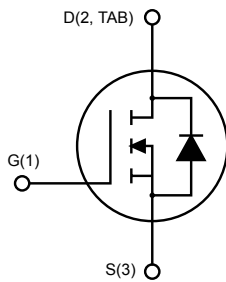
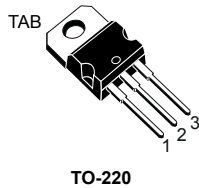


N-channel 200 V, 0.29 Ω typ., 9 A, STripFET™ Power MOSFET in a TO-220 package



Product status link

[IRF630](#)

Product summary

| | |
|-------------------|--------|
| Order code | IRF630 |
| Marking | IRF630 |
| Package | TO-220 |
| Packing | Tube |

Features

| Order code | V_{DS} | $R_{DS(on)}$ max. | I_D |
|------------|----------|-------------------|-------|
| IRF630 | 200 V | 0.40 Ω | 9 A |

- Extremely high dv/dt capability
- Very low intrinsic capacitance
- Gate charge minimized

Applications

- Switching applications

Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters.

1 Electrical ratings

Table 1. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------------------|---|------------|------------------|
| V_{DDS} | Drain-source voltage ($V_{\text{GS}} = 0 \text{ V}$) | 200 | V |
| V_{DGR} | Drain-gate voltage ($R_{\text{GS}} = 20 \text{ k}\Omega$) | 200 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| I_{D} | Drain current (continuous) at $T_{\text{C}} = 25 \text{ }^\circ\text{C}$ | 9 | A |
| | Drain current (continuous) at $T_{\text{C}} = 100 \text{ }^\circ\text{C}$ | 6.5 | A |
| $I_{\text{DM}}^{(1)}$ | Drain current (pulsed) | 36 | A |
| P_{TOT} | Total power dissipation at $T_{\text{C}} = 25 \text{ }^\circ\text{C}$ | 120 | W |
| $E_{\text{AS}}^{(2)}$ | Single pulse avalanche energy | 110 | mJ |
| $dv/dt^{(3)}$ | Drain-body diode dynamic dv/dt ruggedness | 5.8 | V/ns |
| T_{stg} | Storage temperature range | -65 to 175 | $^\circ\text{C}$ |
| T_{J} | Operating junction temperature range | | |

1. Pulse width is limited by safe operating area.
2. Starting $T_{\text{J}} = 25 \text{ }^\circ\text{C}$, $I_{\text{D}} = 4.5 \text{ A}$
3. $I_{\text{SD}} = 9 \text{ A}$, $di/dt = 520 \text{ A}/\mu\text{s}$, $V_{\text{DD}} = 50 \text{ V}$, $T_{\text{J}} < T_{\text{Jmax}}$

Table 2. Thermal data

| Symbol | Parameter | Value | Unit |
|-----------------------|-------------------------------------|-------|---------------------------|
| $R_{\text{thj-case}}$ | Thermal resistance junction-case | 1.26 | $^\circ\text{C}/\text{W}$ |
| $R_{\text{thj-amb}}$ | Thermal resistance junction-ambient | 62.5 | $^\circ\text{C}/\text{W}$ |

2 Electrical characteristics

$T_{CASE} = 25\text{ °C}$ unless otherwise specified

Table 3. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|--|------|------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$ | 200 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0\text{ V}$, $V_{DS} = 200\text{ V}$ | | | 1 | μA |
| | | $V_{GS} = 0\text{ V}$, $V_{DS} = 200\text{ V}$, $T_C = 125\text{ °C}^{(1)}$ | | | 100 | μA |
| I_{GSS} | Gate body leakage current | $V_{DS} = 0\text{ V}$, $V_{GS} = 20\text{ V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$ | 2 | 3 | 4 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}$, $I_D = 4.5\text{ A}$ | | 0.29 | 0.40 | Ω |

1. Defined by design, not subject to production test.

Table 4. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|--|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$ | - | 370 | - | pF |
| C_{oss} | Output capacitance | | - | 77 | - | pF |
| C_{rss} | Reverse transfer capacitance | | - | 14 | - | pF |
| Q_g | Total gate charge | $V_{DD} = 160\text{ V}$, $I_D = 9\text{ A}$ $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior) | - | 11.6 | - | nC |
| Q_{gs} | Gate-source charge | | - | 2.2 | - | nC |
| Q_{gd} | Gate-drain charge | | - | 5.5 | - | nC |

Table 5. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 100\text{ V}$, $I_D = 4.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform) | - | 5.6 | - | ns |
| t_r | Rise time | | - | 2.6 | - | ns |

