Powering the SiC evolution™

# GP2T080A120H

| | |
|---|---|
| $V_{DS}$ | 1200 V |
| $R_{DS,on}$ | 77 mΩ |
| $I_{D\ (TC=25C)}$ | 35 A |
| $T_{J,max}$ | 175°C |

## QSiC™ 1200V SiC MOSFET

### Features

- High speed switching
- Reliable body diode
- All parts tested to above 1400V
- Avalanche tested to 200mJ
- Driver source pin for gate driving
- Increased creepage due to notched design

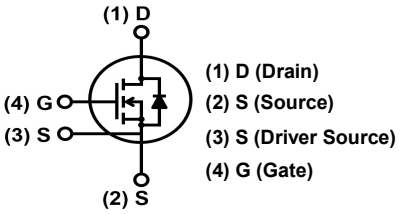
### Benefits

- Lower capacitance
- Higher system efficiency
- Easy to parallel
- Lower Qg

### Applications

- Solar Inverters
- Switch mode power supplies, UPS
- Induction Heating and Welding
- EV charging stations
- High Voltage DC/DC Converters
- Motor Drives

### Package




| Part # | Package | Marking |
|---|---|---|
| GP2T080A120H | TO-247-4L | 2T080A120 |

**Maximum Ratings**, at $T_J$=25°C, unless otherwise specified

| Characteristics | Symbol | Conditions | Values | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{rated}$ | $V_{GS}$=0V, $I_D$=1μA | 1200 | V |
| Continuous Drain Current | $I_D$ | $T_C$=25°C, $V_{GS}$=20V | 35 | A |
| | | $T_C$=100°C, $V_{GS}$=20V | 26 | |
| Pulsed Drain Current | $I_{D,pulse}$ | $T_C$=25°C | 80 | |
| Gate Source Voltage | $V_{GSmax}$ | | -10/25 | V |
| | $V_{GSop}$ | Recommended operational | -5/20 | |
| Power Dissipation | $P_{tot}$ | $T_C$=25°C | 188 | W |
| Operating & Storage Temperature | $T_J$, $T_{storage}$ | Continuous | -55...175 | °C |
| Single Pulse Avalanche Energy | $E_{AS}$ | L=1mH, $I_{AS}$=20.0A, V=50V | 200 | mJ |

### Thermal Characteristics

| Characteristics | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| Thermal Resistance, Junction to Case | $R_{thJC}$ | | - | 0.65 | 0.80 | °C/W |
| Thermal Resistance, Junction to Ambient | $R_{thJA}$ | | - | - | 40.0 | |

## **Static Electrical Characteristics**, at $T_J$=25°C, unless otherwise specified

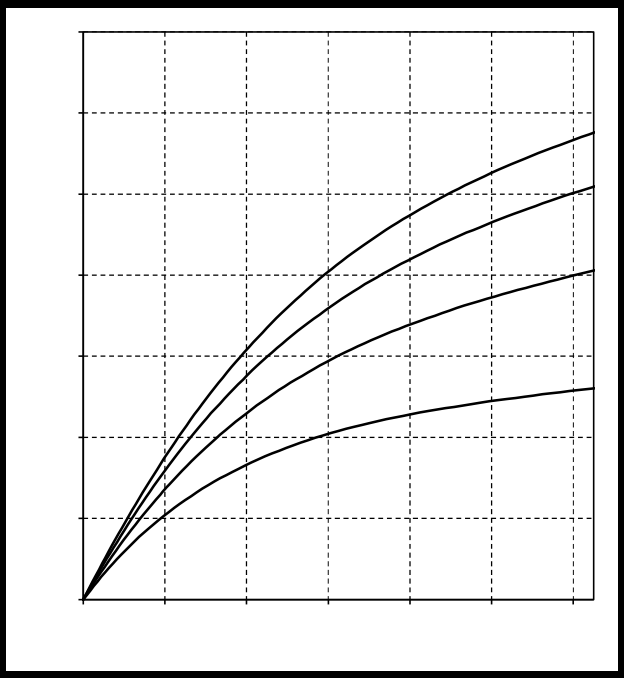
| Characteristics | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=1mA | 1200 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=1200V, $V_{GS}$=0V | - | 0.1 | 1.0 | μA |
| | | $V_{DS}$=1200V, $V_{GS}$=0V, $T_J$=175°C | - | 1 | - | |
| Gate-Source Leakage Current | $I_{GSS+}$ | $V_{GS}$=20V, $V_{DS}$=0V | - | 10 | 100 | nA |
| | $I_{GSS-}$ | $V_{GS}$=-5V, $V_{DS}$=0V | - | -10 | -100 | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$=$V_{DS}$, $I_D$=10mA | 1.8 | 2.8 | 4 | V |
| | | $V_{GS}$=$V_{DS}$, $I_D$=10mA, $T_J$=125°C | - | 2.1 | - | |
| | | $V_{GS}$=$V_{DS}$, $I_D$=10mA, $T_J$=175°C | - | 1.9 | - | |
| Drain-Source On-Resistance | $R_{DSon}$ | $V_{GS}$=20V, $I_D$=20A | - | 77 | 100 | mΩ |
| | | $V_{GS}$=20V, $I_D$=10A | - | 71 | 90 | |
| | | $V_{GS}$=20V, $I_D$=20A, $T_J$=125°C | - | 106 | - | |
| | | $V_{GS}$=20V, $I_D$=20A, $T_J$=175°C | - | 134 | - | |
| Gate Input Resistance | $R_G$ | f=1MHz, VAC=25mV, D-S Short | - | 3.0 | - | Ω |

