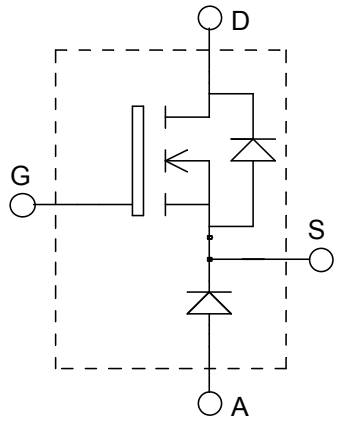
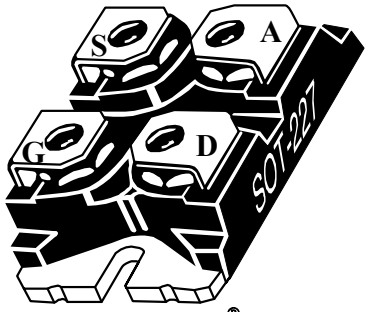
# APT20M120JCU3

## *ISOTOP® Buck chopper MOSFET + SiC chopper diode Power module*

$V_{DSS}$ = 1200V
$R_{DSon}$ = 560mΩ typ @ Tj = 25°C
$I_D$ = 20A @ Tc = 25°C




ISOTOP®

**Application**

- AC and DC motor control
- Switched Mode Power Supplies

**Features**

- ***Power MOS 8™ MOSFET***
  - Low $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
- ***SiC Schottky Diode***
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- ISOTOP® Package (SOT-227)
- Very low stray inductance
- High level of integration

**Benefits**

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- RoHS Compliant

### Absolute maximum ratings

| *Symbol* | *Parameter* | | *Max ratings* | *Unit* |
|---|---|---|---|---|
| $V_{DSS}$ | Drain - Source Breakdown Voltage | | 1200 | V |
| $I_D$ | Continuous Drain Current | $T_c$ = 25°C | 20 | A |
| | | $T_c$ = 80°C | 15 | |
| $I_{DM}$ | Pulsed Drain current | | 104 | |
| $V_{GS}$ | Gate - Source Voltage | | ±30 | V |
| $R_{DSon}$ | Drain - Source ON Resistance | | 672 | mΩ |
| $P_D$ | Maximum Power Dissipation | $T_c$ = 25°C | 543 | W |
| $I_{AR}$ | Avalanche current (repetitive and non repetitive) | | 14 | A |

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

**All ratings @ $T_j$ = 25°C unless otherwise specified**

## Electrical Characteristics

| *Symbol* | *Characteristic* | *Test Conditions* | | *Min* | *Typ* | *Max* | *Unit* |
|---|---|---|---|---|---|---|---|
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ =1200V<br>$V_{GS}$ = 0V | $T_j$ = 25°C | | | 100 | µA |
| | | | $T_j$ = 125°C | | | 500 | |
| $R_{DS(on)}$ | Drain – Source on Resistance | $V_{GS}$ = 10V, $I_D$ = 14A | | | 560 | 672 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 2.5mA | | 3 | 4 | 5 | V |
| $I_{GSS}$ | Gate – Source Leakage Current | $V_{GS}$ = ±30 V | | | | ±100 | nA |

## Dynamic Characteristics

| *Symbol* | *Characteristic* | *Test Conditions* | *Min* | *Typ* | *Max* | *Unit* |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V<br>$V_{DS}$ = 25V<br>f = 1MHz | | 7736 | | pF |
| $C_{oss}$ | Output Capacitance | | | 715 | | |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 92 | | |
| $Q_g$ | Total gate Charge | $V_{GS}$ = 10V<br>$V_{Bus}$ = 600V<br>$I_D$ = 14A | | 300 | | nC |
| $Q_{gs}$ | Gate – Source Charge | | | 50 | | |
| $Q_{gd}$ | Gate – Drain Charge | | | 140 | | |
| $T_{d(on)}$ | Turn-on Delay Time | **Resistive switching @ 25°C**<br>$V_{GS}$ = 15V<br>$V_{Bus}$ = 800V<br>$I_D$ = 14A<br>$R_G$ = 2.2Ω | | 50 | | ns |
| $T_r$ | Rise Time | | | 31 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 170 | | |
| $T_f$ | Fall Time | | | 48 | | |

