# AT65R380KC

## 650V Super Junction Power MOSFET

## Features

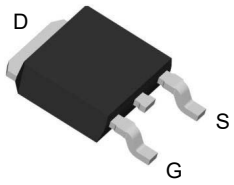
- Low drain-source on-resistance:$R_{DS(ON)}$=0.34Ωtyp)
- Easy to control gate switching
- Enhancement mode: $V_{th}$ = 2 to 4V
- 100% avalanche tested
- RoHS compliant

## Key Performance Parameters

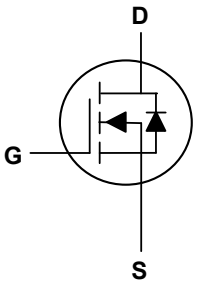
| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ @ $T_{j,max}$ | 650 | V |
| $R_{DS(ON),max}$ | 380 | mΩ |
| $I_D$ | 13 | A |
| $Q_{g,typ}$ | 19.5 | nC |
| $I_{DM}$ | 45 | A |

## Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- Charger,Lighting




**TO-252 Top View**




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

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 650 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | V |
| Continuous Drain Current[1] | $T_C$=25℃ | $I_D$ | 13 | A |
| Continuous Drain Current[1] | $T_C$=125℃ | $I_D$ | 8.2 | A |
| Pulsed Drain Current[2] | | $I_{DM}$ | 45 | A |
| Single Pulse Avalanche Energy[4] | | $E_{AS}$ | 163 | mJ |
| Avalanche Current | | $I_{AS}$ | 3.3 | A |
| MOSFET dv/dt ruggedness, $V_{DS}$ = 0...400V | | dv/dt | 50 | V/ns |
| Reverse diode dv/dt[3] $V_{DS}$=0...400V, $I_{SD}$≤$I_D$ | | | 15 | |
| Total Power Dissipation （$T_C$=25℃） | | $P_D$ | 105 | 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 | $R_{\theta JA}$ | 62 | ℃/W |
| Thermal Resistance Junction-Case | $R_{\theta JC}$ | 1.2 | ℃/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 | 650 | --- | --- | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V , $I_D$=6.5A | --- | 340 | 380 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 2 | --- | 4 | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=650V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=650V, $V_{GS}$=0V, $T_J$=125℃ | --- | --- | 100 | uA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±30V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| Total Gate Charge | $Q_g$ | $V_{DD}$=400V , $V_{GS}$=10V , $I_D$=6.5A | --- | 19.5 | --- | nC |
| Gate-Source Charge | $Q_{gs}$ | | --- | 3.9 | --- | |
| Gate-Drain Charge | $Q_{gd}$ | | --- | 7.5 | --- | |
| Turn-On Delay Time | $T_{d(on)}$ | $V_{DD}$=400V , $V_{GS}$=10V , $I_D$=6.5A | --- | 11.5 | --- | ns |
| Rise Time | $T_r$ | | --- | 23.5 | --- | |
| Turn-Off Delay Time | $T_{d(off)}$ | | --- | 43 | --- | |
| Fall Time | $T_f$ | | --- | 21.5 | --- | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=100V , $V_{GS}$=0V , f=1MHz | --- | 810 | --- | pF |
| Output Capacitance | $C_{oss}$ | | --- | 30 | --- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | --- | 0.8 | --- | |

