

Features

- Fast switching
- Low Gate Charge
- Improved dv/dt capability
- 100% avalanche tested
- Green Device Available

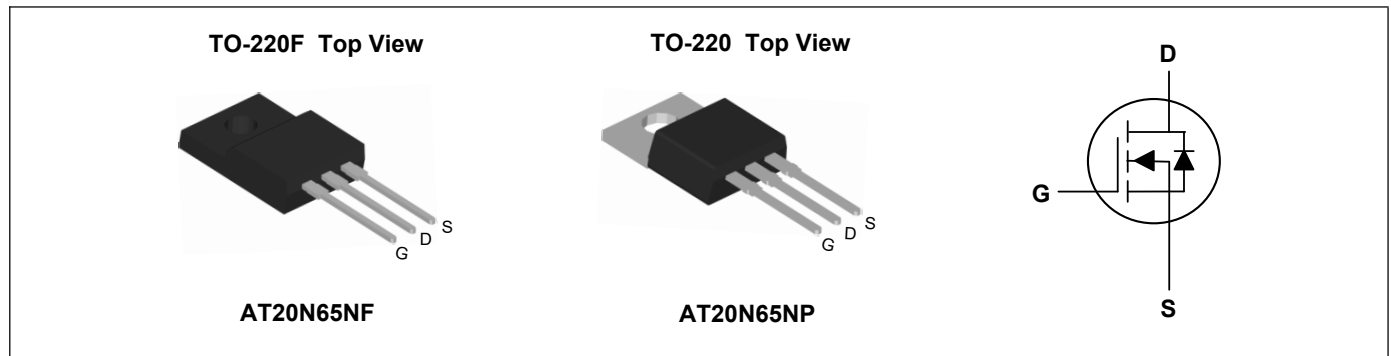
Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- AC to DC Converters

Product Summary



| | | |
|---------------------------------|------|----------|
| V_{DS} | 650 | V |
| I_D | 20 | A |
| $R_{DS(ON)}$ (at $V_{GS}=10V$) | 0.45 | Ω |



Absolute Maximum Ratings ($T_C=25^\circ C$, unless otherwise noted)

| Parameter | Symbol | Rating | | Units |
|--|-----------|------------|--------|------------|
| | | TO-220F | TO-220 | |
| Drain-Source Voltage | V_{DS} | 650 | | V |
| Gate-Source Voltage | V_{GS} | ± 30 | | V |
| Continuous Drain Current | I_D | 20 | | A |
| Pulsed Drain Current ² | I_{DM} | 80 | | A |
| Single Pulse Avalanche Energy ³ | E_{AS} | 1500 | | mJ |
| Avalanche Current | I_{AS} | 17 | | A |
| Repetitive Avalanche Energy | E_{AR} | 90 | | mJ |
| Total Power Dissipation ⁴ | P_D | 120 | 416 | W |
| Storage Temperature Range | T_{STG} | -55 to 150 | | $^\circ C$ |
| Operating Junction Temperature Range | T_J | -55 to 150 | | $^\circ C$ |

Thermal Characteristics

| Parameter | Symbol | TO-220F | TO-220 | Unit |
|--|-----------------|---------|--------|--------------|
| Thermal Resistance Junction-Ambient ¹ (Max) | $R_{\theta JA}$ | 62.5 | 60 | $^\circ C/W$ |
| Thermal Resistance Junction-Case ¹ (Max) | $R_{\theta JC}$ | 1.04 | 0.3 | $^\circ C/W$ |