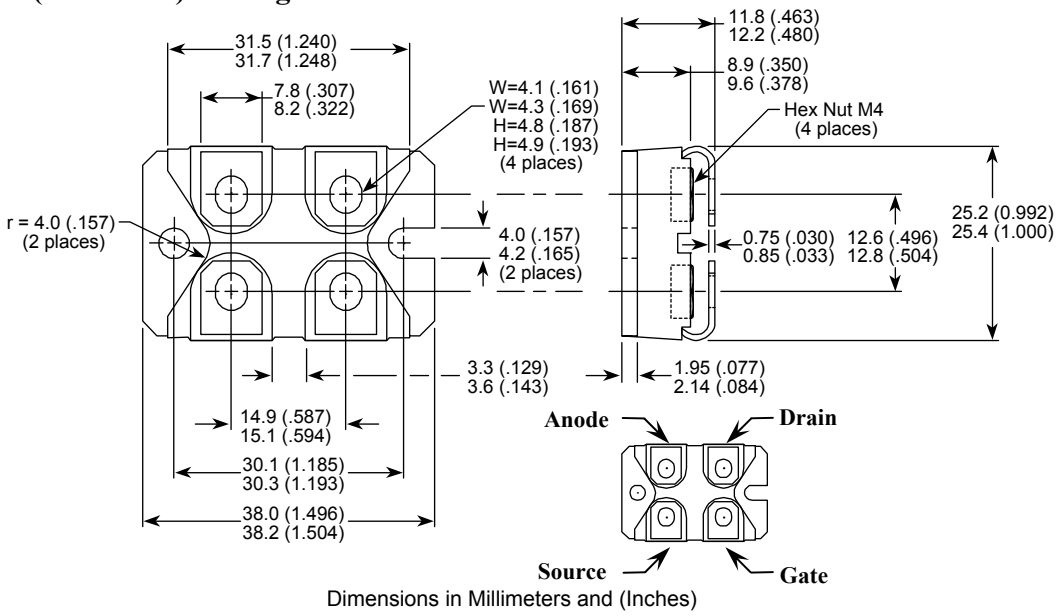
## SiC chopper diode ratings and characteristics

| *Symbol* | *Characteristic* | *Test Conditions* | | *Min* | *Typ* | *Max* | *Unit* |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage | | | 1200 | | | V |
| $I_{RM}$ | Maximum Reverse Leakage Current | $V_R$=1200V | $T_j$ = 25°C | | 32 | 200 | µA |
| | | | $T_j$ = 175°C | | 56 | 1000 | |
| $I_F$ | DC Forward Current | | Tc = 100°C | | 10 | | A |
| $V_F$ | Diode Forward Voltage | $I_F$ = 10A | $T_j$ = 25°C | | 1.6 | 1.8 | V |
| | | | $T_j$ = 175°C | | 2.3 | 3 | |
| $Q_C$ | Total Capacitive Charge | $I_F$ = 10A, $V_R$ = 600V<br>di/dt =500A/µs | | | 80 | | nC |
| C | Total Capacitance | f = 1MHz, $V_R$ = 200V | | | 96 | | pF |
| | | f = 1MHz, $V_R$ = 400V | | | 69 | | |

## Thermal and package characteristics

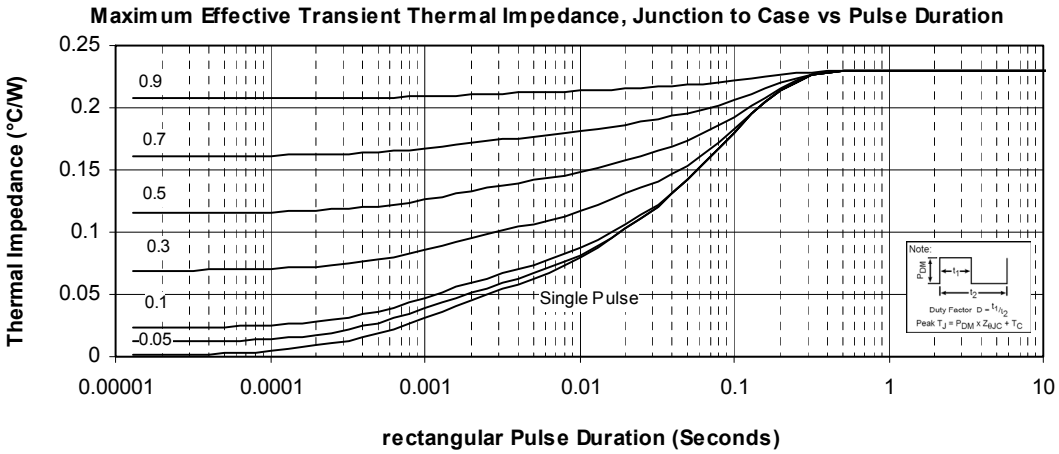
| *Symbol* | *Characteristic* | | *Min* | *Typ* | *Max* | *Unit* |
|---|---|---|---|---|---|---|
| $R_{thJC}$ | Junction to Case Thermal Resistance | Mosfet | | | 0.23 | °C/W |
| | | SiC Diode | | | 1.65 | |
| $R_{thJA}$ | Junction to Ambient (IGBT & Diode) | | | | 20 | |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz | | 2500 | | | V |
| $T_J$,$T_{STG}$ | Storage Temperature Range | | -40 | | 150 | °C |
| $T_L$ | Max Lead Temp for Soldering:0.063" from case for 10 sec | | | | 300 | |
| Torque | Mounting torque (Mounting = 8-32 or 4mm Machine and terminals = 4mm Machine) | | | | 1.5 | N.m |
| Wt | Package Weight | | | 29.2 | | g |