## Drain-Source Diode Characteristics

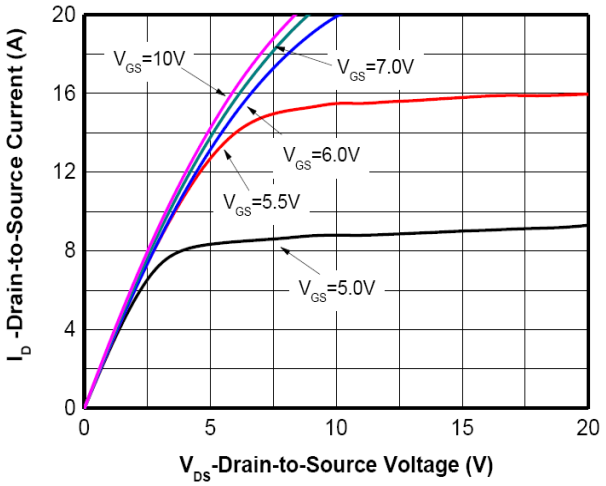
| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Continuous Source Current | $I_S$ | $T_C$=25℃ | --- | --- | 13 | A |
| Pulsed Source Current | $I_{SM}$ | | --- | --- | 45 | A |
| Diode Forward Voltage | $V_{SD}$ | $V_G$=0V , $I_S$=13A ,$T_J$=25℃ | --- | 0.9 | 1.4 | V |
| Reverse Recovery Time | $t_{rr}$ | $V_{DD}$=400V, $I_S$=6.5A, $di_F/dt$=100A/μs | --- | 250 | --- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | --- | 1.8 | --- | uC |
| Peak Reverse Recovery Current | $I_{rrm}$ | | --- | 14.9 | --- | A |

**Note:**

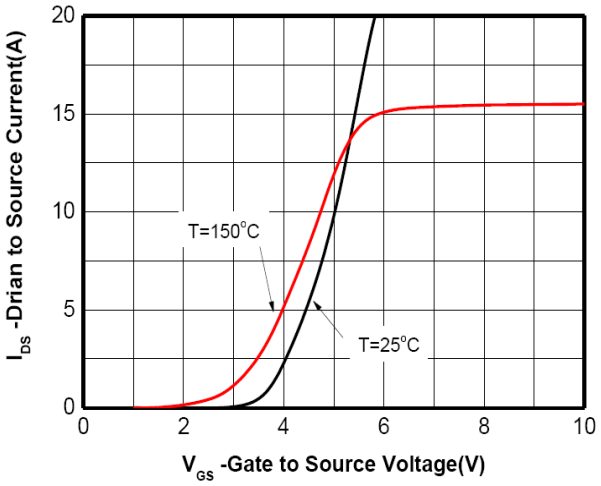
1. Limited by $T_{j,max.}$ Maximum Duty Cycle D = 0.50
2. Pulse width $t_p$ limited by $T_{j,max}$
3. Identical low side and high side switch with identical $R_G$
4. $V_{DD}$=50V,$R_G$=25Ω

