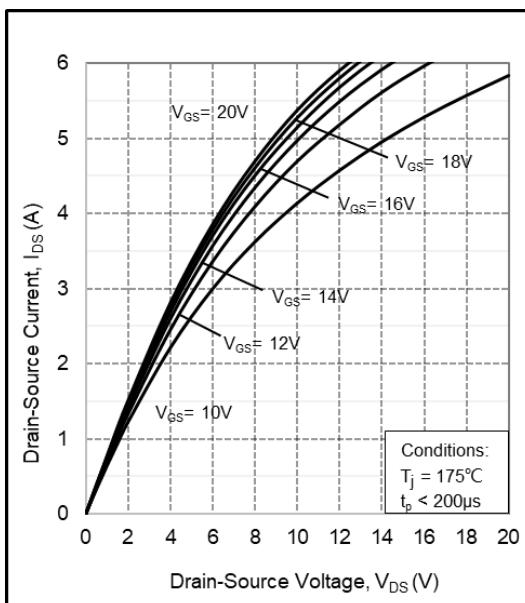


Figure 5. On-resistance vs. drain current

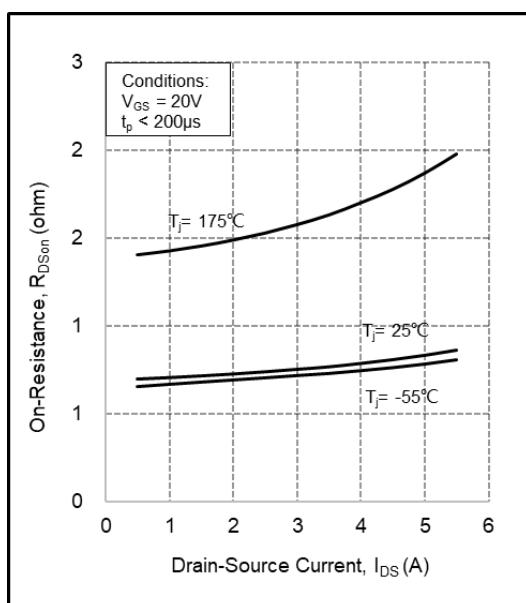


Figure 2. Output characteristics at $T_j = 25^\circ\text{C}$

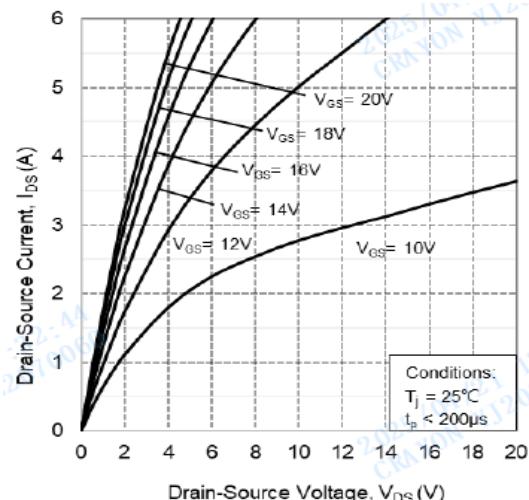


Figure 4. Normalized on-resistance vs. temperature

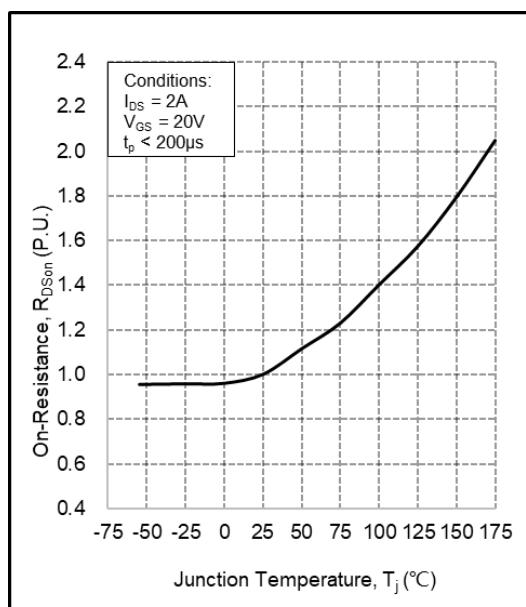
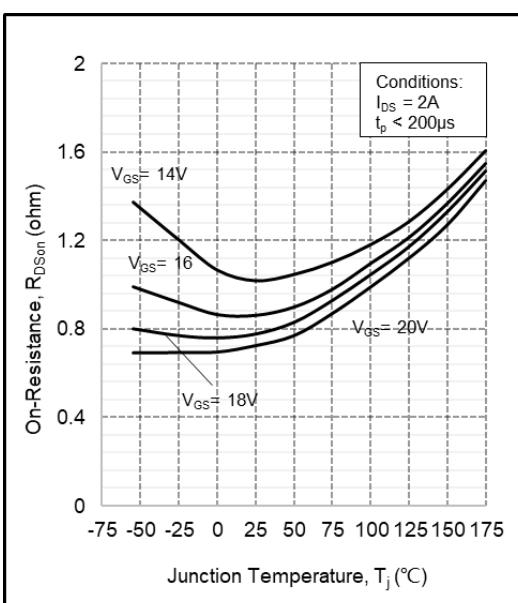


Figure 6. On-resistance vs. temperature



Curve Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Figure 7. Transfer characteristic