Electrical Characteristics (T_J=25°C, 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 ² | R _{DS(ON)} | V _{GS} =10V, I _D =10A | --- | 0.36 | 0.45 | Ω |
| Gate Threshold Voltage | V _{GS(th)} | V _{GS} =V _{DS} , I _D =250uA | 2 | --- | 5 | V |
| Drain-Source Leakage Current | I _{DSS} | V _{DS} =650V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| Gate-Source Leakage Current | I _{GSS} | V _{GS} =±30V, V _{DS} =0V | --- | --- | ±100 | nA |
| Total Gate Charge | Q _g | V _{DD} =520V, V _{GS} =10V, I _D =20A | --- | 62 | --- | nC |
| Gate-Source Charge | Q _{gs} | | --- | 14 | --- | |
| Gate-Drain Charge | Q _{gd} | | --- | 23 | --- | |
| Turn-On Delay Time | T _{d(on)} | V _{DD} =325V, R _G =25Ω, I _D =20A | --- | 37 | --- | ns |
| Rise Time | T _r | | --- | 66 | --- | |
| Turn-Off Delay Time | T _{d(off)} | | --- | 175 | --- | |
| Fall Time | T _f | | --- | 84 | --- | |
| Input Capacitance | C _{iss} | V _{DS} =25V, V _{GS} =0V, f=1MHz | --- | 3000 | --- | pF |
| Output Capacitance | C _{oss} | | --- | 250 | --- | |
| Reverse Transfer Capacitance | C _{rss} | | --- | 20 | --- | |

Drain-Source Diode Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|-----------------|--|-----|-----|-----|------|
| Continuous Source Current ¹ | I _S | T _C =25°C | --- | --- | 20 | A |
| Pulsed Source Current ² | I _{SM} | | --- | --- | 80 | A |
| Diode Forward Voltage ² | V _{SD} | V _{GS} =0V, I _S =10A, T _J =25°C | --- | --- | 1.4 | V |
| Reverse Recovery Time | t _{rr} | V _R =400V, I _F =20A, di _F /dt=100A/μs | --- | 450 | --- | ns |
| Reverse Recovery Charge | Q _{rr} | | --- | 7.1 | --- | uC |

Note:

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The EAS data shows Max. rating. The test condition is V_{DD}=50V, V_{GS}=10V, I_{AS}=17A
- 4.The power dissipation is limited by 150°C junction temperature

Typical Characteristics

Figure 1. Output Characteristics

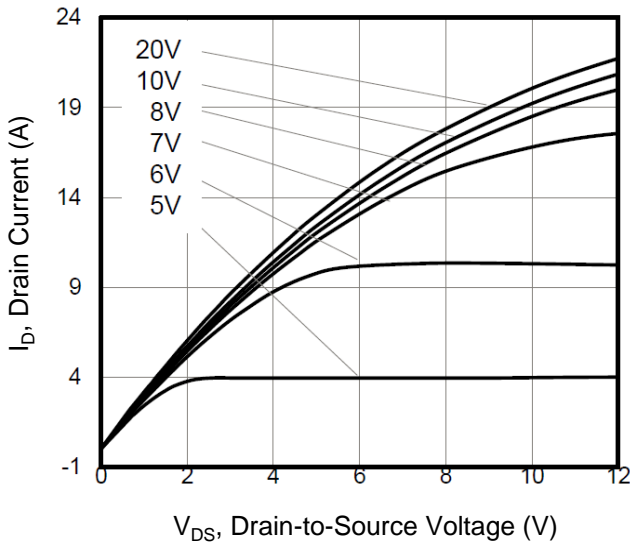


Figure 2. Transfer Characteristics

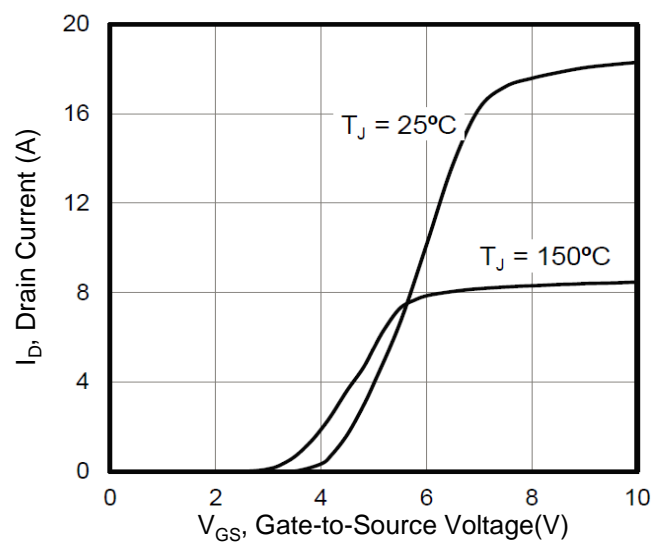


Figure 3. BV_{DSS} vs. Temperature

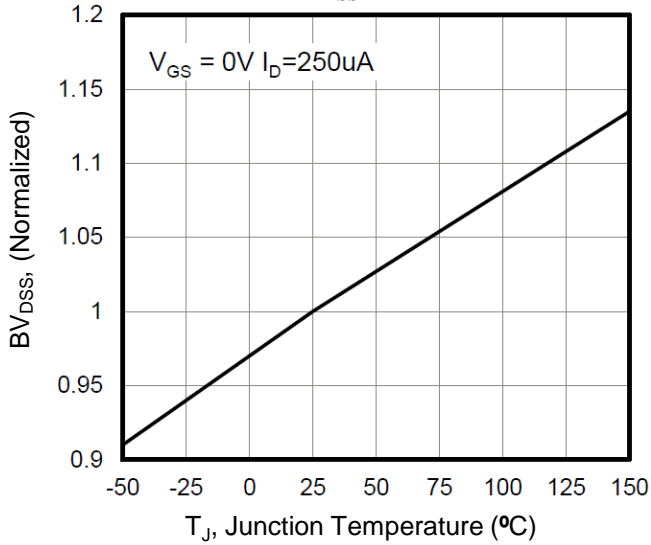


Figure 4. On-Resistance vs. Temperature

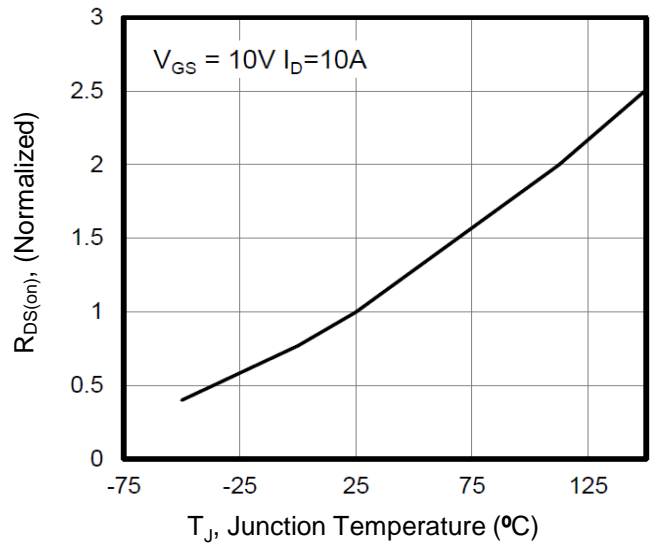


Figure 5. Gate Charge

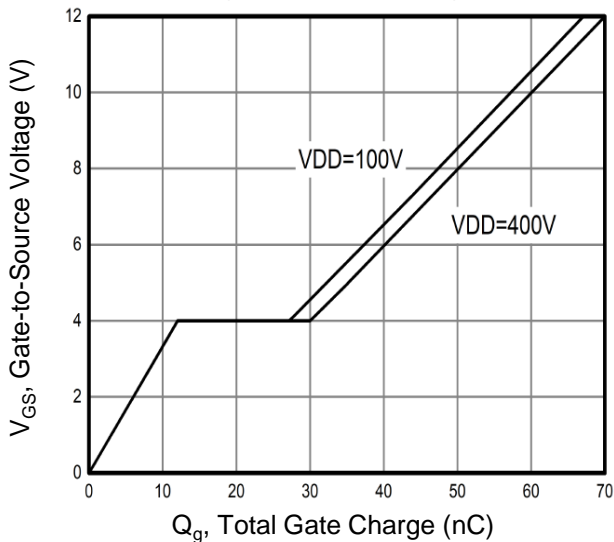


Figure 6. Body Diode Forward Voltage

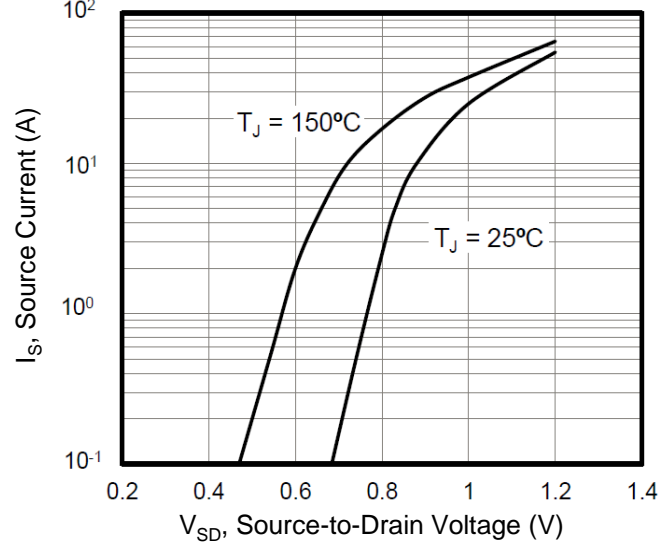


Figure 7. Transient Thermal Impedance (TO-220F)

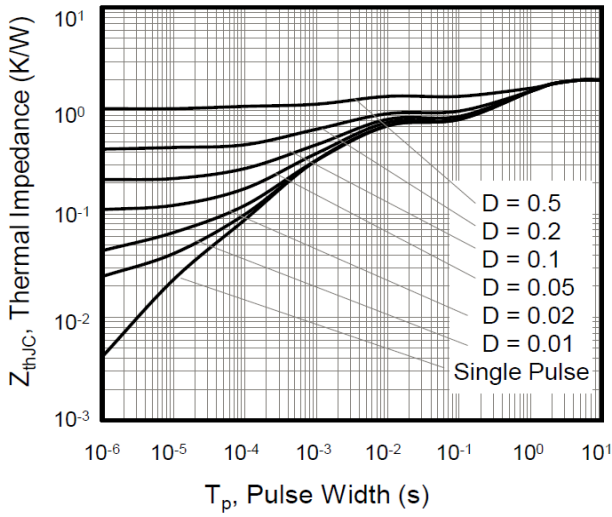
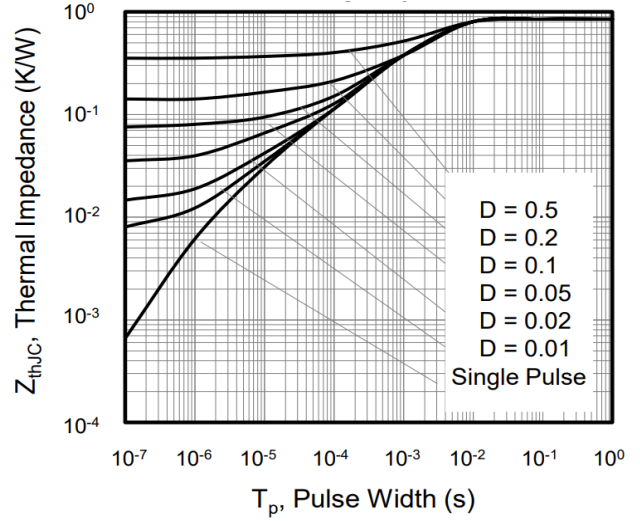
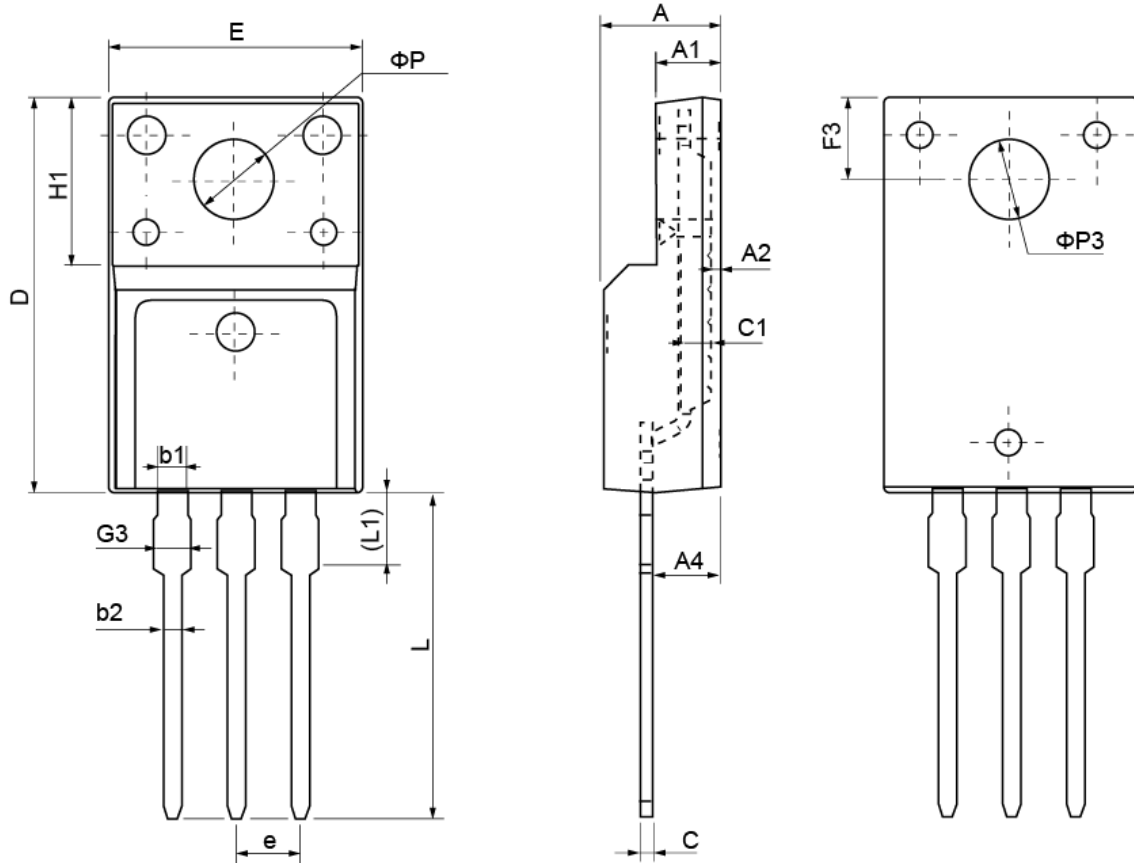


Figure 8. Transient Thermal Impedance (TO-220)