## **AC Electrical Characteristics**, at $T_J$=25°C, unless otherwise specified

| Characteristics | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$=0V<br>$V_{DS}$=1000V<br>f=200kHz. Vac=25mV | - | 1377 | - | pF |
| Output Capacitance | $C_{OSS}$ | | - | 62 | - | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | - | 4 | - | |
| Coss Stored Energy | $E_{OSS}$ | | - | 38 | - | μJ |
| Turn-On Switching Energy | $E_{ON}$ | $V_{DD}$=800V, $I_{DS}$=20A,<br>$R_{G(ext)}$=2.5Ω,<br>$V_{GS}$=-5/+20V, L=975μH,<br>FWD = GP2T080A120H | - | 208 | - | |
| Turn-Off Switching Energy | $E_{OFF}$ | | - | 25 | - | |
| Total Switching Energy | $E_{TOT}$ | | - | 233 | - | |
| Turn-On Switching Energy | $E_{ON}$ | $V_{DD}$=800V, $I_{DS}$=20A,<br>$R_{G(ext)}$=2.5Ω,<br>$V_{GS}$=-5/+20V, L=975μH,<br>FWD = GP3D010A120A | - | 167 | - | μJ |
| Turn-Off Switching Energy | $E_{OFF}$ | | - | 27 | - | |
| Total Switching Energy | $E_{TOT}$ | | - | 194 | - | |
| Turn-On Delay Time | $t_{D(on)}$ | $V_{DD}$=800V, $I_{DS}$=20A,<br>$R_{G(ext)}$=2.5Ω, $V_{GS}$=-5V/20V,<br>L=975μH,<br>FWD = GP2T080A120H | - | 9 | - | ns |
| Rise Time | $t_R$ | | - | 4 | - | |
| Turn-Off Delay Time | $t_{D(off)}$ | | - | 15 | - | |
| Fall Time | $t_F$ | | - | 10 | - | |
| Total Gate Charge | $Q_G$ | $V_{DD}$=800V, $I_{DS}$=20A<br>$V_{GS}$=-5/20V | - | 61 | - | nC |
| Gate to Source Charge | $Q_{GS}$ | | - | 24 | - | |
| Gate to Drain Charge | $Q_{GD}$ | | - | 14 | - | |

## **Body Diode Characteristics**, at $T_J$=25°C, unless otherwise specified

| Characteristics | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| Max Continuous Diode Fwd Current | $I_S$ | $V_{GS}$=-5V, $T_C$=25°C | - | - | 43 | A |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=-5V, $I_S$=10A | - | 3.8 | - | V |
| Reverse Recovery Time | $t_{RR}$ | $I_S$=20A, $V_R$=800V, $V_{GS}$=-5V<br>$di_F/dt$=8.0A/ns | - | 8 | - | ns |
| Reverse Recovery Charge | $Q_{RR}$ | | - | 130 | - | nC |
| Peak Reverse Recovery Current | $I_{RRM}$ | | - | 29 | - | A |