Table 6. Source-drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|--|------|-------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage | $I_{SD} = 9\text{ A}$, $V_{GS} = 0\text{ V}$ | - | | 1.5 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 9\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, | - | 118.5 | | ns |
| Q_{rr} | Reverse recovery charge | $V_{DD} = 50\text{ V}$ | - | 393 | | nC |
| I_{RRM} | Reverse recovery current | (see Figure 17. Switching time waveform) | - | 6.6 | | A |

1. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

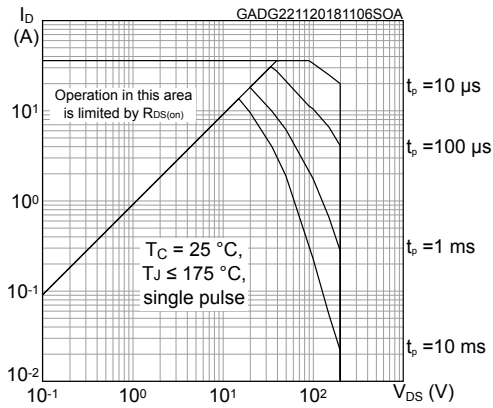
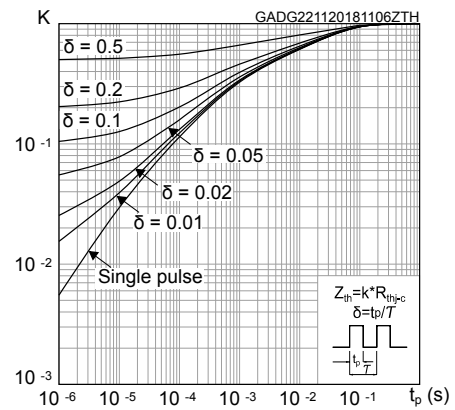
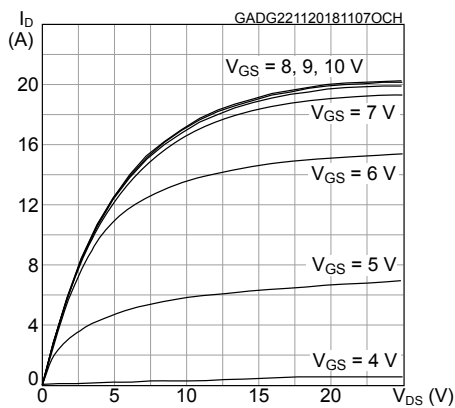
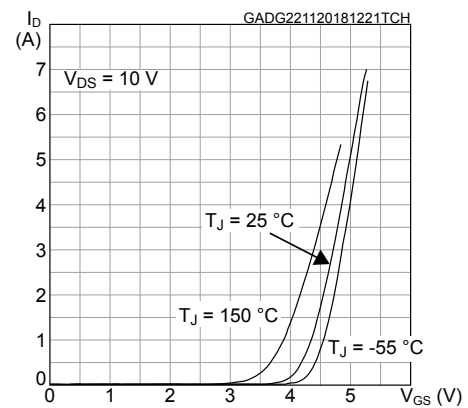
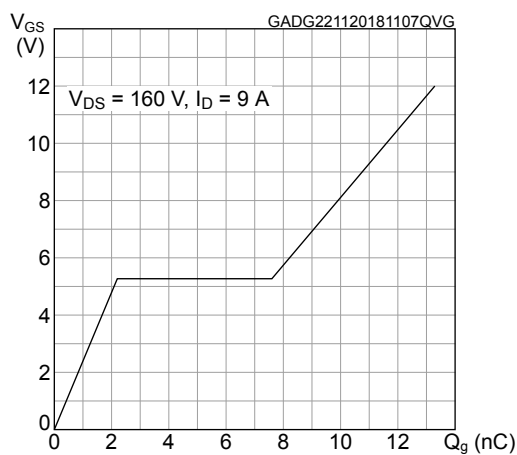
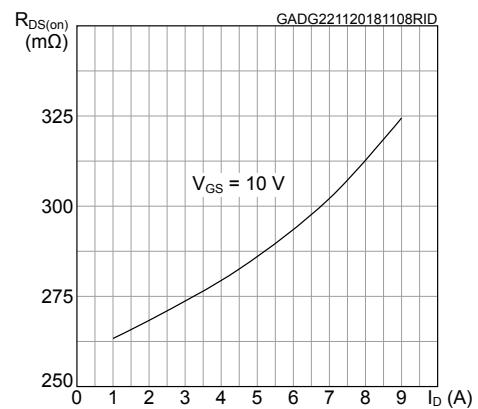
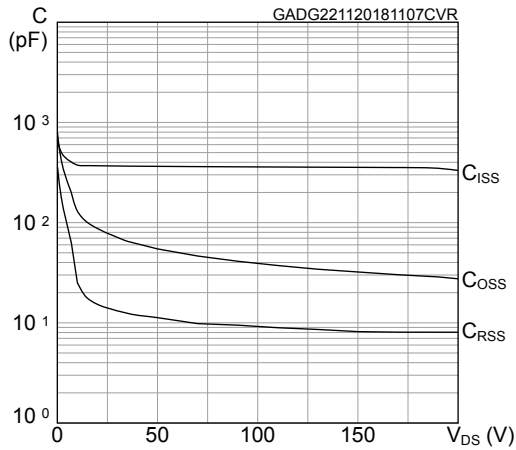
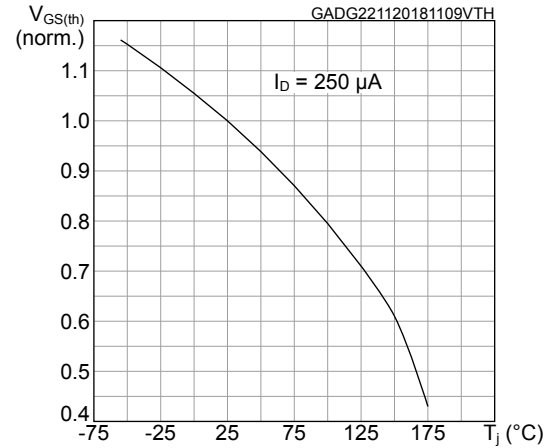
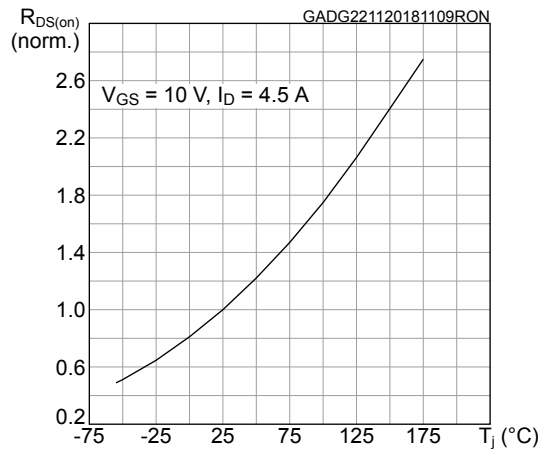
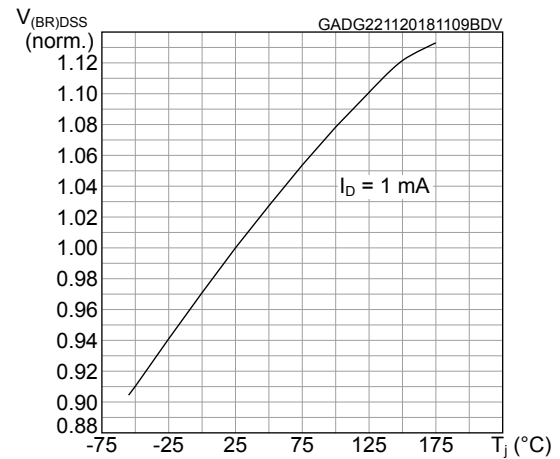
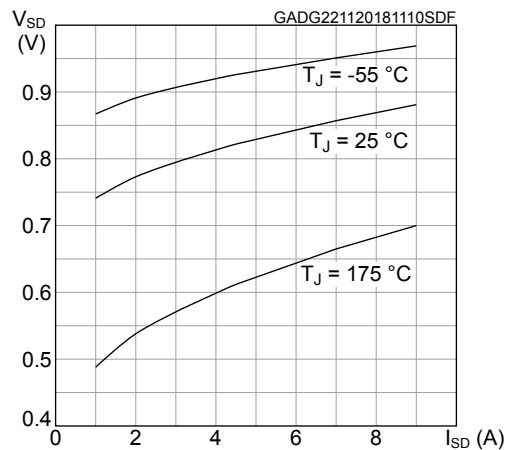
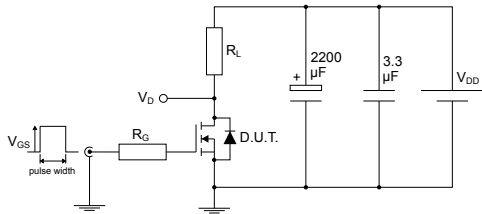
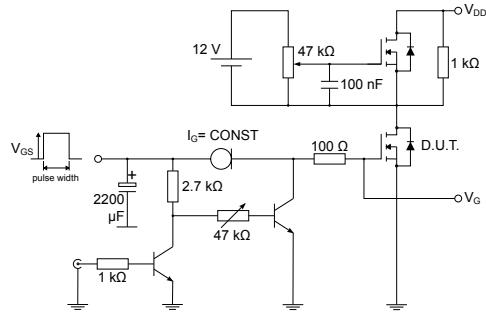
Figure 1. Safe operating area