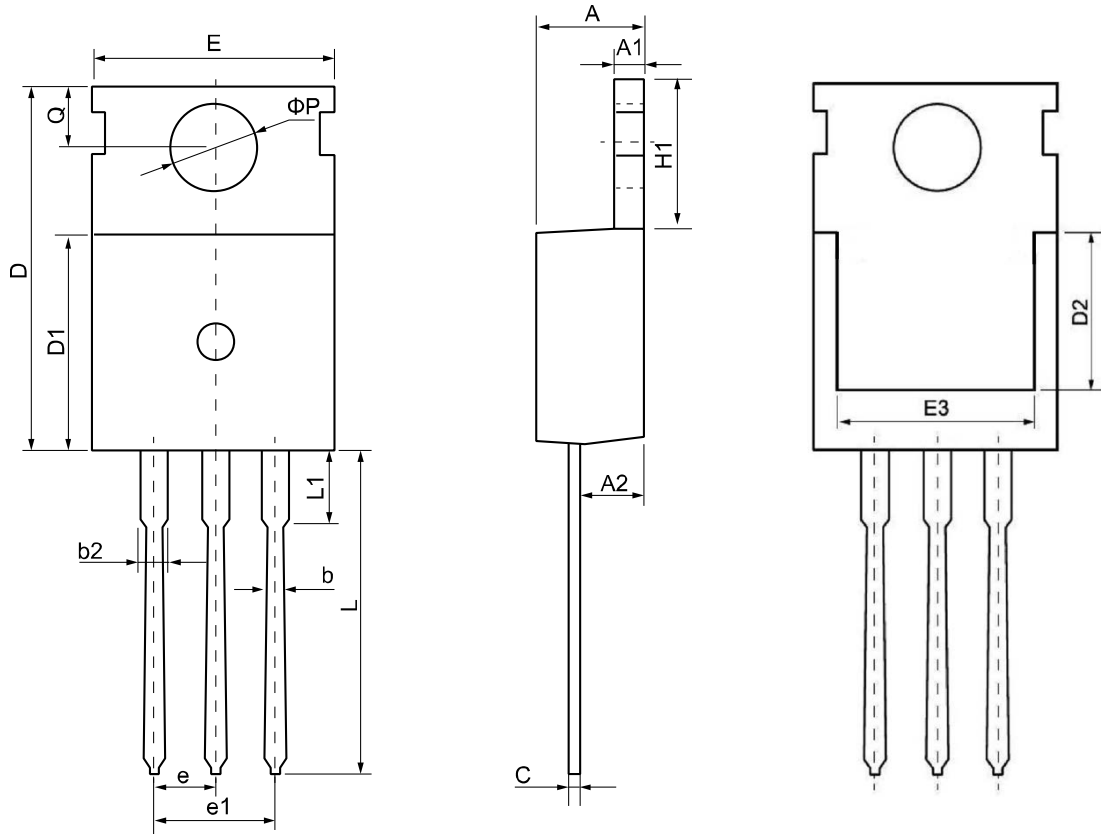


TO-220F Package Outline Dimensions



| 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 | φ P | 3.03 | 3.20 | 3.50 |
| c | 0.30 | 0.50 | 0.70 | φ P3 | 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 |

TO-220 Package Outline Dimensions



| Symbol | Dimensions (unit:mm) | | | Symbol | Dimensions (unit:mm) | | |
|-----------|----------------------|-------|-------|-----------|----------------------|-------|-------|
| | Min | Typ | Max | | Min | Typ | Max |
| A | 4.30 | 4.55 | 4.75 | E | 9.65 | 10.00 | 10.25 |
| A1 | 1.15 | 1.30 | 1.45 | E3 | 7.00 | -- | -- |
| A2 | 2.20 | 2.40 | 2.60 | e | 2.54 BSC | | |
| b | 0.70 | 0.80 | 0.95 | e1 | 5.08 BSC | | |
| b2 | 1.17 | 1.27 | 1.47 | H1 | 6.30 | 6.50 | 6.80 |
| c | 0.40 | 0.50 | 0.65 | L | 12.70 | 13.50 | 14.10 |
| D | 15.30 | 15.60 | 15.90 | L1 | -- | 3.20 | 3.95 |
| D1 | 8.90 | 9.10 | 9.35 | φP | 3.40 | 3.60 | 3.80 |
| D2 | 5.50 | -- | -- | Q | 2.60 | 2.80 | 3.00 |

Printing Information

ATC =====Brand

XXXXXXXX =====Material Code

XXYY =====XX Representative Year
 YY Representative Weeks