# AT80R420CF

## 800V Super Junction Power MOSFET

## Features

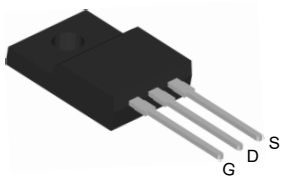
- Low drain-source on-resistance:$R_{DS(ON)}$=0.37Ω(typ)
- Easy to control gate switching
- Enhancement mode: $V_{th}$ = 2.5 to 4.5V
- 100% avalanche tested
- RoHS compliant

## Key Performance Parameters

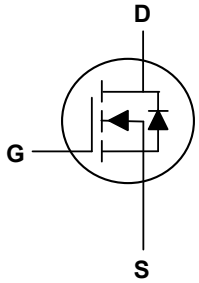
| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ @ $T_{j,max}$ | 800 | V |
| $R_{DS(ON),max}$ | 420 | mΩ |
| $I_D$ | 14 | A |
| $Q_{g,typ}$ | 26 | nC |
| $I_{DM}$ | 42 | A |

## Applications

- Switch Mode Power Supply (SMPS)
- TV power & LED Lighting Power
- AC to DC Converters
- Telecom




**TO-220F Top View**




## Absolute Maximum Ratings($T_C$=25℃, unless otherwise noted)

| Parameter | Symbol | Rating | Units |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 800 | V |
| Gate-Source Voltage | $V_{GS}$ | ±30 | V |
| Continuous Drain Current[1] | $I_D$@$T_C$=25℃ | 14 | A |
| Continuous Drain Current[1] | $I_D$@$T_C$=100℃ | 8.9 | A |
| Pulsed Drain Current[2] | $I_{DM}$ | 42 | A |
| Single Pulse Avalanche Energy[3] | $E_{AS}$ | 184 | mJ |
| Total Power Dissipation[4] | $P_D$ | 31 | W |
| Storage Temperature Range | $T_{STG}$ | -55 to 150 | ℃ |
| Operating Junction Temperature Range | $T_J$ | -55 to 150 | ℃ |

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance Junction-Ambient (Max) | $R_{\theta JA}$ | 80 | ℃/W |
| Thermal Resistance Junction-Case (Max) | $R_{\theta JC}$ | 4 | ℃/W |

## Electrical Characteristics ($T_J$=25℃, unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V , $I_D$=250uA | 800 | --- | --- | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V , $I_D$=7A | --- | 370 | 420 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 2.5 | --- | 4.5 | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=800V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±30V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| Gate Resistance | $R_g$ | f=1MHz | --- | 25 | --- | Ω |
| Total Gate Charge | $Q_g$ | $V_{DS}$=640V , $V_{GS}$=10V , $I_D$=14A | --- | 26 | --- | nC |
| Gate-Source Charge | $Q_{gs}$ | | --- | 6.9 | --- | |
| Gate-Drain Charge | $Q_{gd}$ | | --- | 9.3 | --- | |
| Turn-On Delay Time | $T_{d(on)}$ | $V_{DS}$=400V , $V_{GS}$=10V , $R_G$=25Ω, $I_D$=14A | --- | 24 | --- | ns |
| Rise Time | $T_r$ | | --- | 42 | --- | |
| Turn-Off Delay Time | $T_{d(off)}$ | | --- | 137 | --- | |
| Fall Time | $T_f$ | | --- | 22 | --- | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=100V , $V_{GS}$=0V , f=1MHz | --- | 952 | --- | pF |
| Output Capacitance | $C_{oss}$ | | --- | 40 | --- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | --- | 1.5 | --- | |