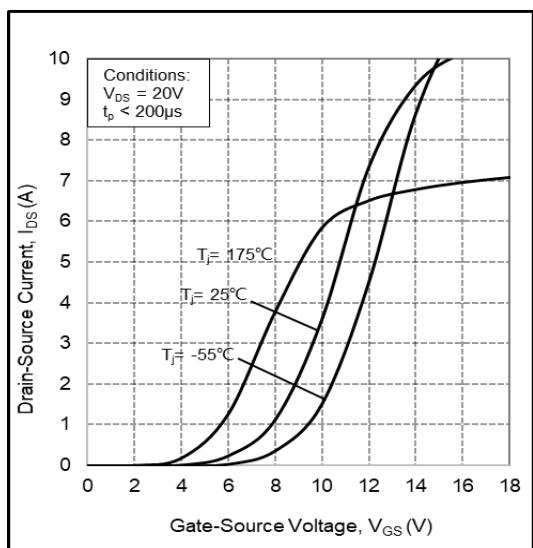


Figure 9. Body diode characteristic at $T_j = 25^\circ\text{C}$

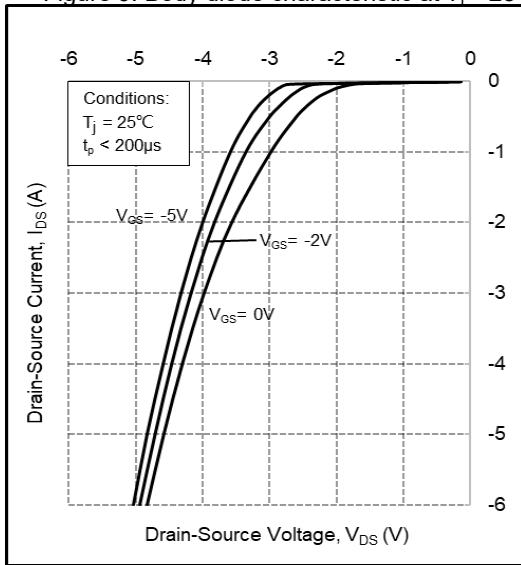


Figure 11. Threshold voltage vs. temperature

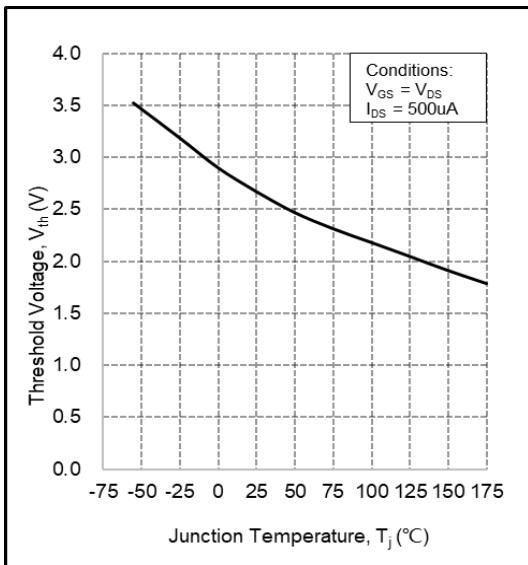


Figure 8. Body diode characteristic at $T_j = -55^\circ\text{C}$

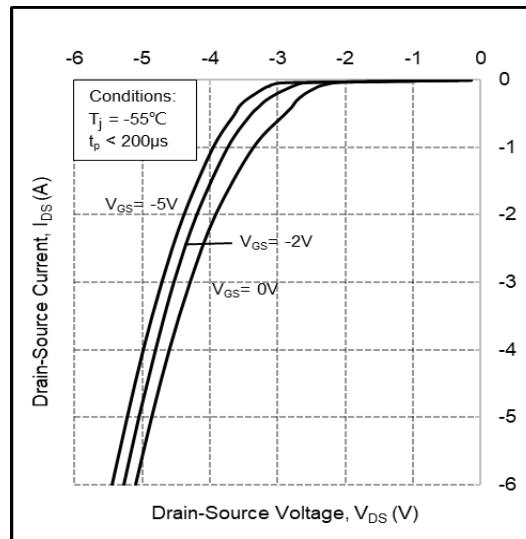