## SOT-227 (ISOTOP®) Package Outline

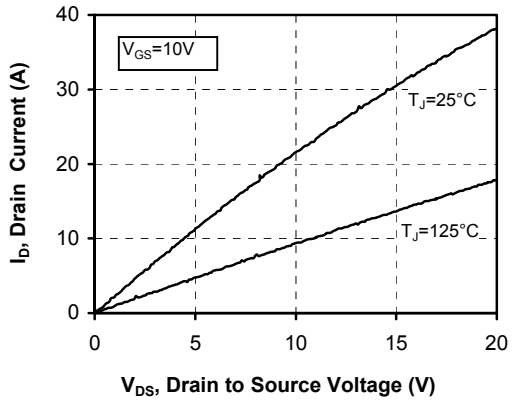



Dimensions in Millimeters and (Inches)

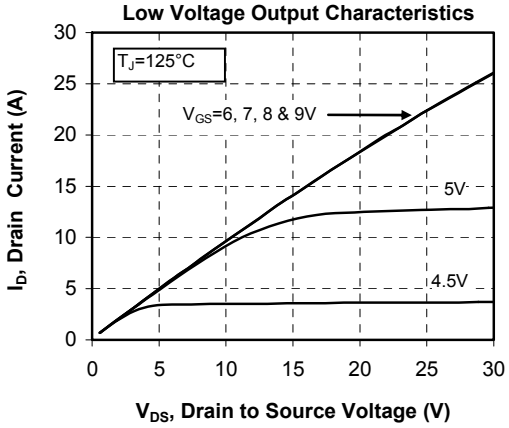
## Typical Mosfet Performance Curve



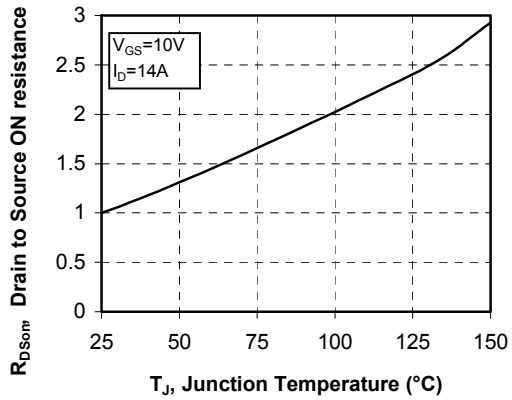
**Low Voltage Output Characteristics**



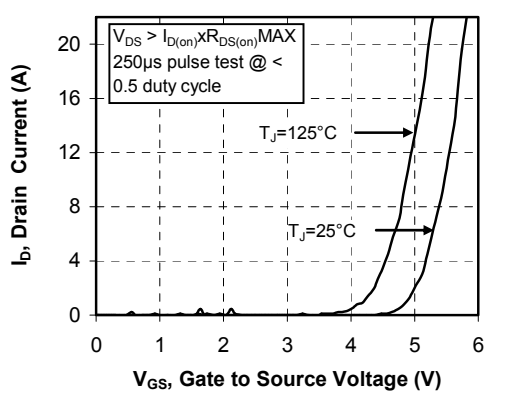

**Low Voltage Output Characteristics**



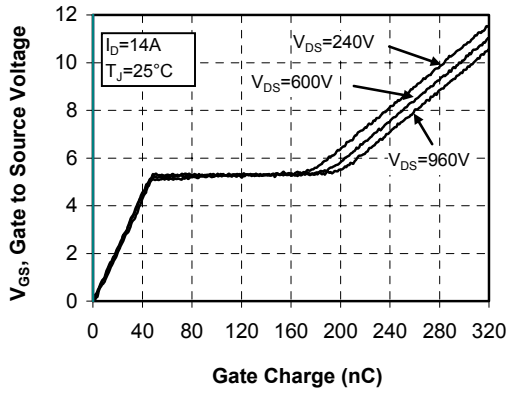