## Drain-Source Diode Characteristics

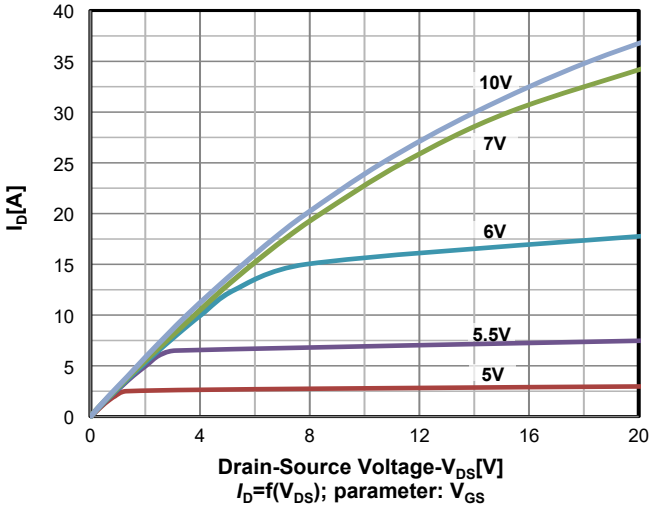
| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Continuous Source Current | $I_S$ | $T_C$=25℃ | --- | --- | 14 | A |
| Pulsed Source Current | $I_{SM}$ | | --- | --- | 42 | A |
| Diode Forward Voltage | $V_{SD}$ | $V_G$=0V , $I_S$=14A ,$T_J$=25℃ | --- | 0.9 | 1.4 | V |
| Reverse Recovery Time | $t_{rr}$ | $V_{DD}$=400V, $I_S$=14A, $di_F/dt$=100A/μs | --- | 430 | --- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | --- | 6.9 | --- | uC |
| Peak Reverse Recovery Current | $I_{rrm}$ | | --- | 29 | --- | A |

**Note:**

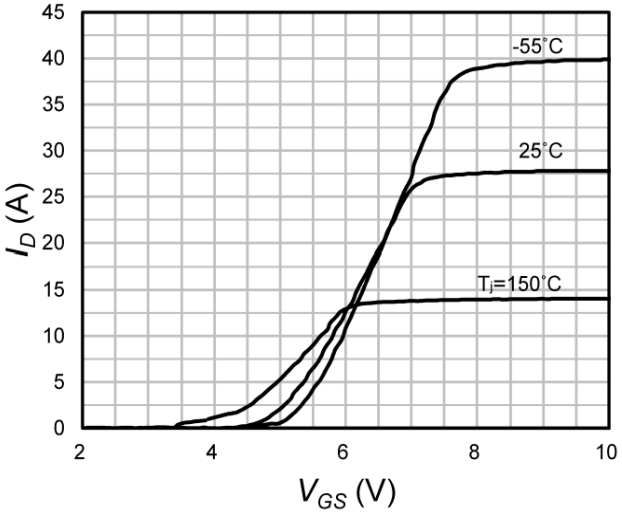
1. Limited by $T_{j,max.}$ Maximum Duty Cycle D = 0.50
2. Pulse width $t_p$ limited by $T_{j,max}$
3. Identical low side and high side switch with identical $R_G$
4. $V_{DD}$=50V,$I_{AS}$=Id,L=30mH, Starting $T_J$=25℃