Figure 10. Body diode characteristic at $T_j = 175^\circ\text{C}$

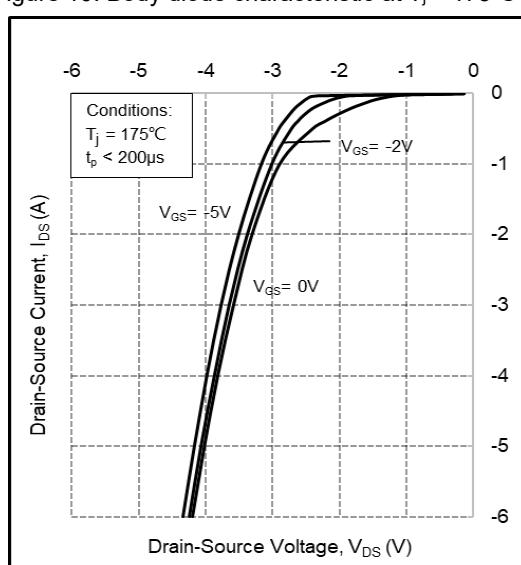
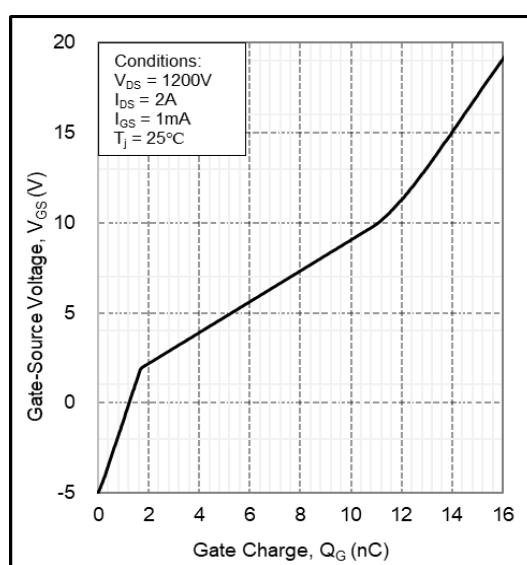


Figure 12. Gate Charge Characteristic



Curve Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Figure 13. 3rd quadrant characteristic at $T_j = -55^\circ\text{C}$