## Typical Characteristics

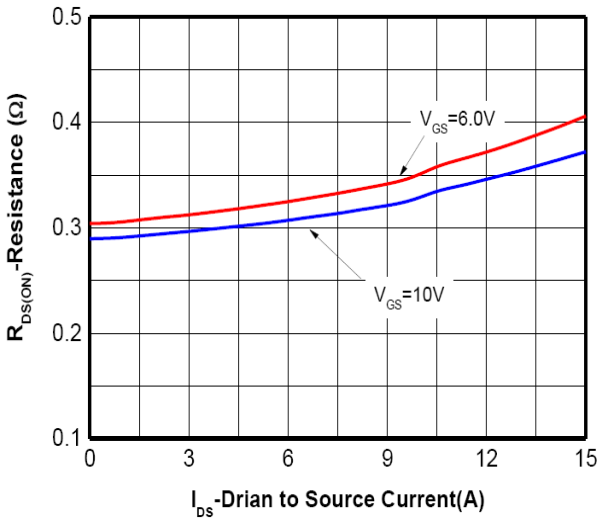
Typ. output characteristics $T_j$=25 ℃



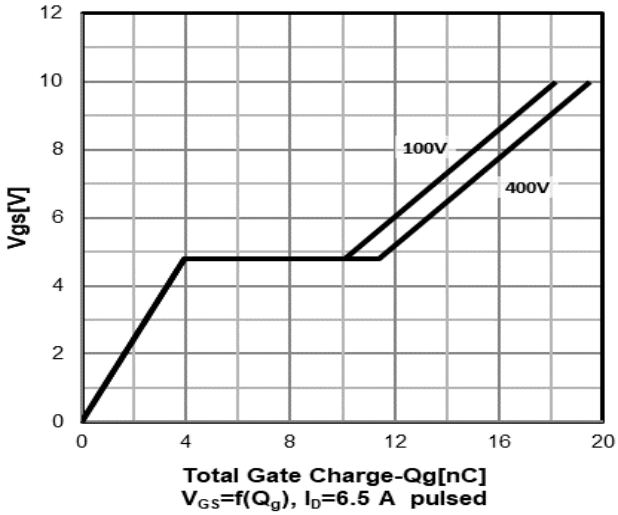

Typ. transfer characteristics



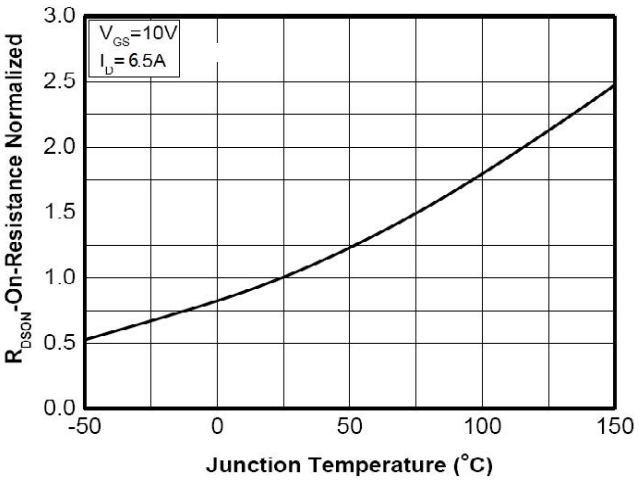

Typ. drain-source on-state resistance



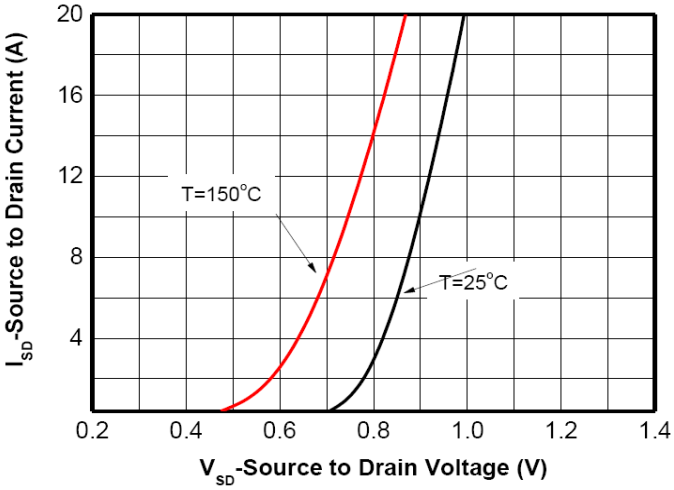

Typ. gate charge characteristics



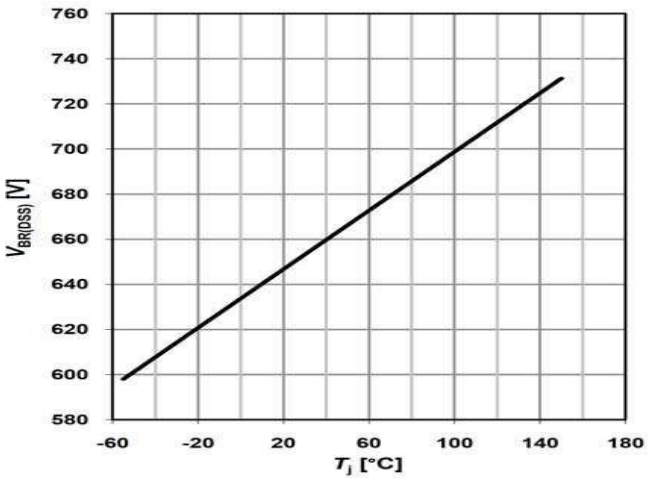

Normalized on resistance vs temperature