## Typical Characteristics

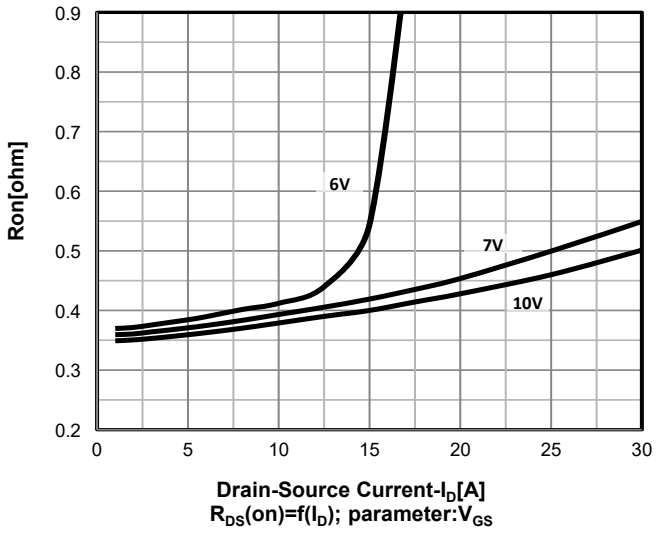
Typ. output characteristics $T_j$=25 ℃



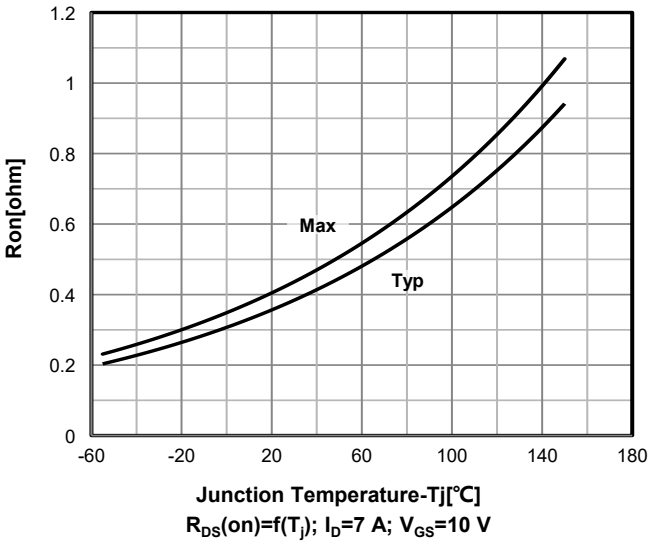

Transfer characteristics



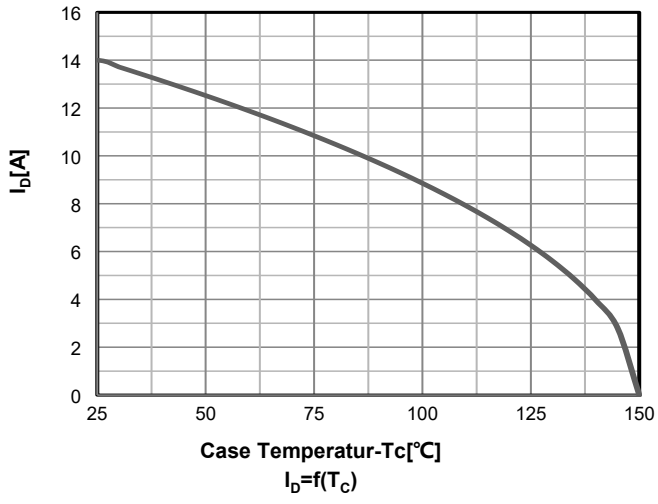

Typ. drain-source on-state resistance



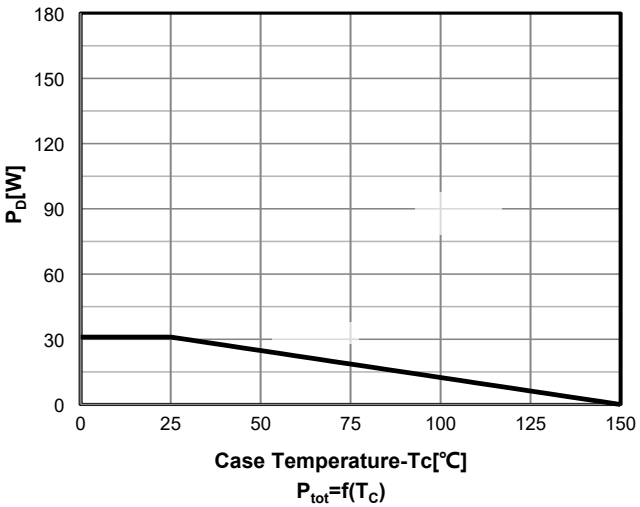

On-resistance vs temperature