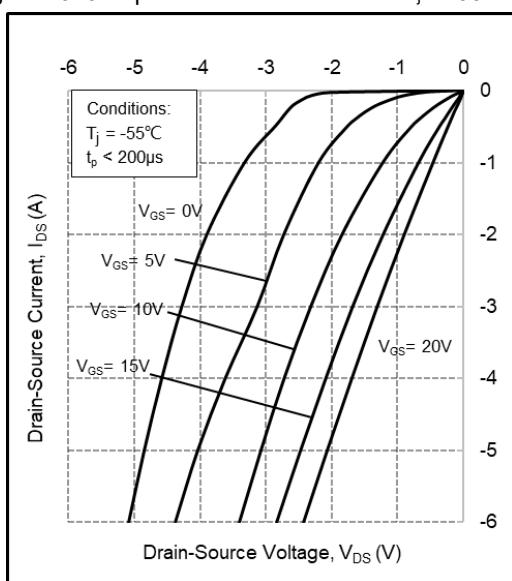


Figure 14. 3rd quadrant characteristic at $T_j = 25^\circ\text{C}$

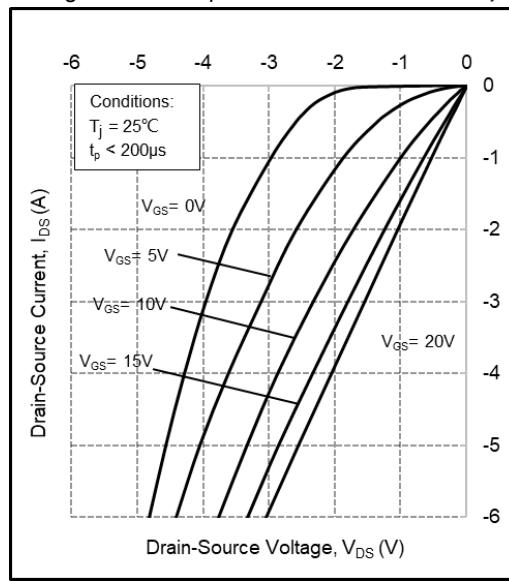


Figure 15. 3rd quadrant characteristic at $T_j = 175^\circ\text{C}$

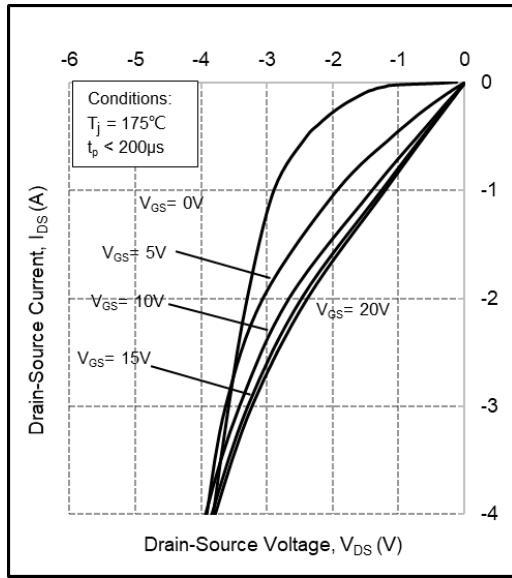


Figure 16. Output capacitor stored energy

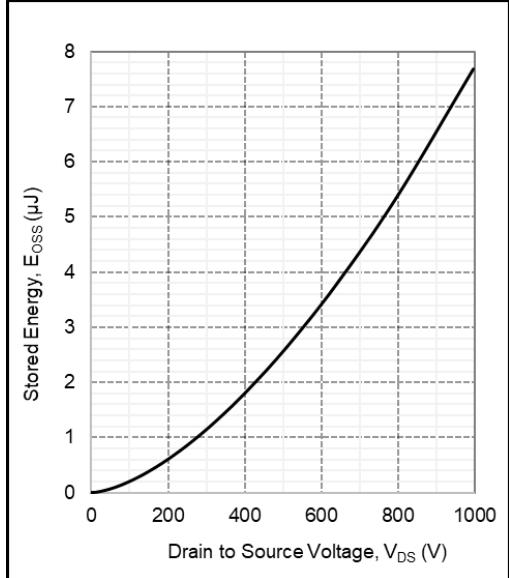


Figure 17. Capacitance vs. drain-source voltage (0 - 200V)