Figure 2. Thermal impedance

Figure 3. Output characteristics

Figure 4. Transfer characteristics

Figure 5. Gate charge vs gate-source voltage

Figure 6. Static drain-source on-resistance


Figure 7. Capacitance variations

Figure 8. Normalized gate threshold voltage vs temperature

Figure 9. Normalized on-resistance vs temperature

Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

Figure 11. Source-drain diode forward characteristics


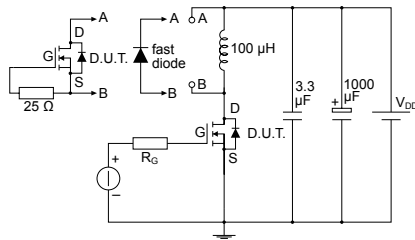
3 Test circuits

Figure 12. Test circuit for resistive load switching times


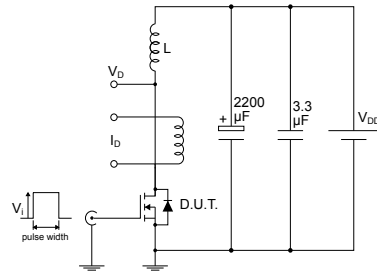
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Figure 13. Test circuit for gate charge behavior


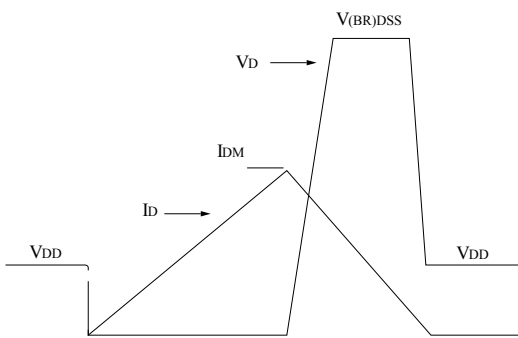
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Figure 14. Test circuit for inductive load switching and diode recovery times


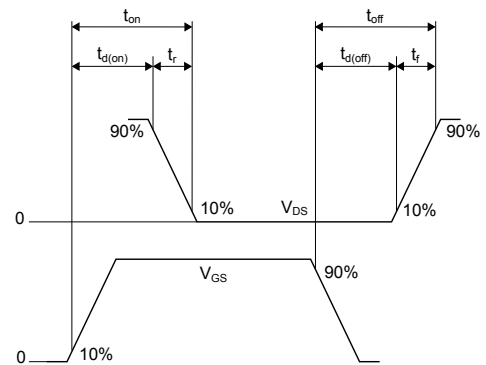
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Figure 15. Unclamped inductive load test circuit


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Figure 16. Unclamped inductive waveform