Conditions:
$T_j$ = 175°C
tp = 100 µs

Vgs = 20V

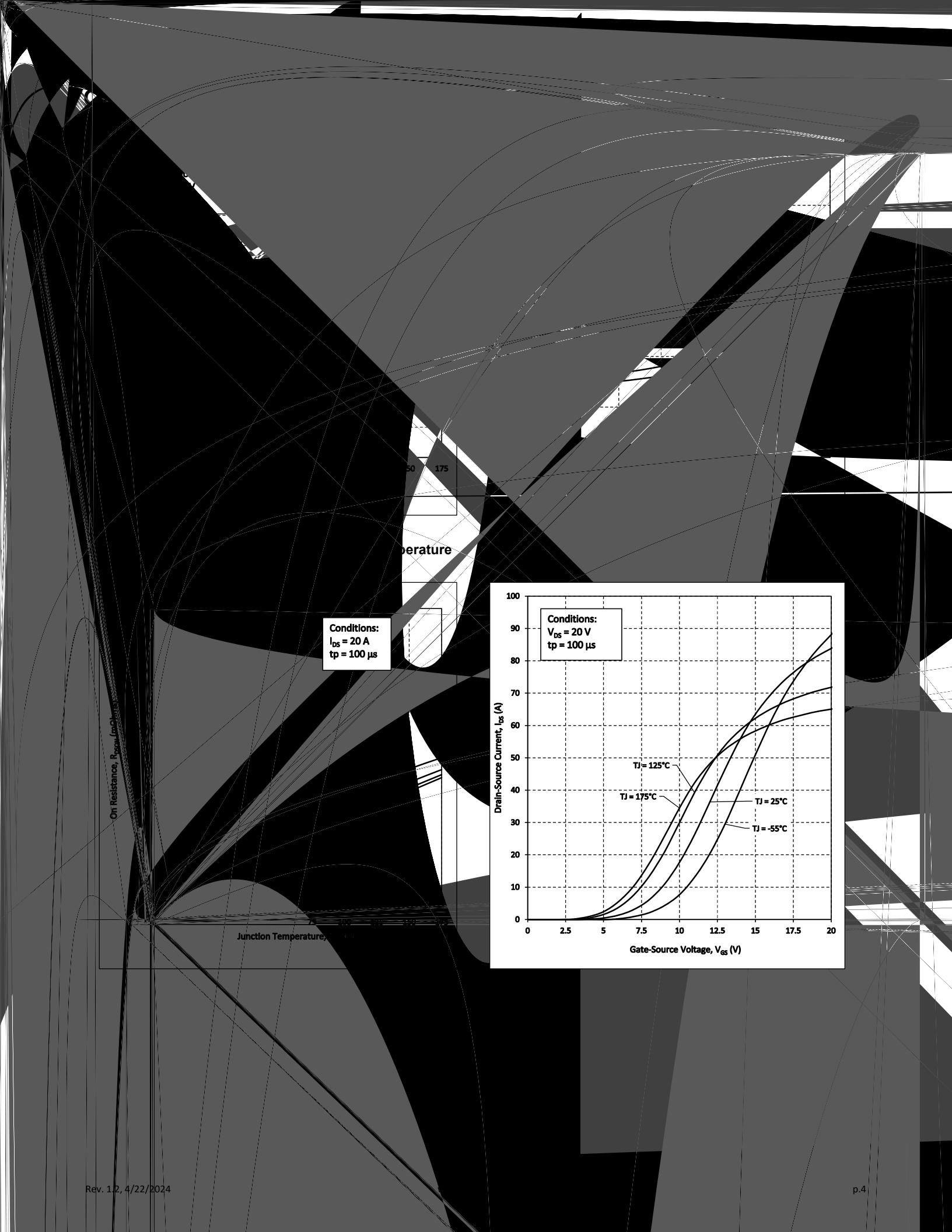
Vgs = 16V

Vgs = 14V

Vgs = 18V

Vgs = 12V

Vgs = 10V


Conditions:
$I_{DS}$ = 20 A
tp = 100 µs
Conditions:
$V_{DS}$ = 20 V
tp = 100 µs
TJ = 125°C
TJ = 175°C
TJ = 25°C
TJ = -55°C
Drain-Source Current, $I_{DS}$ (A)
Gate-Source Voltage, $V_{GS}$ (V)
0
10
20
30
40
50
60
70
80
90
100
0
2.5
5
7.5
10
12.5
15
17.5
20