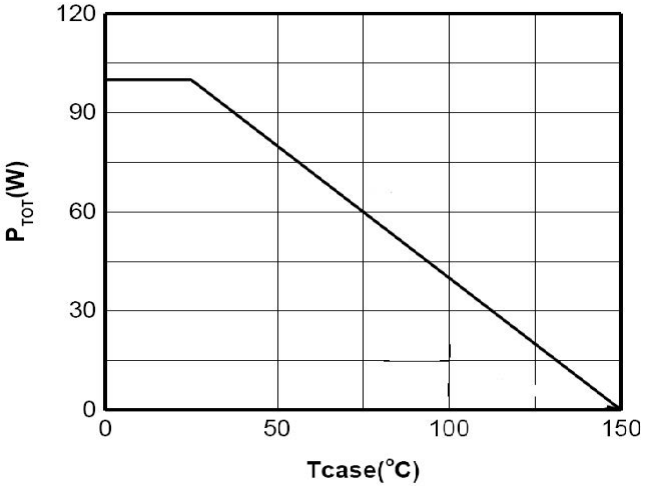

Forward characteristics of reverse diode



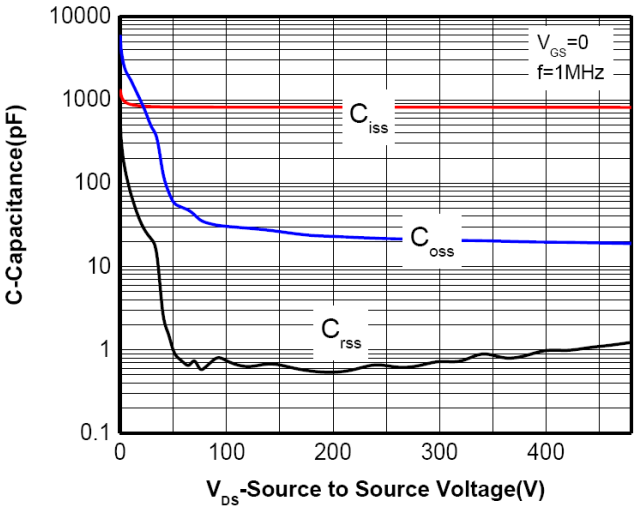
Drain-source breakdown voltage



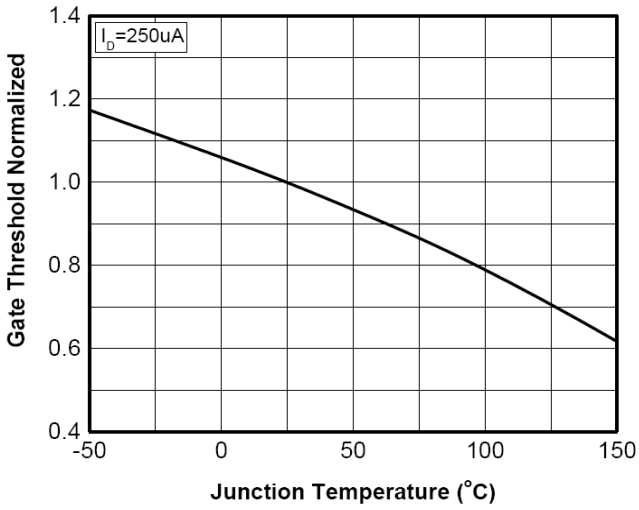

Power dissipation



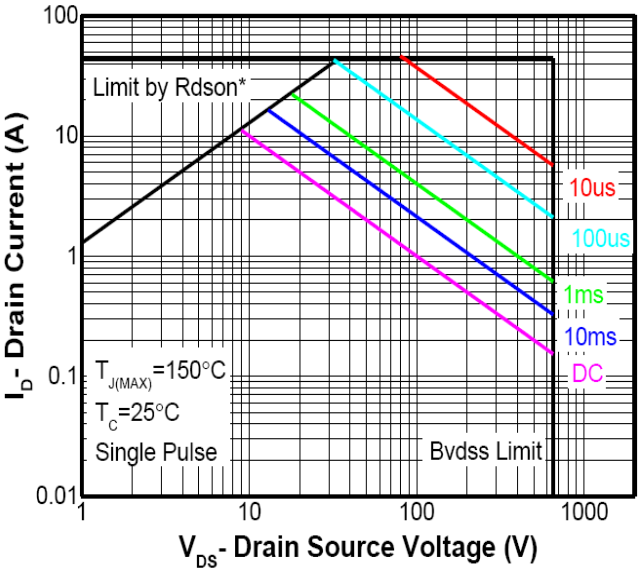

Typ. capacitances



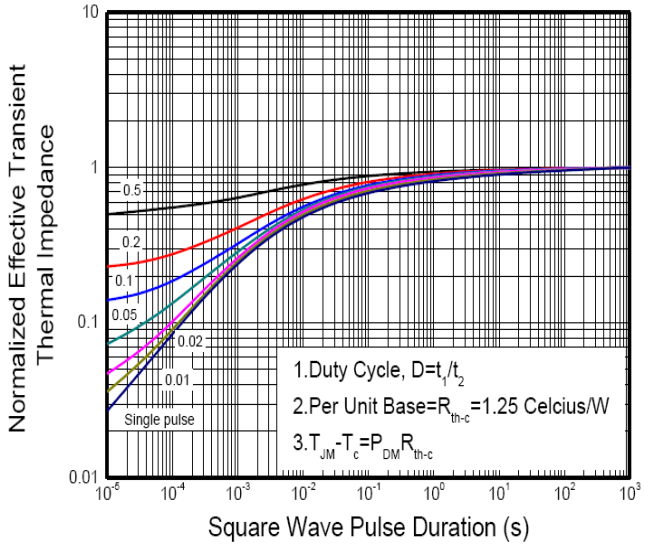

Normalized $V_{GS(th)}$ characteristics



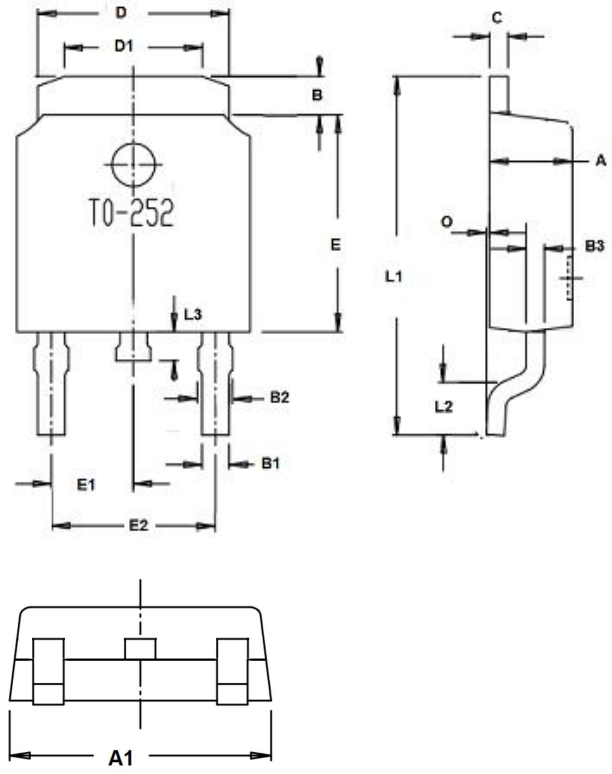

Safe operating area TC=25 ℃




Max. transient thermal impedance



## TO-252 Package Outline Dimensions




| Dim. | Min. | Max. |
|---|---|---|
| A | 2.1 | 2.5 |
| A1 | 6.3 | 6.9 |
| B | 0.96 | 1.42 |
| B1 | 0.74 | 0.86 |
| B2 | 0.74 | 0.94 |
| C | Typ0.5 | |
| D | 5.33 | 5.53 |
| D1 | 3.65 | 4.05 |
| E | 6.0 | 6.2 |
| E1 | Typ2.29 | |
| E2 | Typ4.58 | |
| O | 0 | 0.15 |
| L1 | 9.9 | 10.5 |
| L2 | Typ1.65 | |
| L3 | 0.6 | 1.0 |
| All Dimensions in millimeter | | |