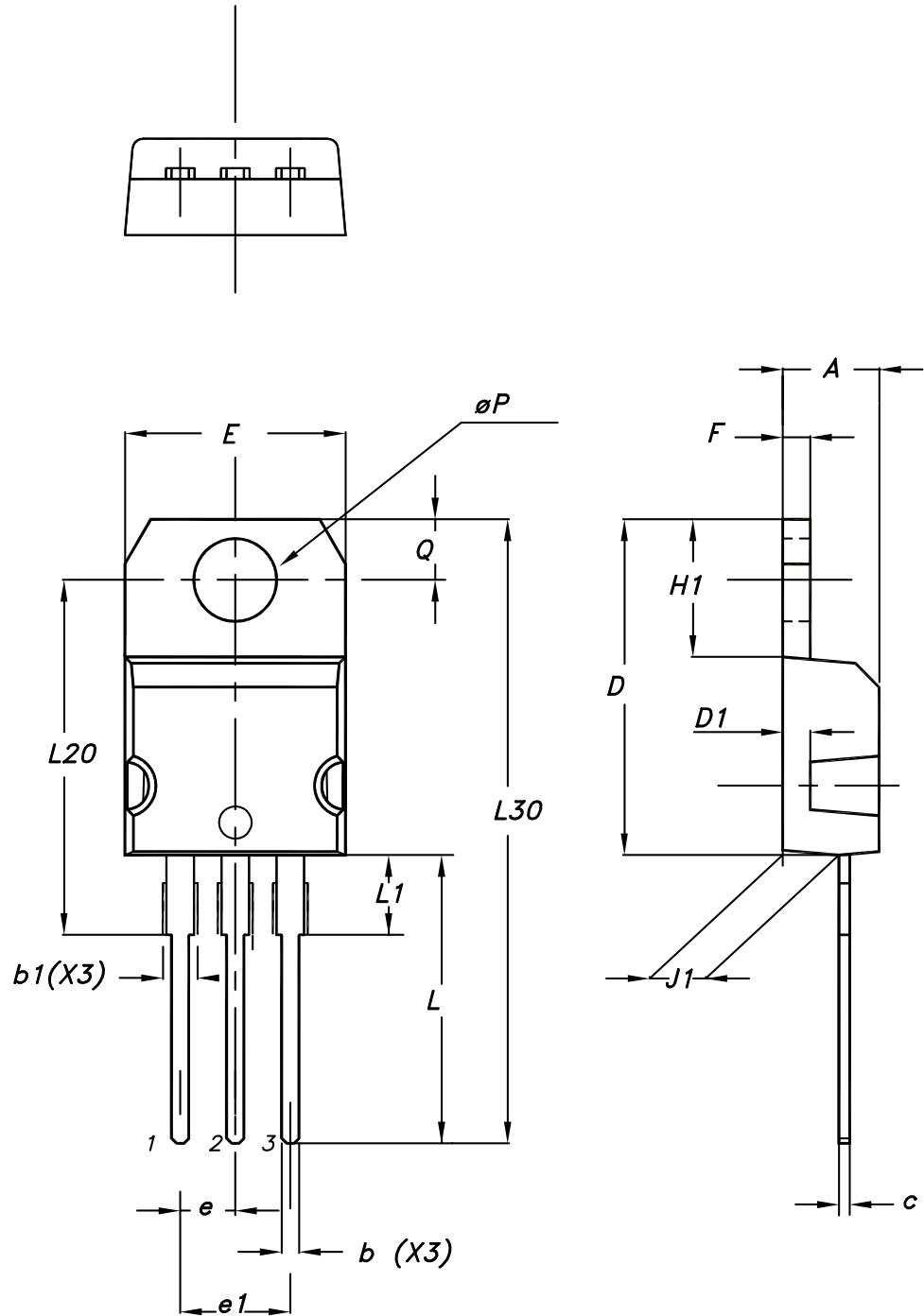
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Figure 17. Switching time waveform


AM01473v1

4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK®** packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

4.1 TO-220 type A package information
Figure 18. TO-220 type A package outline


0015988_typeA_Rev_22

Table 7. TO-220 type A package mechanical data

| Dim. | mm | | |
|------|-------|-------|-------|
| | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 |
| b | 0.61 | | 0.88 |
| b1 | 1.14 | | 1.55 |
| c | 0.48 | | 0.70 |
| D | 15.25 | | 15.75 |
| D1 | | 1.27 | |
| E | 10.00 | | 10.40 |
| e | 2.40 | | 2.70 |
| e1 | 4.95 | | 5.15 |
| F | 1.23 | | 1.32 |
| H1 | 6.20 | | 6.60 |
| J1 | 2.40 | | 2.72 |
| L | 13.00 | | 14.00 |
| L1 | 3.50 | | 3.93 |
| L20 | | 16.40 | |
| L30 | | 28.90 | |
| øP | 3.75 | | 3.85 |
| Q | 2.65 | | 2.95 |

Revision history

Table 8. Document revision history

| Date | Version | Changes |
|-------------|---------|--|
| 09-Sep-2004 | 8 | Complete version |
| 03-Aug-2006 | 9 | New template, no content change |
| 12-Dec-2018 | 10 | Part number IRF630FP has been moved to a separate datasheet and the document has been updated accordingly. Minor text changes |

Contents

| | | |
|------------|--|-----------|
| 1 | Electrical ratings | 2 |
| 2 | Electrical characteristics | 3 |
| 2.1 | Electrical characteristics (curves) | 5 |
| 3 | Test circuits | 7 |
| 4 | Package information | 8 |
| 4.1 | TO-220 type A package information | 8 |
| | Revision history | 11 |

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