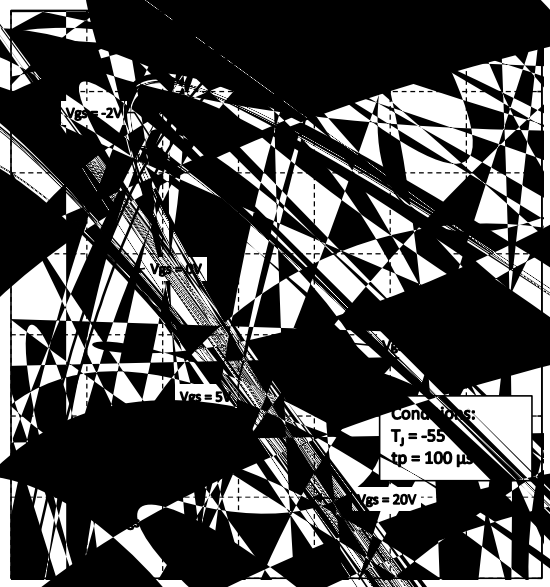
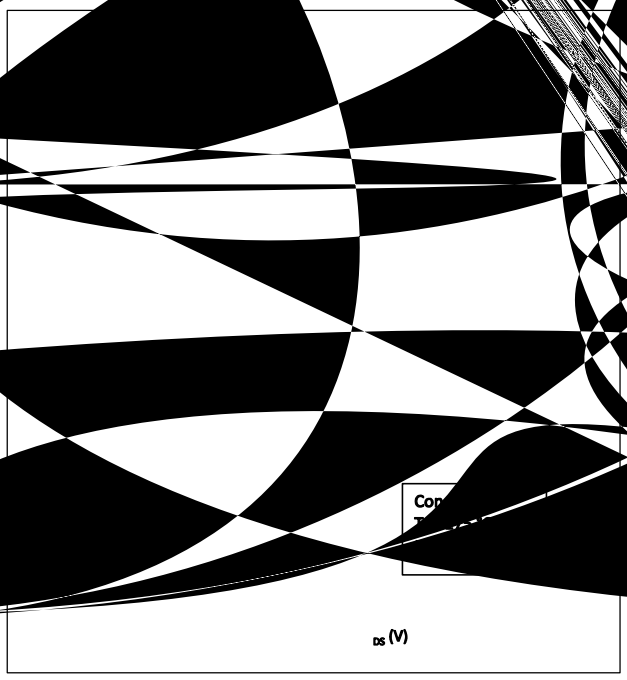