**Normalized $R_{DS(on)}$ vs. Temperature**



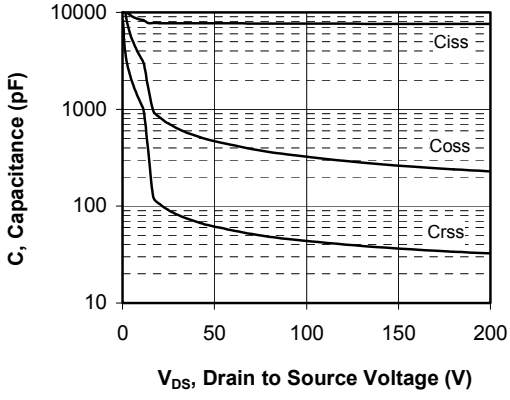

**Transfert Characteristics**



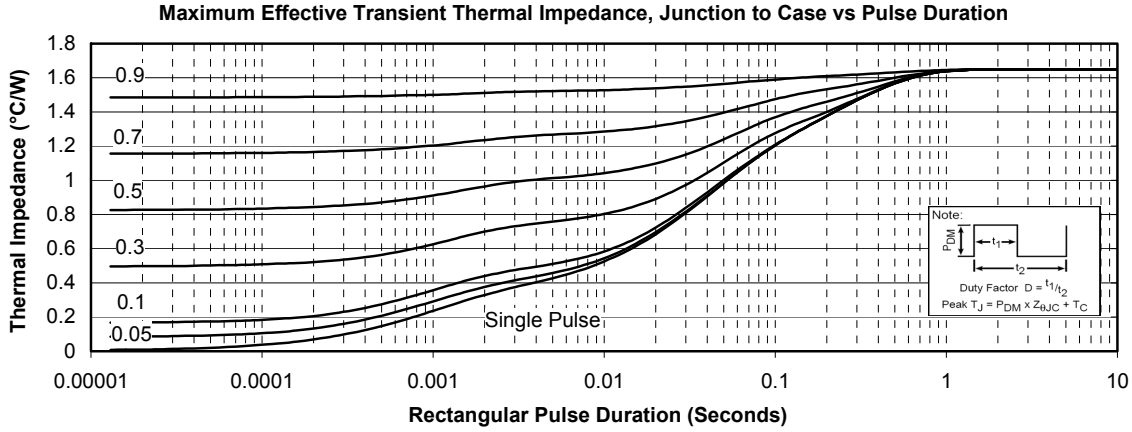

**Gate Charge vs Gate to Source**

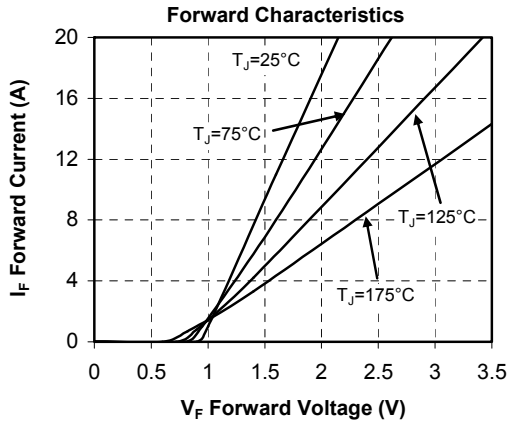


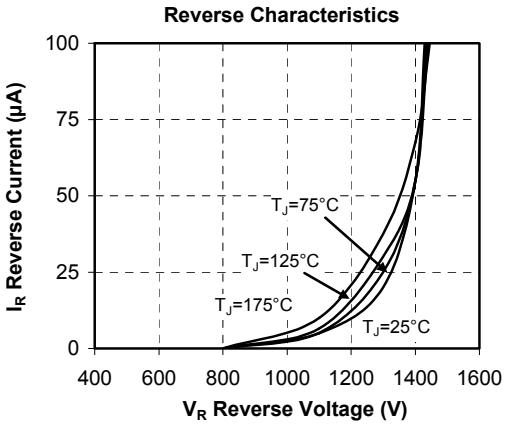

**Capacitance vs Drain to Source Voltage**

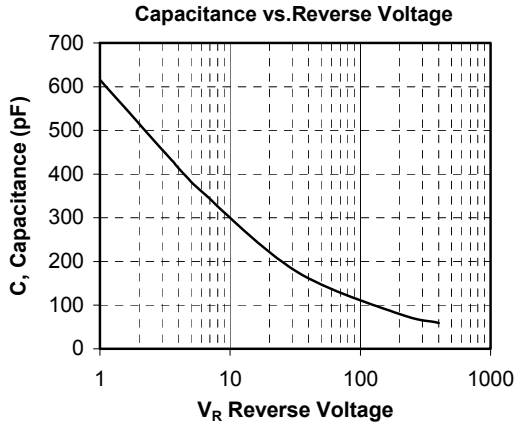


## Typical SiC Diode Performance Curve




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