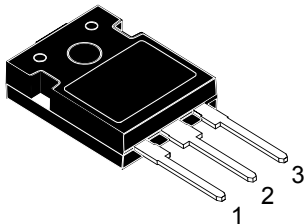
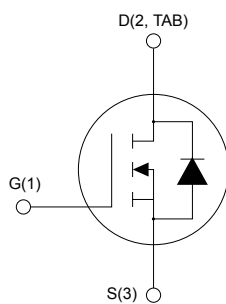


Silicon carbide Power MOSFET 1200 V, 21 mΩ typ., 91 A in an HiP247 package


HiP247


AM01475v1_noZen



Features

| Order code | V_{DS} | $R_{DS(on)}$ max. | I_D |
|---------------|----------|-------------------|-------|
| SCTW70N120G2V | 1200 V | 30 mΩ | 91 A |

- Very fast and robust intrinsic body diode
- Extremely low gate charge and input capacitance
- Very high operating junction temperature capability ($T_J = 200\text{ °C}$)

Applications

- Switching mode power supply
- DC-DC converters
- Industrial motor control

Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 2nd generation SiC MOSFET technology. The device features remarkably low on-resistance per unit area and very good switching performance. The variation of switching loss is almost independent of junction temperature.

Product status link

[SCTW70N120G2V](#)

Product summary

| | |
|-------------------|---------------|
| Order code | SCTW70N120G2V |
| Marking | SCT70N120G2 |
| Package | HiP247 |
| Packing | Tube |

1 Electrical ratings

Table 1. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|---|------------|------|
| V_{DS} | Drain-source voltage | 1200 | V |
| V_{GS} | Gate-source voltage | -10 to 22 | V |
| | Gate-source voltage (recommended operating values) | -5 to 18 | |
| I_D | Drain current (continuous) at $T_C = 25\text{ °C}$ | 91 | A |
| | Drain current (continuous) at $T_C = 100\text{ °C}$ | 69 | |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 274 | A |
| P_{TOT} | Total power dissipation at $T_C = 25\text{ °C}$ | 547 | W |
| T_{stg} | Storage temperature range | -55 to 200 | °C |
| T_J | Operating junction temperature range | | |

1. Pulse width is limited by safe operating area.

Table 2. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|---|-------|------|
| R_{thJC} | Thermal resistance, junction-to-case | 0.32 | °C/W |
| R_{thJA} | Thermal resistance, junction-to-ambient | 40 | °C/W |

2 Electrical characteristics

($T_C = 25\text{ °C}$ unless otherwise specified).

Table 3. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|--|------|------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$ | 1200 | | | V |
| I_{DSS} | Zero-gate voltage drain current | $V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$ | | | 10 | μA |
| I_{GSS} | Gate-body leakage current | $V_{DS} = 0\text{ V}, V_{GS} = -10\text{ to }22\text{ V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}, I_D = 1\text{ mA}$ | 1.9 | 2.45 | 4.9 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 18\text{ V}, I_D = 50\text{ A}$ | | 21 | 30 | m Ω |
| | | $V_{GS} = 18\text{ V}, I_D = 50\text{ A}, T_J = 200\text{ °C}$ | | 46 | | |

Table 4. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------|---|------|------|------|----------|
| C_{iss} | Input capacitance | $V_{DS} = 800\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$ | - | 3540 | - | pF |
| C_{oss} | Output capacitance | | - | 176 | - | pF |
| C_{riss} | Reverse transfer capacitance | | - | 28 | - | pF |
| R_G | Intrinsic gate resistance | $f = 1\text{ MHz}, I_D = 0\text{ A}$ | - | 1 | - | Ω |
| Q_g | Total gate charge | $V_{DD} = 800\text{ V}, I_D = 50\text{ A}, V_{GS} = -5\text{ to }18\text{ V}$ | - | 150 | - | nC |
| Q_{gs} | Gate-source charge | | - | 28 | - | nC |
| Q_{gd} | Gate-drain charge | | - | 63 | - | nC |