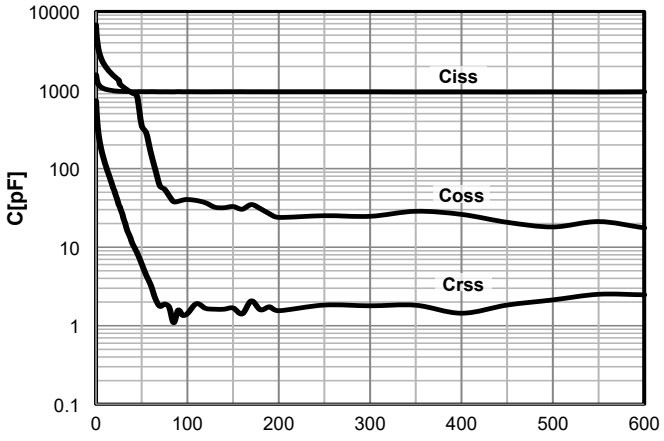

Drain current vs temperature




Power dissipation

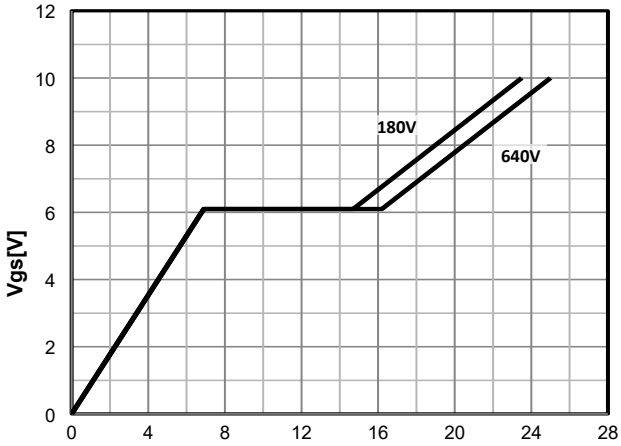


## Typ. capacitances



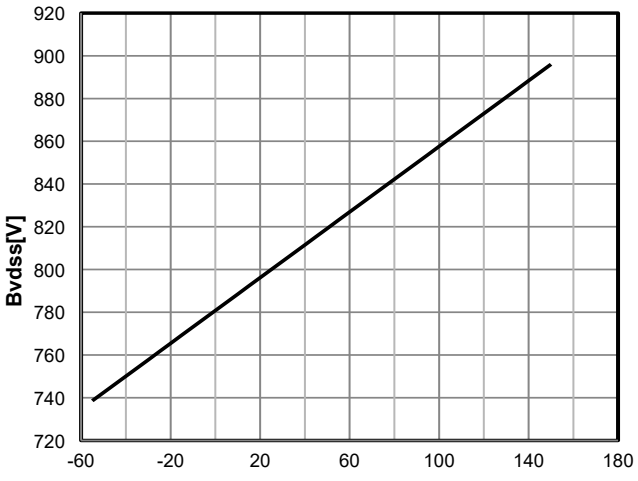

Drain-Source Voltage-$V_{DS}$[V]
C=f($V_{DS}$); $V_{GS}$=0 V

## Typ. gate charge characteristics



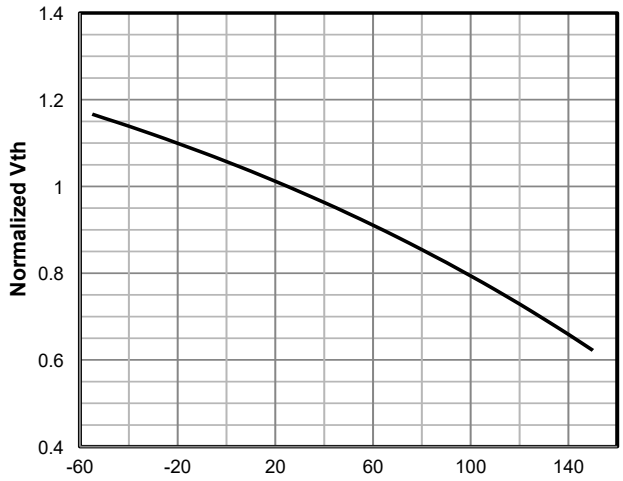