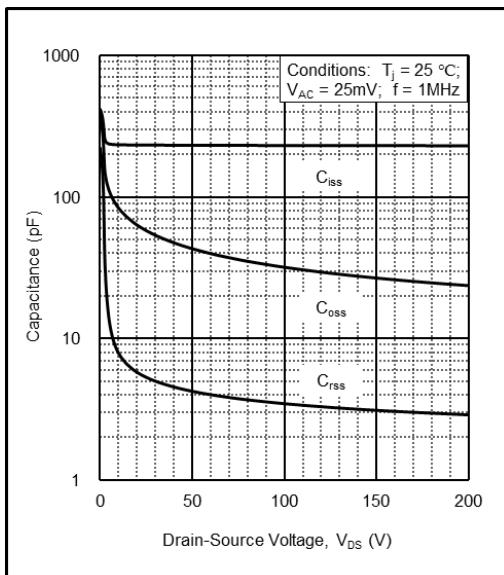
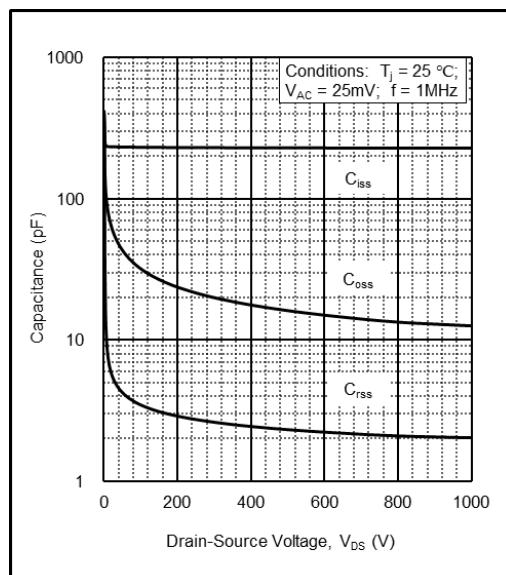


Figure 18. Capacitance vs. drain-source voltage (0 - 1000V)



Curve Characteristics ($T_J=25^\circ\text{C}$ unless otherwise specified)

