Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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# Contact us

# APTM60A23UT1G

**Microsemi.**
POWER PRODUCTS GROUP

*Phase leg MOSFET Power Module*

$V_{DSS} = 600V$
$R_{DSon} = 230m\Omega$ typ @ Tj = 25°C
$I_D = 20A$ @ Tc = 25°C
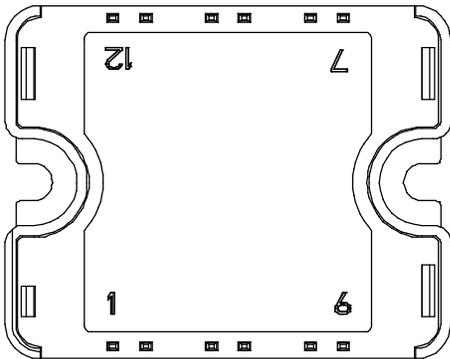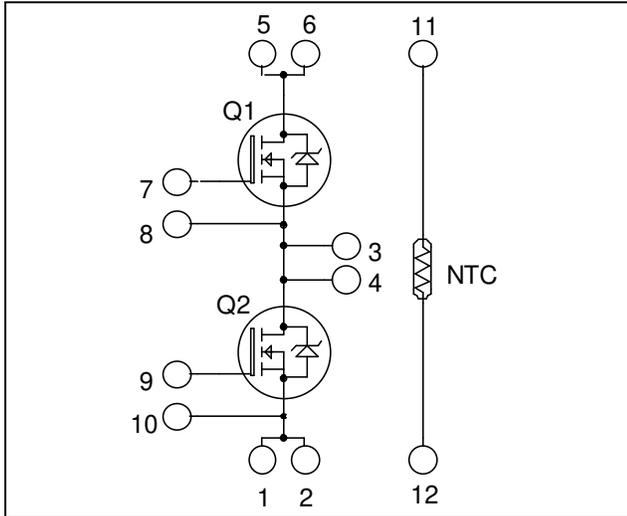


Pins 1/2 ; 3/4 ; 5/6 must be shorted together

## Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

## Features

- Power MOS 8™ Ultrafast FREDFETs
    - Low $R_{DSon}$
    - Low input and Miller capacitance
    - Low gate charge
    - Ultrafast intrinsic reverse diode
    - Avalanche energy rated
    - Very rugged
- Very low stray inductance
    - Symmetrical design
- Internal thermistor for temperature monitoring
- High level of integration

## Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS Compliant

## Absolute maximum ratings

| Symbol | Parameter | | Max ratings | Unit |
|--------|-----------|---|-------------|------|
| $V_{DSS}$ | Drain - Source Breakdown Voltage | | 600 | V |
| $I_D$ | Continuous Drain Current | $T_c = 25°C$ | 20 | A |
| | | $T_c = 80°C$ | 15 | |
| $I_{DM}$ | Pulsed Drain current | | 125 | |
| $V_{GS}$ | Gate - Source Voltage | | ±30 | V |
| $R_{DSon}$ | Drain - Source ON Resistance | | 276 | mΩ |
| $P_D$ | Maximum Power Dissipation | $T_c = 25°C$ | 208 | W |
| $I_{AR}$ | Avalanche current (repetitive and non repetitive) | | 17 | A |

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling 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 | $V_{DS} = 600V$ $V_{GS} = 0V$ | $T_j = 25°C$ | | | 250 | μA |
| | | | $T_j = 125°C$ | | | 1000 | |
| $R_{DS(on)}$ | Drain – Source on Resistance | $V_{GS} = 10V$, $I_D = 17A$ | | | 230 | 276 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}$, $I_D = 1mA$ | | 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 | $V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1MHz$ | | 5316 | | pF |
| $C_{oss}$ | Output Capacitance | | | 610 | | |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 56 | | |
| $Q_g$ | Total gate Charge | $V_{GS} = 10V$ $V_{Bus} = 300V$ $I_D = 17A$ | | 165 | | nC |
| $Q_{gs}$ | Gate – Source Charge | | | 36 | | |
| $Q_{gd}$ | Gate – Drain Charge | | | 70 | | |
| $T_{d(on)}$ | Turn-on Delay Time | **Resistive switching @ 25°C** $V_{GS} = 15V$ $V_{Bus} = 400V$ $I_D = 17A$ $R_G = 4.7Ω$ | | 37 | | ns |
| $T_r$ | Rise Time | | | 43 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 115 | | |
| $T_f$ | Fall Time | | | 34 | | |