Figure 9. Bod[illegible] Characte[illegible]at TJ = -55°

Figure 10. [illegible] Diode Characte[illegible] TJ = 25°C



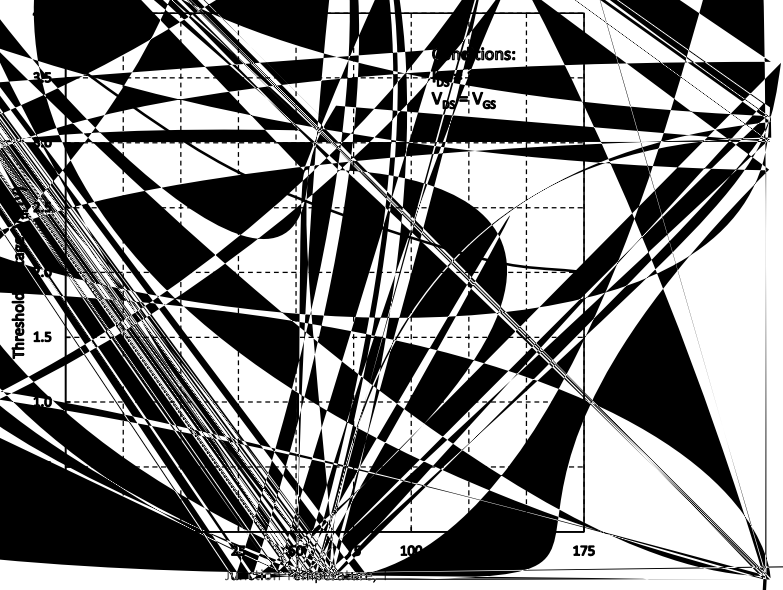




Figure 11. Body Diode Characteristics at TJ = 175°C

Figure 12. Threshold Voltage vs. Temperature

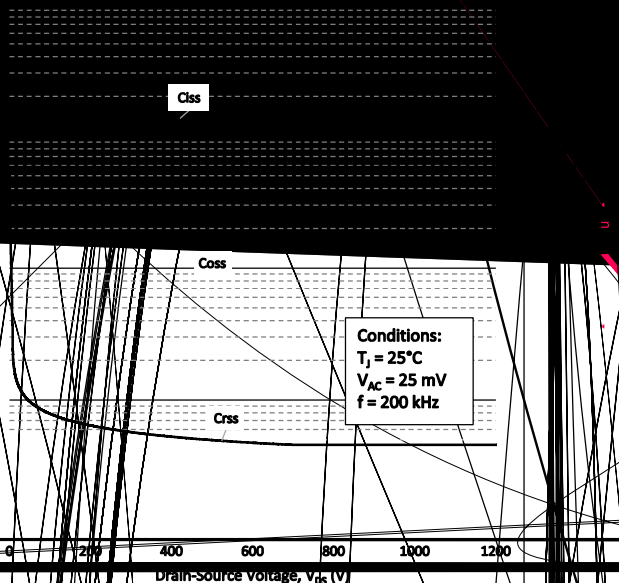



Figure 15. Capacitance vs Drain-Source Voltage

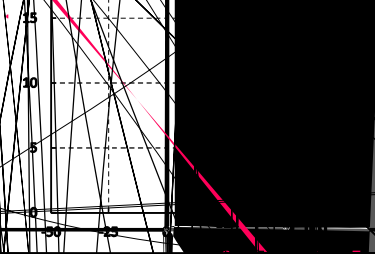
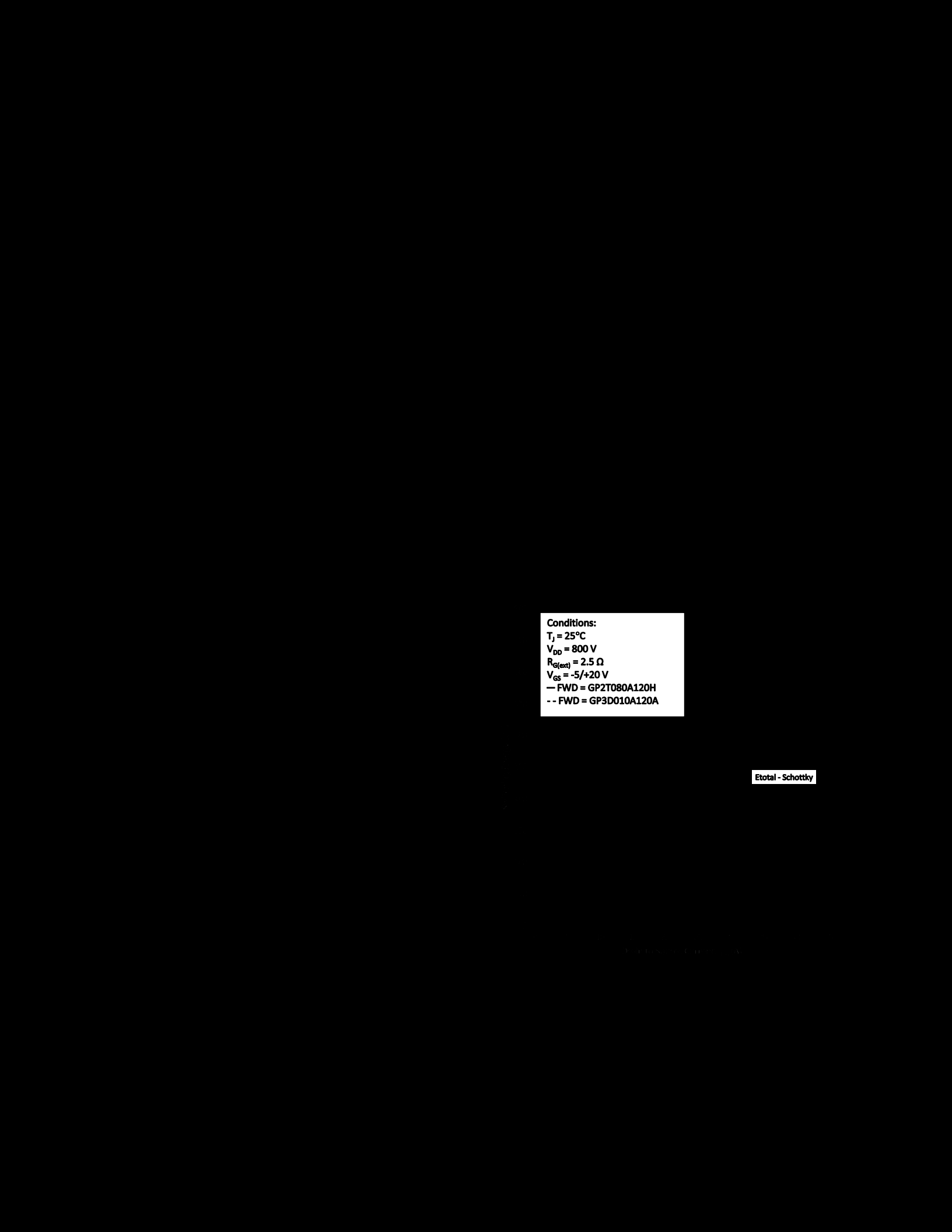