Figure 19. Continuous drain current derating vs. temperature

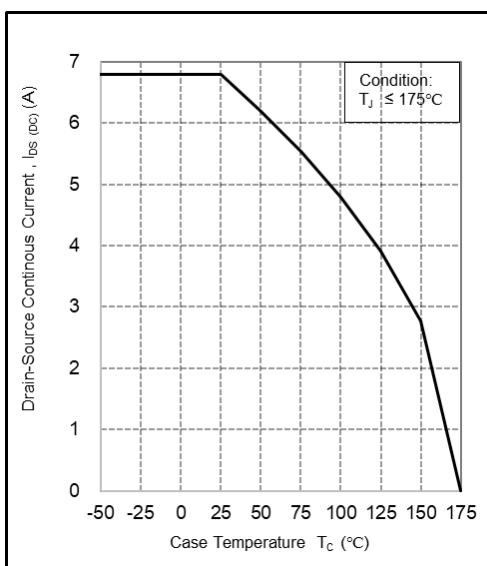


Figure 21. Switching Times vs. $R_{G(\text{ext})}$

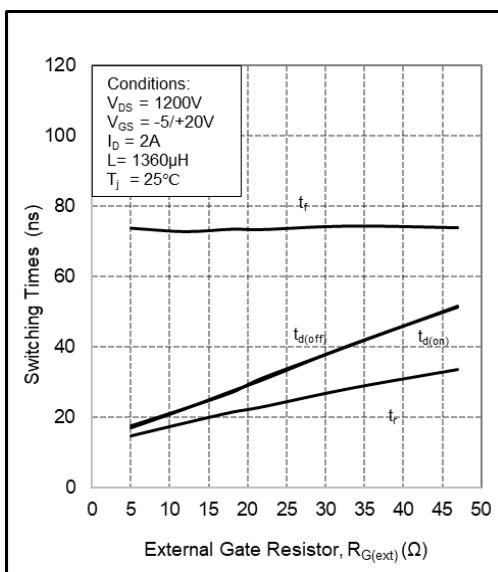


Figure 23. Clamped inductive Switching energy vs. temperature

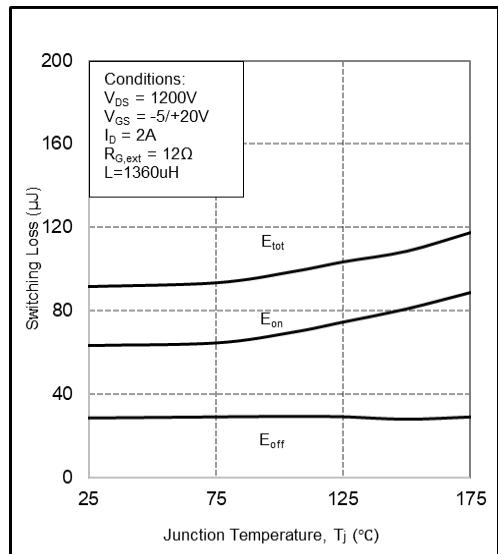


Figure 20. Maximum power dissipation derating vs. temperature

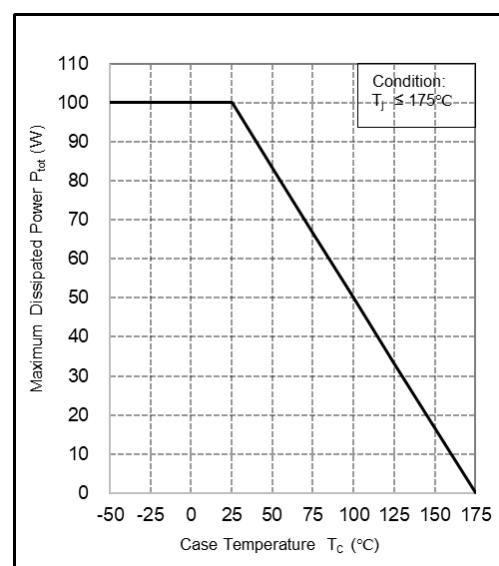


Figure 22. Clamped inductive Switching energy vs. drain current

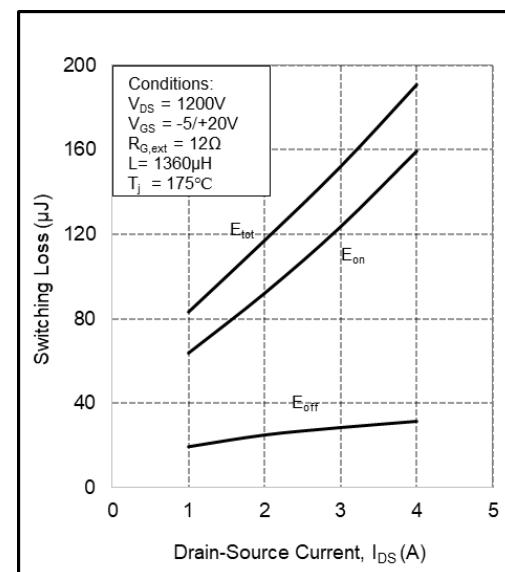
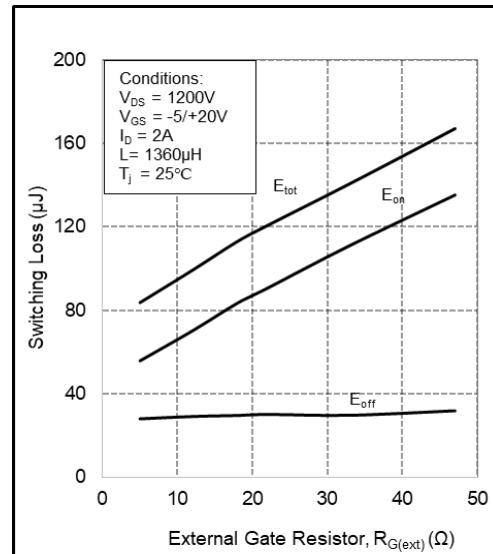


Figure 24. Clamped inductive Switching energy vs. $R_{G(\text{ext})}$



Curve Characteristics ($T_J=25^\circ\text{C}$ unless otherwise specified)