### Source - Drain diode ratings and characteristics

| Symbol | Characteristic | Test Conditions | | Min | Typ | Max | Unit |
|--------|----------------|-----------------|---|-----|-----|-----|------|
| $I_S$ | Continuous Source current (Body diode) | | $Tc = 25°C$ | | | 20 | A |
| | | | $Tc = 80°C$ | | | 15 | |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS} = 0V$, $I_S = -17A$ | | | | 1 | V |
| dv/dt | Peak Diode Recovery ❶ | | | | | 30 | V/ns |
| $t_{rr}$ | Reverse Recovery Time | $I_S = -17A$ $V_R = 100V$ $di_S/dt = 100A/μs$ | $T_j = 25°C$ | | | 200 | ns |
| | | | $T_j = 125°C$ | | | 370 | |
| $Q_{rr}$ | Reverse Recovery Charge | | $T_j = 25°C$ | | 0.76 | | μC |
| | | | $T_j = 125°C$ | | 1.91 | | |

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.

$I_S \leq -17A$      $di/dt \leq 1000A/μs$      $V_{DD} \leq 400V$      $T_j \leq 125°C$

## Thermal and package characteristics

| Symbol | Characteristic | | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 0.6 | °C/W |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz | | | 2500 | | | V |
| $T_J$ | Operating junction temperature range | | | -40 | | 150 | |
| $T_{STG}$ | Storage Temperature Range | | | -40 | | 125 | °C |
| $T_C$ | Operating Case Temperature | | | -40 | | 100 | |
| Torque | Mounting torque | To heatsink | M4 | 2.5 | | 4.7 | N.m |
| Wt | Package Weight | | | | | 80 | g |

## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

| Symbol | Characteristic | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $R_{25}$ | Resistance @ 25°C | | 50 | | kΩ |
| $B_{25/85}$ | $T_{25}$ = 298.15 K | | 3952 | | K |

$$R_T = \frac{R_{25}}{\exp\left[ B_{25/85}\left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