Total Gate Charge-Qg[nC]
$V_{GS}$=f($Q_g$), $I_D$=14 A pulsed

## Drain-source breakdown voltage



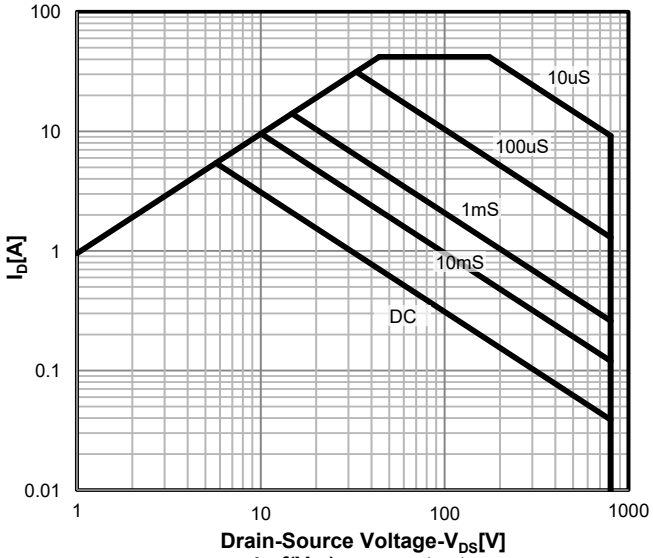

Junction Temperature-Tj[℃]
$V_{BR(DSS)}$=f($T_j$); $I_D$=1.0 mA

## Normalized $V_{GS(th)}$ characteristics



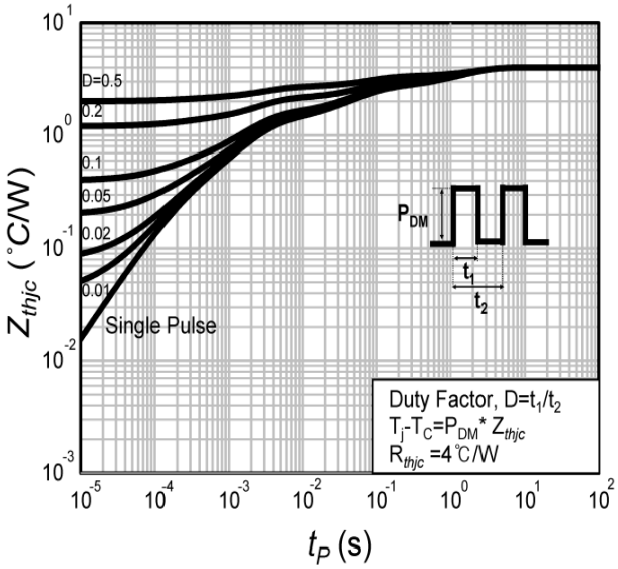

Junction Temperature-Tj[℃]