Table 5. Switching energy

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|---------------------------|--|------|------|------|---------------|
| E_{on} | Turn-on switching energy | $V_{DD} = 800\text{ V}, I_D = 50\text{ A}$ | - | 1019 | - | μJ |
| E_{off} | Turn-off switching energy | $R_G = 3.3\ \Omega, V_{GS} = -5\text{ to }18\text{ V}$ | - | 378 | - | μJ |

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 800\text{ V}, I_D = 50\text{ A}$ | - | 16 | - | ns |
| t_r | Rise time | | - | 9.5 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | $R_G = 3.3\ \Omega, V_{GS} = -5\text{ to }18\text{ V}$ | - | 37 | - | ns |
| t_f | Fall time | | - | 22 | - | ns |

Table 7. Reverse SiC diode characteristics

| Symbol | Parameter | Test conditions | Min | Typ. | Max | Unit |
|-----------|--------------------------|---|-----|-------|-----|------|
| V_{SD} | Forward on voltage | $I_{SD} = 50\text{ A}$, $V_{GS} = 0\text{ V}$ | - | 2.7 | - | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 50\text{ A}$, $V_{DD} = 800\text{ V}$, $V_{GS} = -5\text{ to }18\text{ V}$ | - | 11.16 | - | ns |
| Q_{rr} | Reverse recovery charge | | - | 276 | - | nC |
| I_{RRM} | Reverse recovery current | | - | 40 | - | A |

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

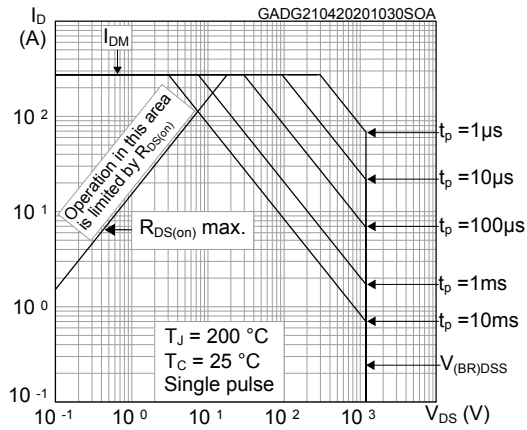


Figure 2. Maximum transient thermal impedance

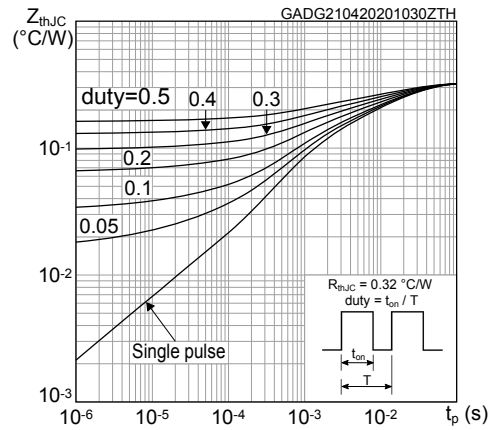


Figure 3. Typical output characteristics ($T_J = 25\text{ °C}$)

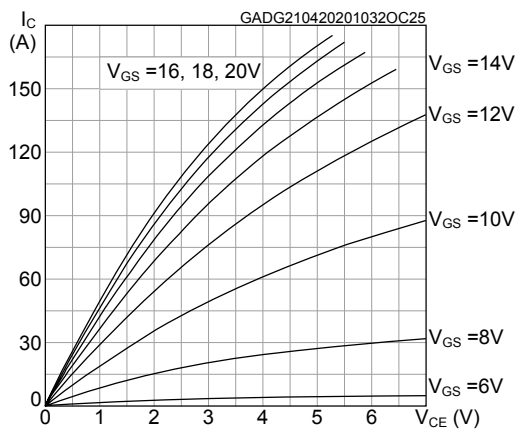


Figure 4. Typical output characteristics ($T_J = 200\text{ °C}$)