Figure 16. Continuou… g vs. Case Te… ure


Conditions:
$T_J$ = 25°C
$V_{DD}$ = 800 V
$R_{G(ext)}$ = 2.5 Ω
$V_{GS}$ = -5/+20 V
— FWD = GP2T080A120H
- - FWD = GP3D010A120A
Etotal - Schottky

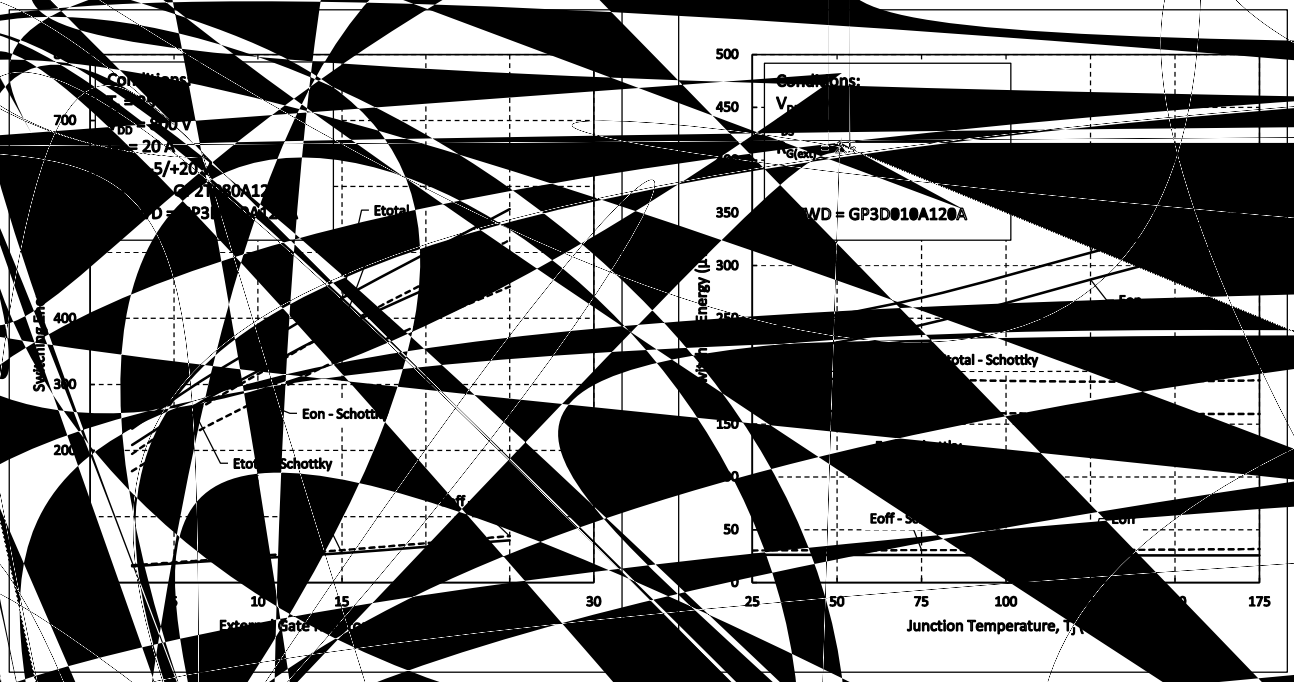



Figure 21. [illegible] Switching Energy [illegible] Figure 22. Clamped [illegible] V vs. Temperature