T: Thermistor temperature
$R_T$: Thermistor value at T

## SP1 Package outline (dimensions in mm)
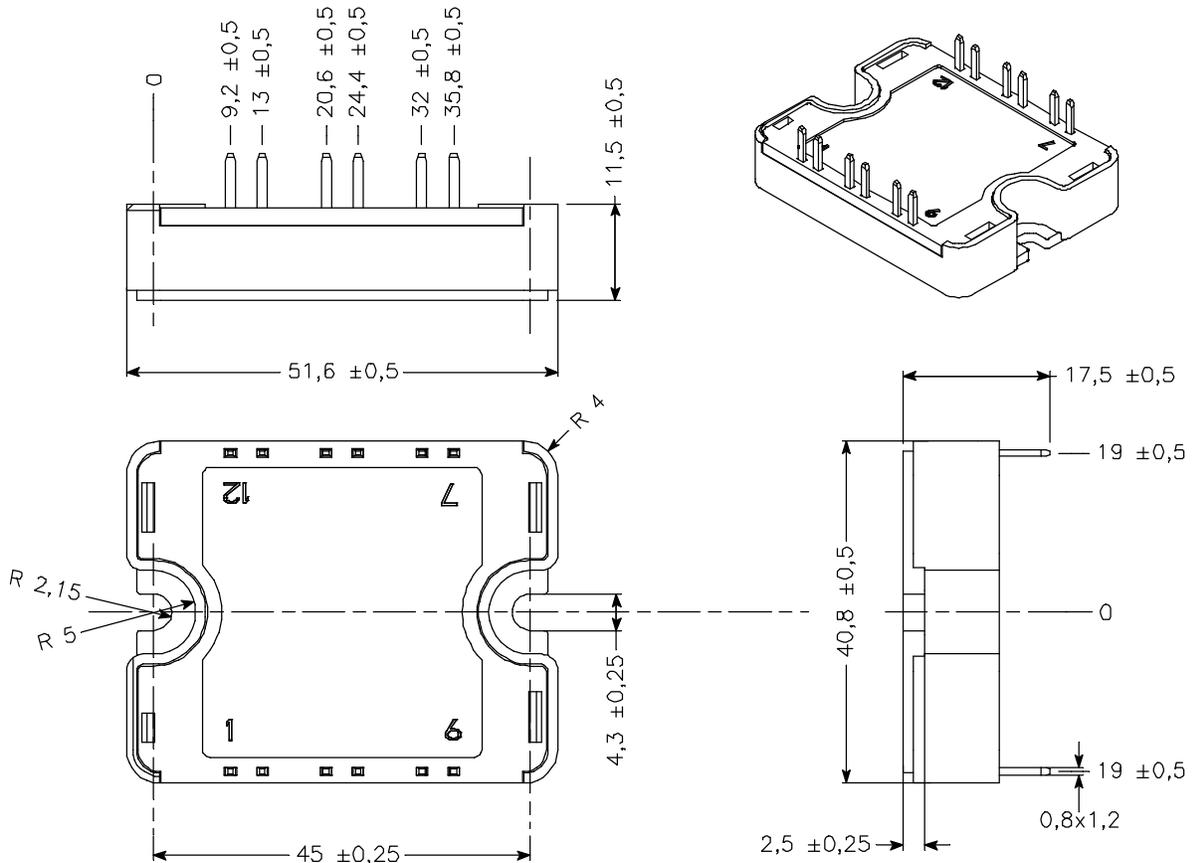


See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

## Typical Performance Curve

**Low Voltage Output Characteristics**



**Low Voltage Output Characteristics**



**Normalized R$_{DSon}$ vs. Temperature**



**Transfert Characteristics**



**Gate Charge vs Gate to Source**