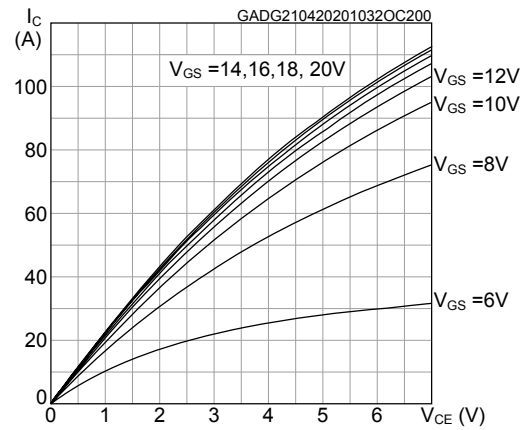


Figure 5. Typical transfer characteristics

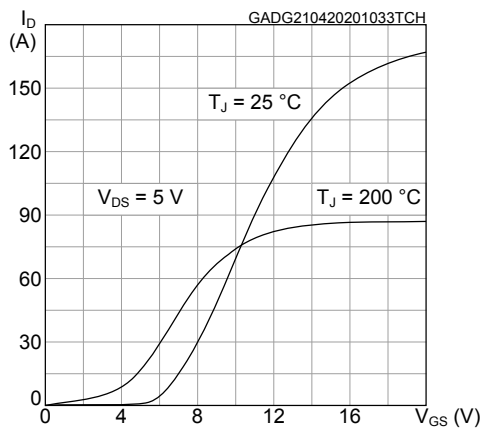


Figure 6. Total power dissipation

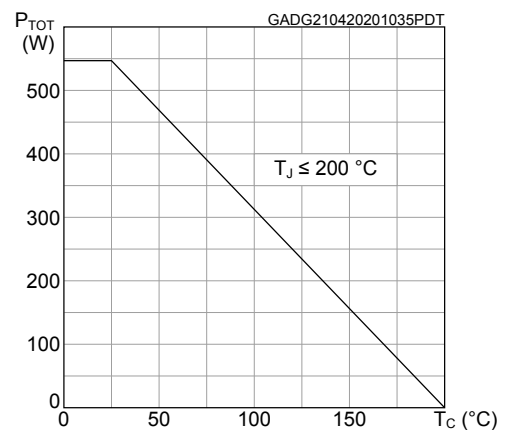


Figure 7. Typical gate charge characteristics

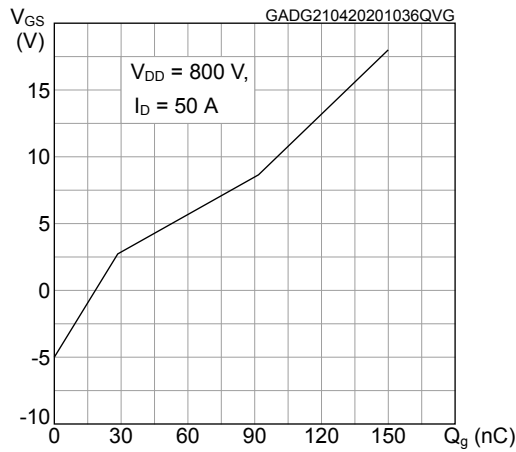


Figure 8. Typical capacitance characteristics

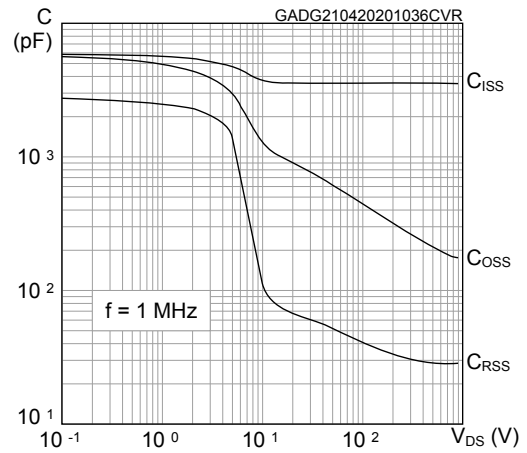


Figure 9. Typical switching energy vs drain current

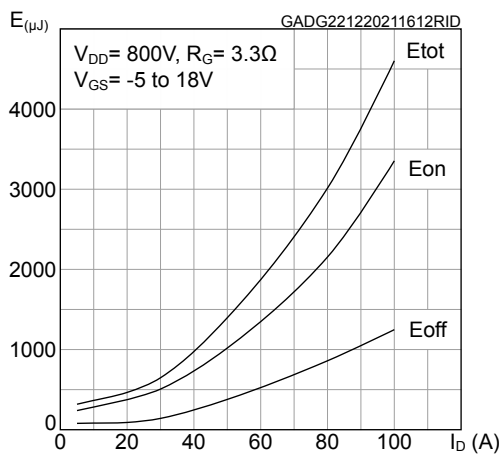


Figure 10. Typical switching energy vs temperature

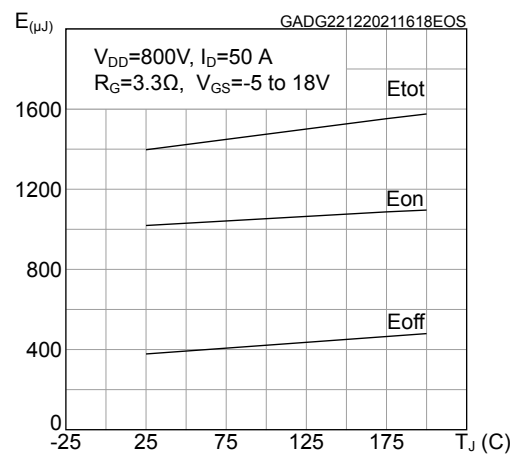


Figure 11. Normalized breakdown voltage vs temperature

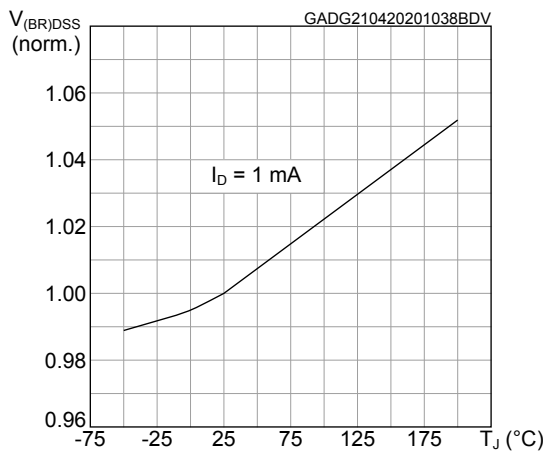


Figure 12. Normalized gate threshold vs temperature

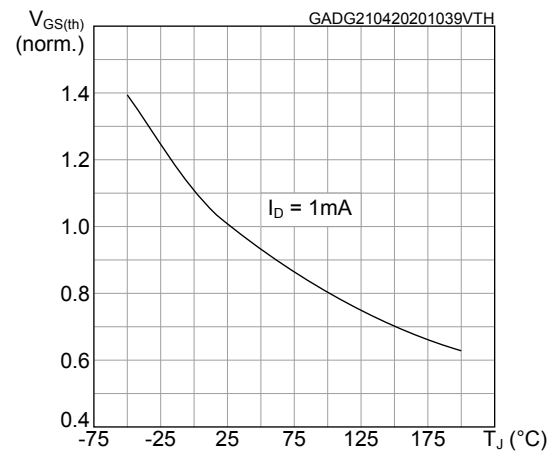


Figure 13. Normalized on-resistance vs temperature

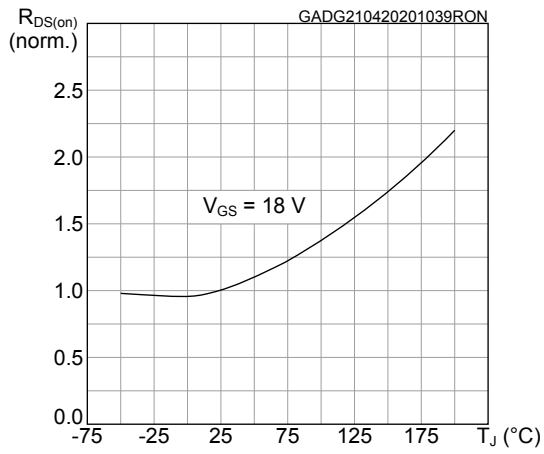


Figure 14. Typical reverse conduction characteristics ($T_J = 25\text{ °C}$)