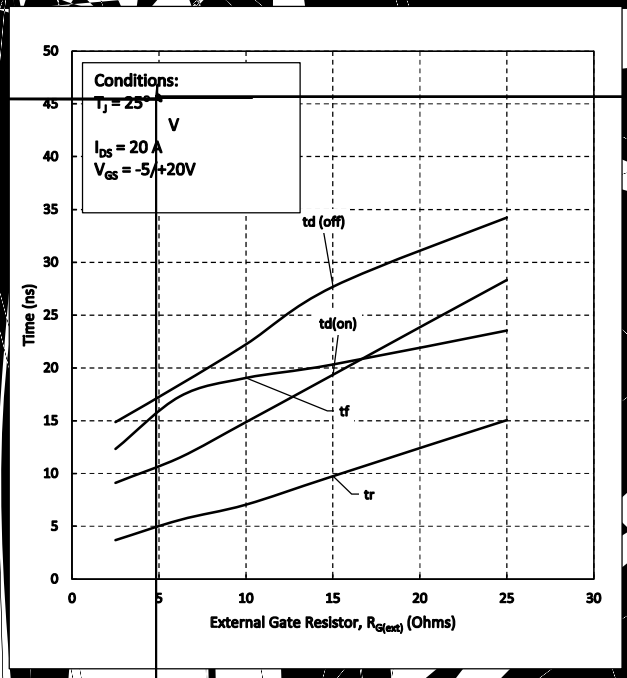



Figure 23. Switching Times vs [illegible]