Figure 25. Reverse recovery charge vs. di_f/dt

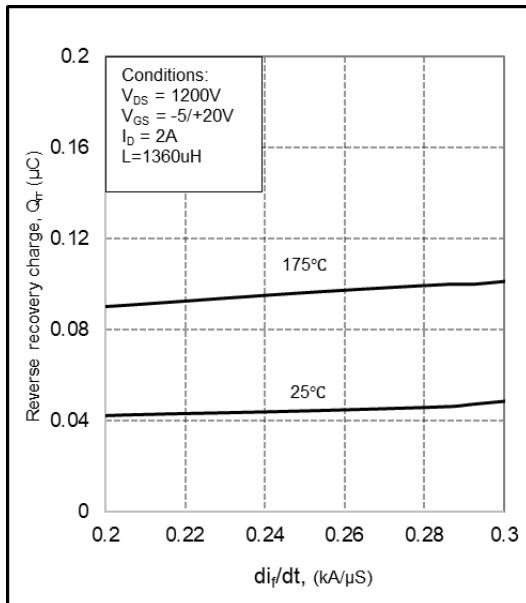


Figure 26. Reverse recovery current vs. di_f/dt

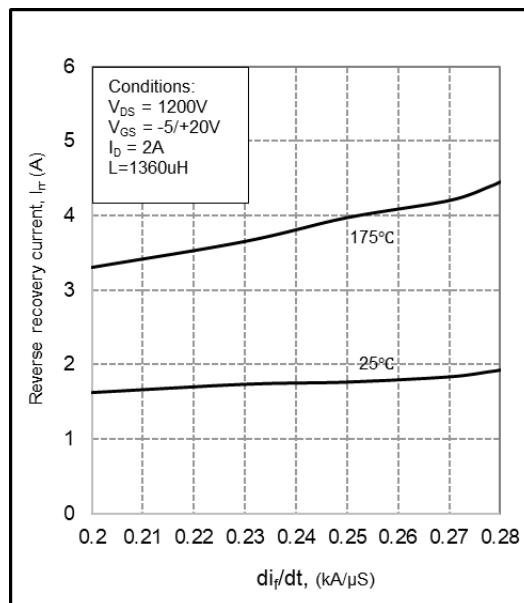


Figure 27. Transient Thermal Impedance (Junction - Case)

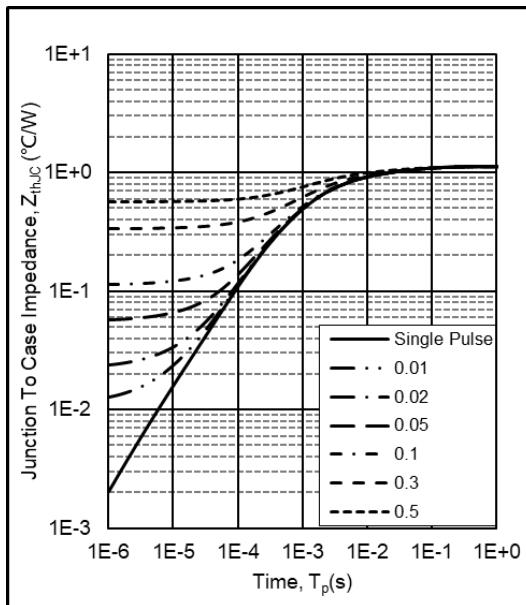
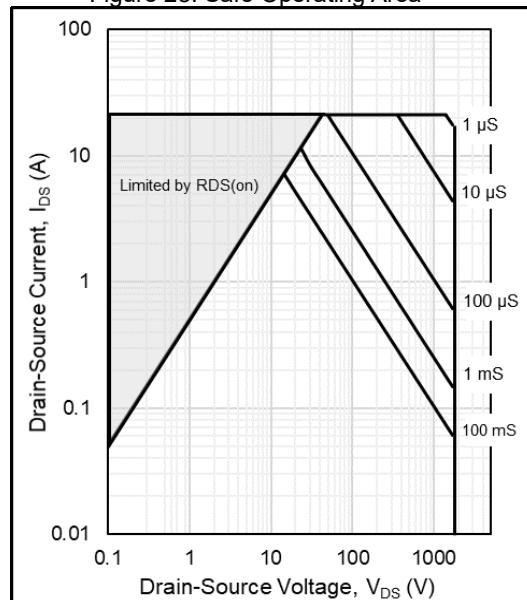


Figure 28. Safe Operating Area



Ordering Information

| Device | Packing |
|----------------|----------------------------|
| Part Number-BP | Tube:30pcs/Tube, 1.8K/Ctn; |

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