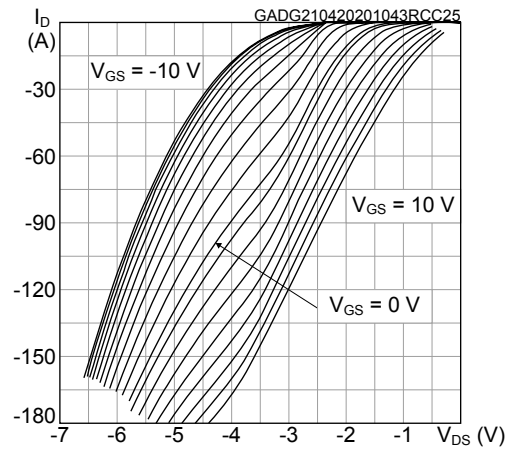


Figure 15. Typical reverse conduction characteristics ($T_J = 200\text{ °C}$)

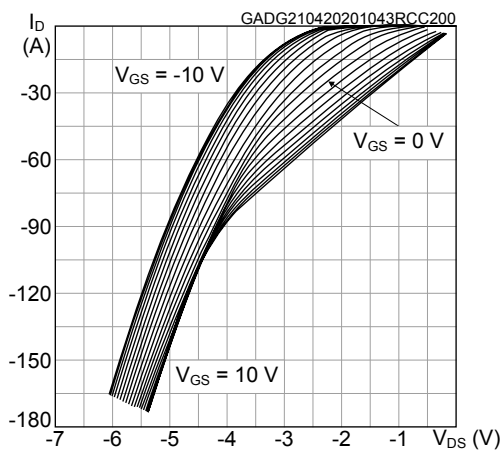
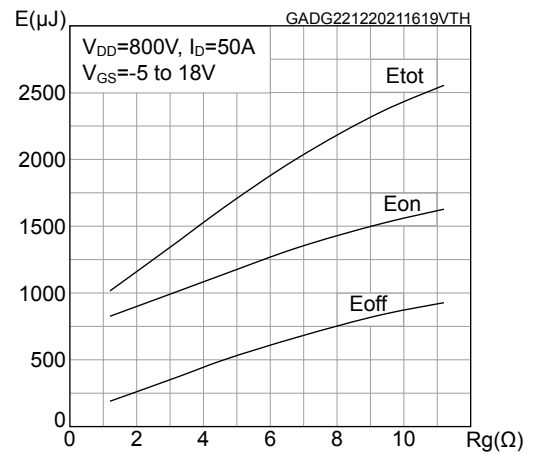