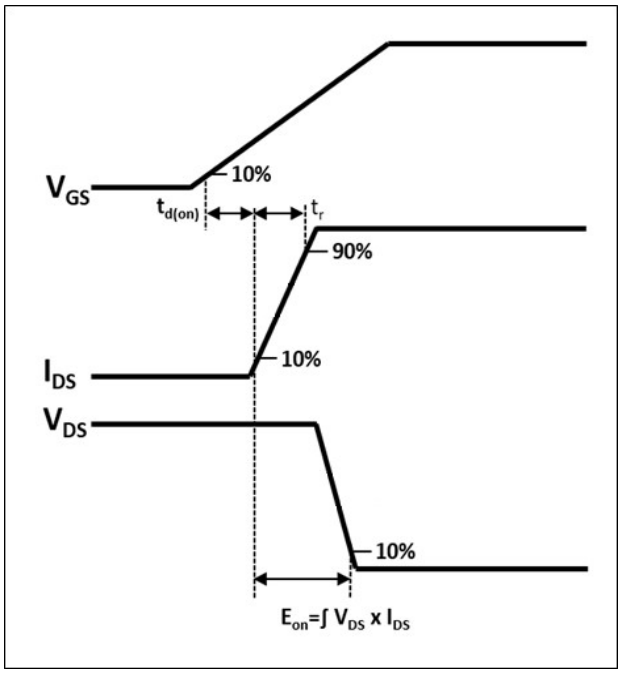



Figure 25. Turn-on Transient Definitions

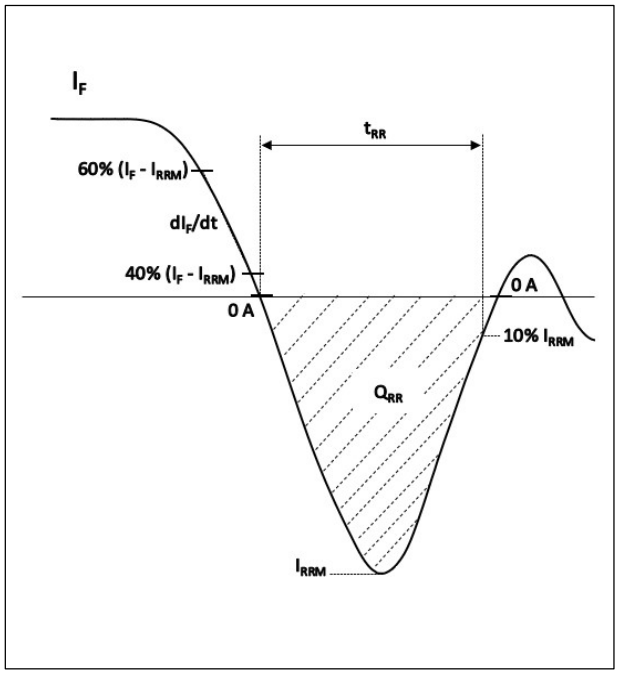
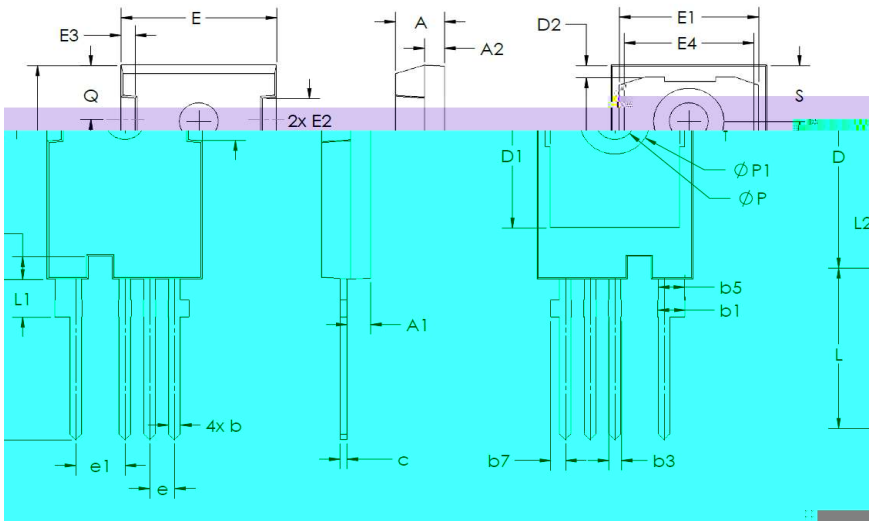



Figure 26. Reverse Recovery Definitions

## Package Dimensions TO-247-4L




| Sym | Millimeters | | Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 4.83 | 5.21 | 0.190 | 0.205 |
| A1 | 2.29 | 2.54 | 0.090 | 0.100 |
| A2 | 1.91 | 2.16 | 0.075 | 0.085 |
| b | 1.07 | 1.33 | 0.042 | 0.052 |
| b1 | 2.39 | 2.94 | 0.094 | 0.116 |
| b3 | 1.07 | 1.60 | 0.042 | 0.063 |
| b5 | 2.39 | 2.69 | 0.094 | 0.106 |
| b7 | 1.30 | 1.70 | 0.051 | 0.067 |
| c | 0.55 | 0.68 | 0.022 | 0.027 |
| c1 | 0.55 | 0.65 | 0.022 | 0.026 |
| D | 23.30 | 23.60 | 0.917 | 0.929 |
| D1 | 16.25 | 17.65 | 0.640 | 0.695 |
| D2 | 0.95 | 1.25 | 0.037 | 0.049 |
| E | 15.75 | 16.13 | 0.620 | 0.635 |
| E1 | 13.10 | 14.15 | 0.516 | 0.557 |
| E2 | 3.68 | 5.10 | 0.145 | 0.201 |
| E3 | 1.00 | 1.90 | 0.039 | 0.075 |
| E4 | 12.38 | 13.43 | 0.487 | 0.529 |
| e | 2.54 BSC | | 0.100 BSC | |
| e1 | 5.08 BSC | | 0.200 BSC | |
| L | 17.31 | 17.82 | 0.681 | 0.702 |
| L1 | 3.97 | 4.37 | 0.156 | 0.172 |
| L2 | 2.35 | 2.65 | 0.093 | 0.104 |
| φP | 3.51 | 3.65 | 0.138 | 0.144 |
| φP1 | 7.19 REF | | 0.283 REF | |
| Q | 5.49 | 6.00 | 0.216 | 0.236 |
| S | 6.04 | 6.30 | 0.238 | 0.248 |

Notes

**RoHS Compliance**

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented March, 2013. RoHS Declarations for this product can be obtained from the Product Documentation sections of www.SemiQ.com.

**REACh Compliance**

REACh substances of high concern (SVHC) information is available for this product. Since the European Chemicals Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future,please contact our office at SemiQ Headquarters in Lake Forest, California to insure you get the most up-to-date REACh SVHC Declaration. REACh banned substance information (REACh Article 67) is also available upon request.

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