## Safe operating area TC=25 ℃

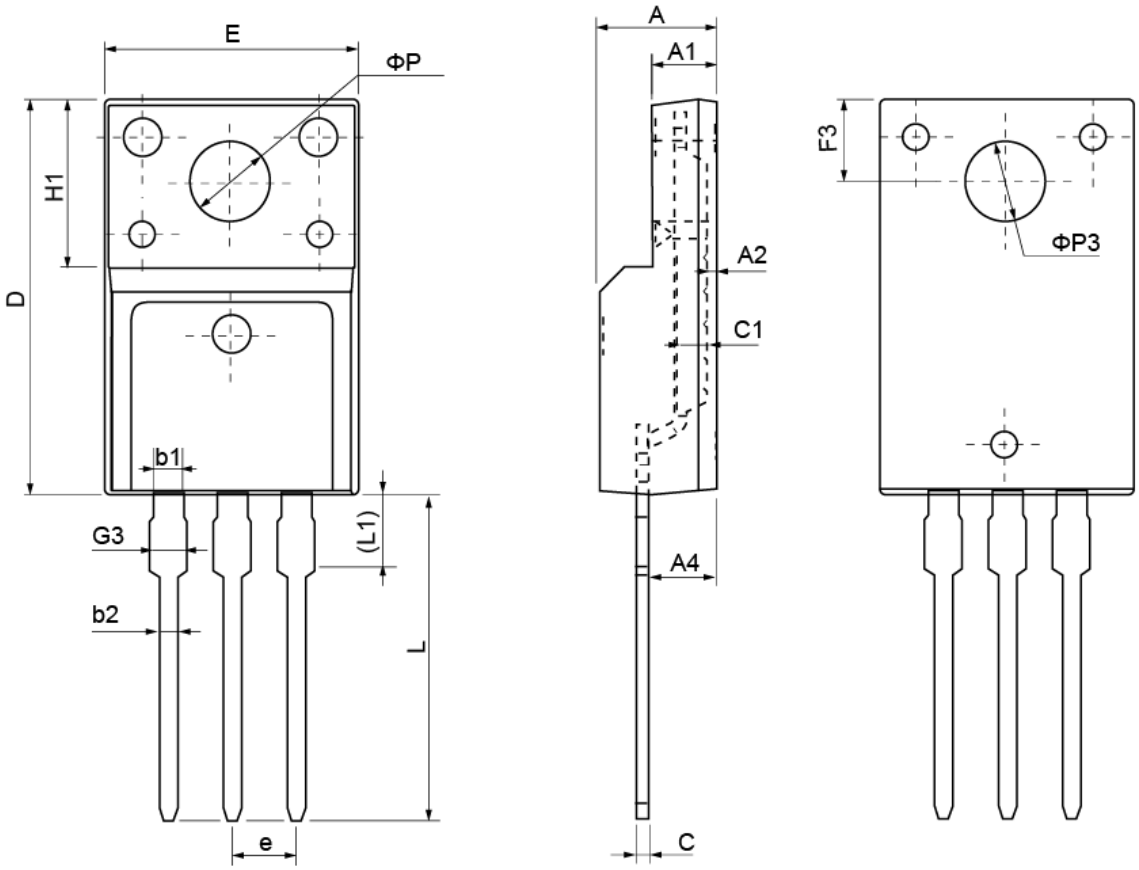



Drain-Source Voltage-$V_{DS}$[V]
$I_D$=f($V_{DS}$); parameter $t_p$

## Max. transient thermal impedance



## TO-220F Package Outline Dimensions




| Symbol | Dimensions (unit:mm) | | | Symbol | Dimensions (unit:mm) | | |
|---|---|---|---|---|---|---|---|
| | Min | Typ | Max | | Min | Typ | Max |
| **A** | 4.40 | 4.70 | 5.00 | **H1** | 6.70 REF | | |
| **A1** | 2.30 | 2.55 | 2.80 | **L** | 12.30 | 12.98 | 13.30 |
| **A2** | 0.30 | 0.50 | 0.70 | **L1** | 2.95 | 3.10 | 3.50 |
| **A4** | 2.45 | 2.80 | 3.05 | **ϕP** | 3.03 | 3.20 | 3.50 |
| **c** | 0.30 | 0.50 | 0.70 | **ϕP3** | 3.15 | 3.45 | 3.65 |
| **c1** | 1.20 | 1.30 | 1.40 | **b1** | 1.10 | 1.30 | 1.45 |
| **D** | 15.40 | 15.90 | 16.40 | **b2** | 0.60 | 0.80 | 1.00 |
| **E** | 9.86 | 10.16 | 10.46 | **F3** | 3.05 | 3.30 | 3.55 |
| **e** | 2.54 BSC | | | **G3** | 1.15 | 1.35 | 1.55 |