Figure 16. Typical switching energy vs gate resistance

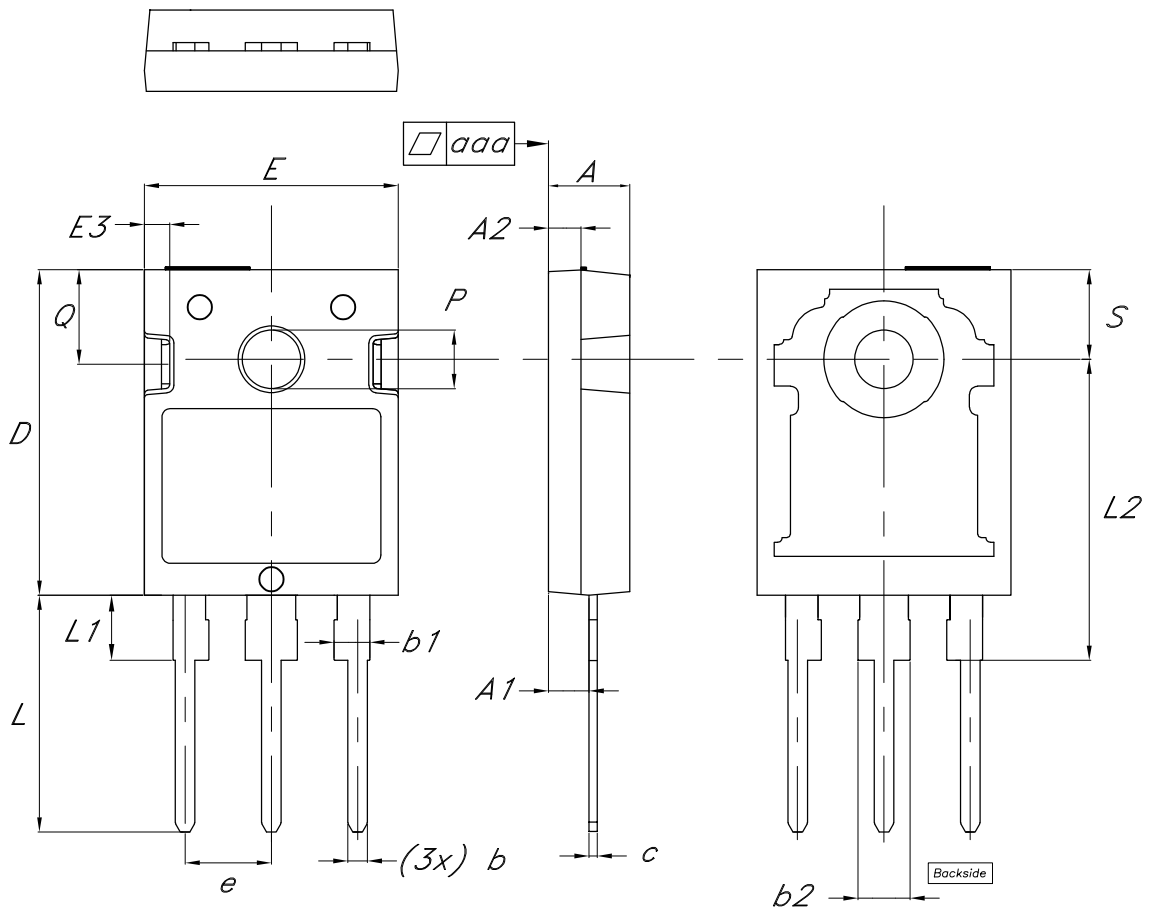


3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

3.1 HiP247 package information

Figure 17. HiP247 package outline



8581091_4

Table 8. HiP247 package mechanical data

| Dim. | mm | | |
|------|-------|-------|-------|
| | Min. | Typ. | Max. |
| A | 4.85 | 5.00 | 5.15 |
| A1 | 2.20 | | 2.60 |
| A2 | 1.90 | 2.00 | 2.10 |
| b | 1.00 | | 1.40 |
| b1 | 2.00 | | 2.40 |
| b2 | 3.00 | | 3.40 |
| c | 0.40 | | 0.80 |
| D | 19.85 | 20.00 | 20.15 |
| E | 15.45 | 15.60 | 15.75 |
| E3 | 1.45 | | 1.65 |
| e | 5.30 | 5.45 | 5.60 |
| L | 14.20 | | 14.80 |
| L1 | 3.70 | | 4.30 |
| L2 | 18.30 | 18.50 | 18.70 |
| P | 3.55 | | 3.65 |
| Q | 5.65 | | 5.95 |
| S | 5.30 | 5.50 | 5.70 |
| aaa | | 0.04 | 0.10 |

Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 26-Jan-2017 | 1 | First release |
| 22-May-2020 | 2 | Updated <i>Title, Internal schematic, Features, Description</i> and <i>Device summary</i> in cover page. Updated <i>Section 1 Electrical ratings</i> . Updated <i>Section 2 Electrical characteristics</i> . Updated <i>Section 2.1 Electrical characteristics (curves)</i> . Updated <i>Section 3 Package information</i> . |
| 31-Aug-2020 | 3 | Modified <i>Table 7. Reverse SiC diode characteristics</i> . Modified <i>Figure 9. Typical switching energy vs drain current</i> . |
| 07-Jan-2022 | 4 | Updated <i>Section 2.1 Electrical characteristics (curves)</i> . Minor text changes. |

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| | Revision history | 10 |

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