**Capacitance vs Drain to Source Voltage**
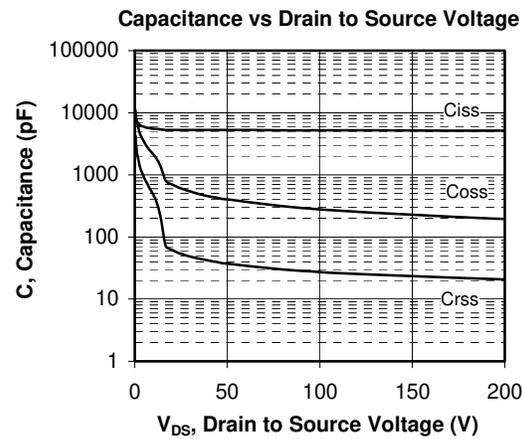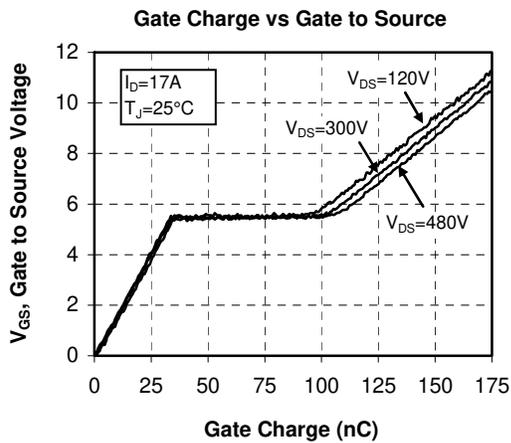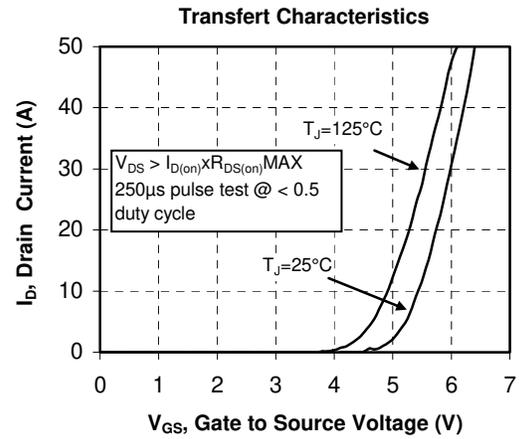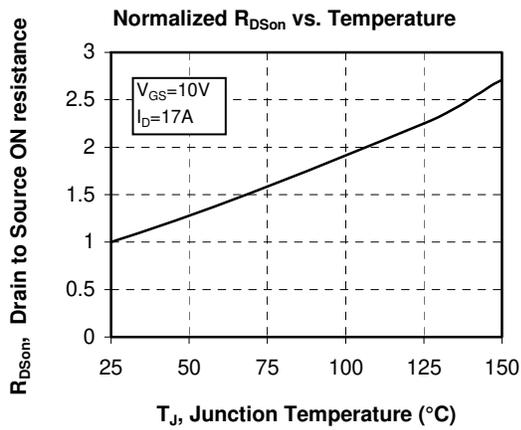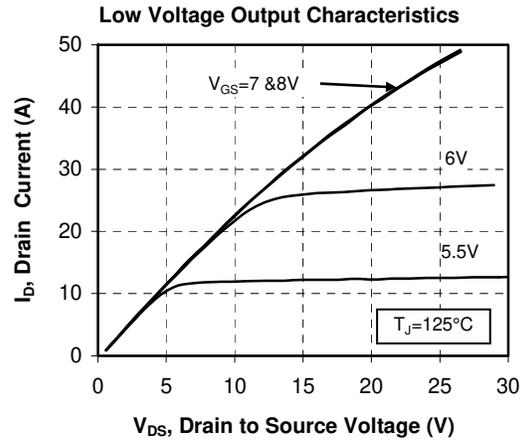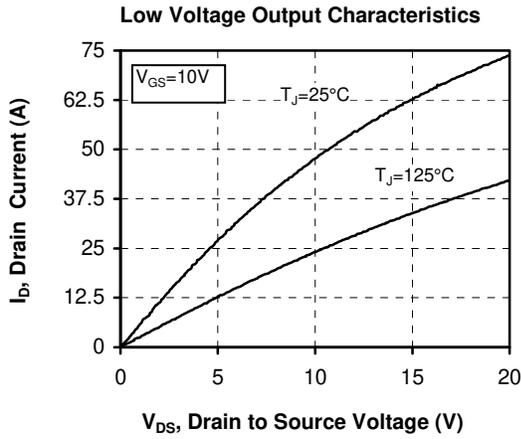
**Drain Current vs Source to Drain Voltage**
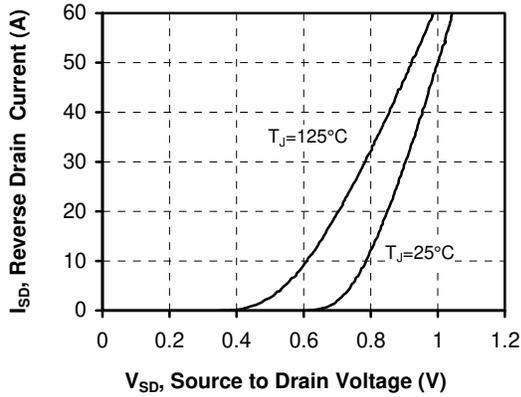


**Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration**