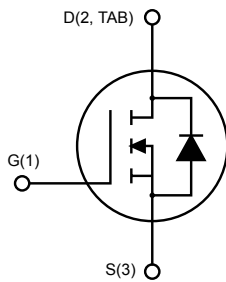
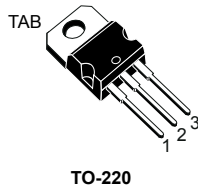


## N-channel 200 V, 0.29 $\Omega$ typ., 9 A, STripFET™ Power MOSFET in a TO-220 package



AM01475v1\_noZen



### Product status link

[IRF630](#)

### Product summary

<b>Order code</b>	IRF630
<b>Marking</b>	IRF630
<b>Package</b>	TO-220
<b>Packing</b>	Tube

### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
IRF630	200 V	0.40 $\Omega$	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
$V_{\text{DDS}}$	Drain-source voltage ( $V_{\text{GS}} = 0 \text{ V}$ )	200	V
$V_{\text{DGR}}$	Drain-gate voltage ( $R_{\text{GS}} = 20 \text{ k}\Omega$ )	200	V
$V_{\text{GS}}$	Gate-source voltage	$\pm 20$	V
$I_{\text{D}}$	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
$P_{\text{TOT}}$	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
$T_{\text{stg}}$	Storage temperature range	-65 to 175	$^{\circ}\text{C}$
$T_{\text{J}}$	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	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 200\text{ V}$ , $T_C = 125\text{ °C}^{(1)}$			100	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = 20\text{ V}$			$\pm 100$	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	$\Omega$

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	$V_{DD} = 160\text{ V}$ , $I_D = 9\text{ A}$	-	11.6	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 0\text{ to }10\text{ V}$	-	2.2	-	nC
$Q_{gd}$	Gate-drain charge	(see Figure 13. Test circuit for gate charge behavior)	-	5.5	-	nC

**Table 5. Switching times**

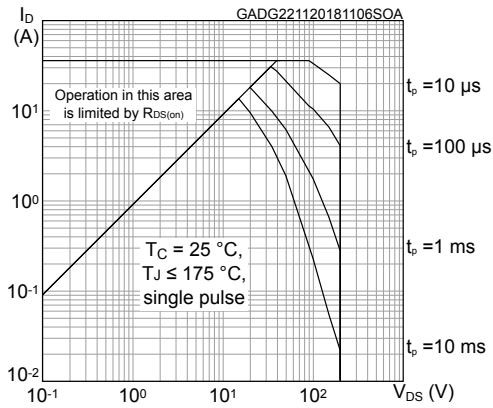
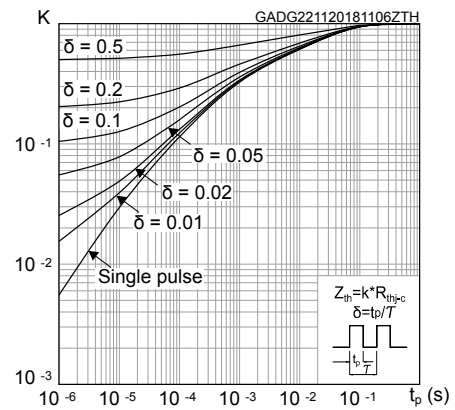
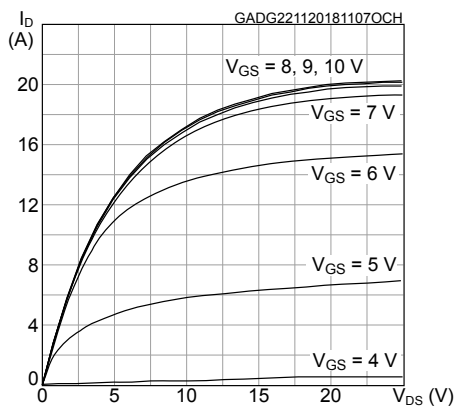
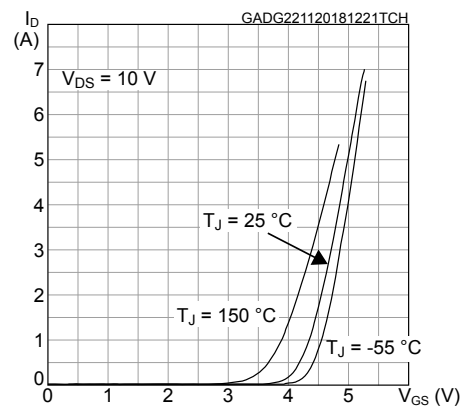
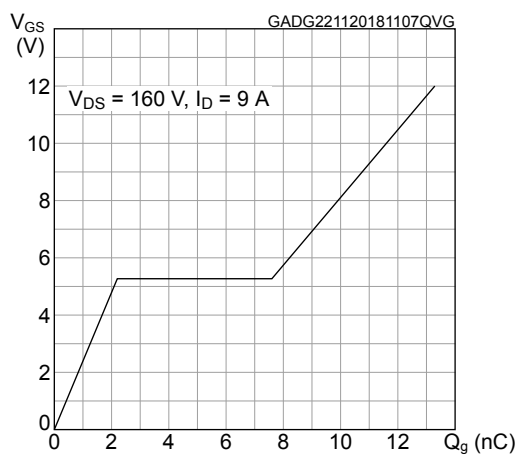
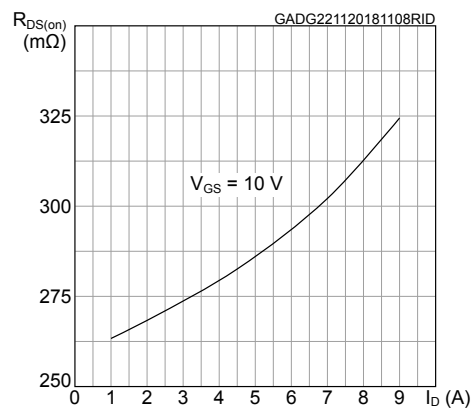
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 100\text{ V}$ , $I_D = 4.5\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$	-	5.6	-	ns
$t_r$	Rise time	(see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time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

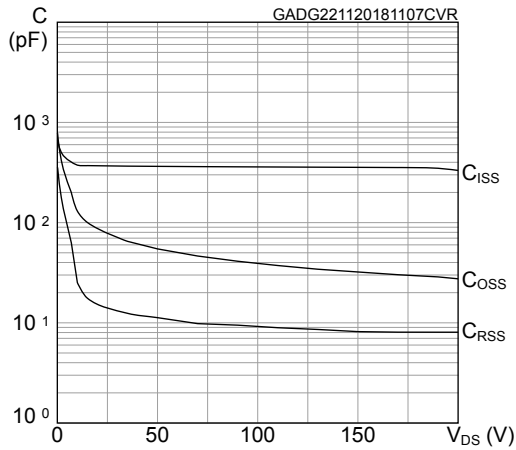
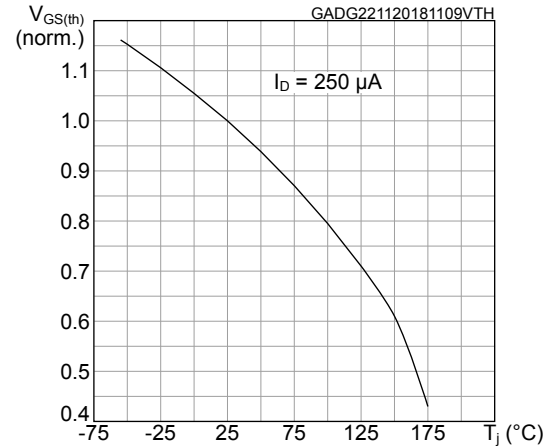
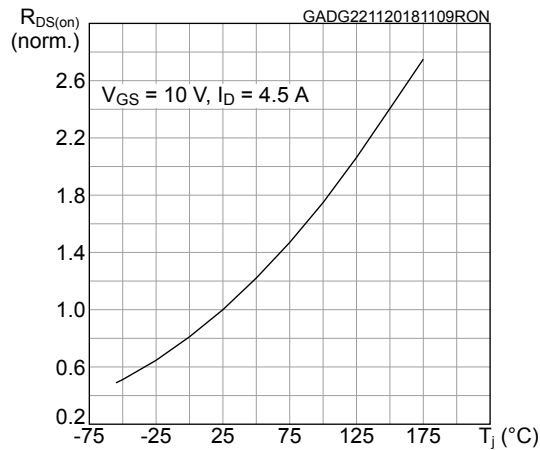
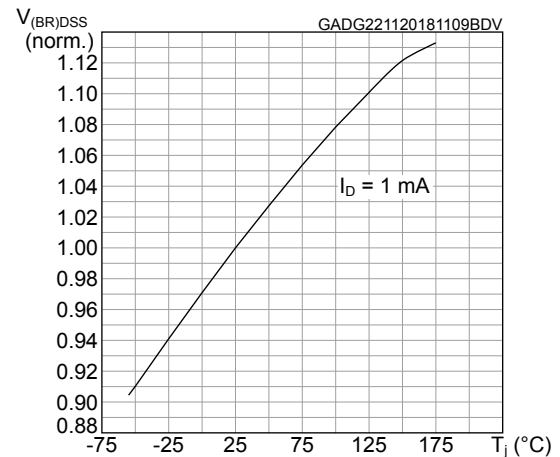
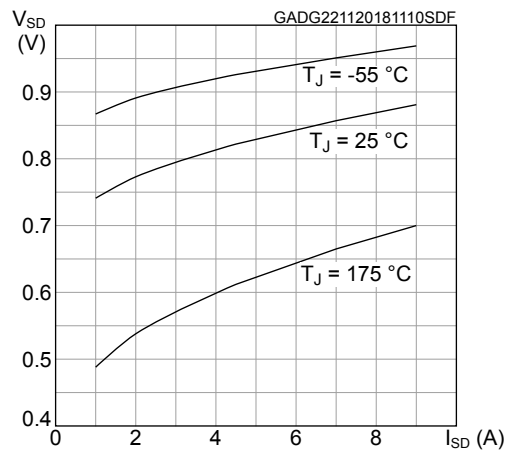
**Table 6. Source-drain diode**

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 <a href="#">Figure 17. Switching time waveform</a> )	-	6.6		A

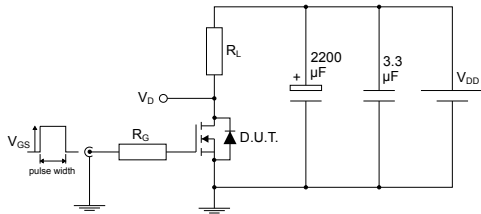
1. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

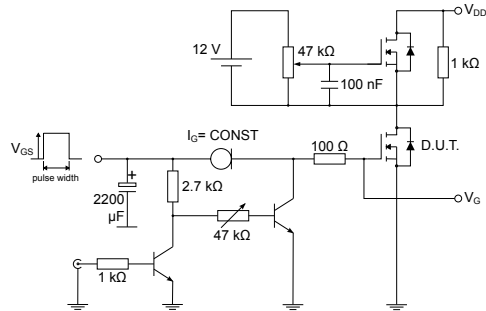
**Figure 1. Safe operating area**

**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**


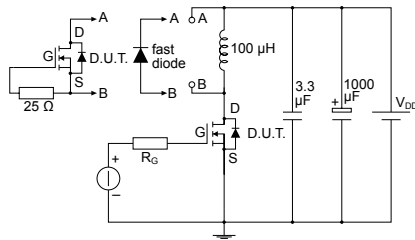
### 3 Test circuits

**Figure 12. Test circuit for resistive load switching times**


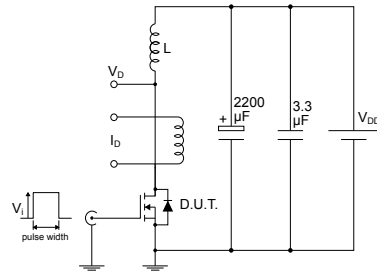
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**Figure 13. Test circuit for gate charge behavior**


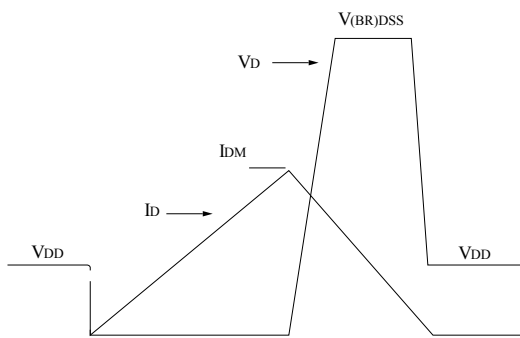
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**Figure 14. Test circuit for inductive load switching and diode recovery times**


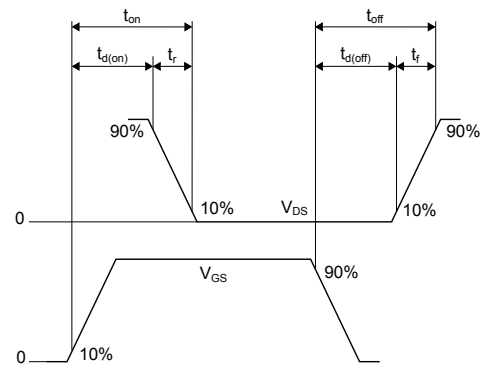
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**Figure 15. Unclamped inductive load test circuit**


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**Figure 16. Unclamped inductive waveform**


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**Figure 17. Switching time waveform**


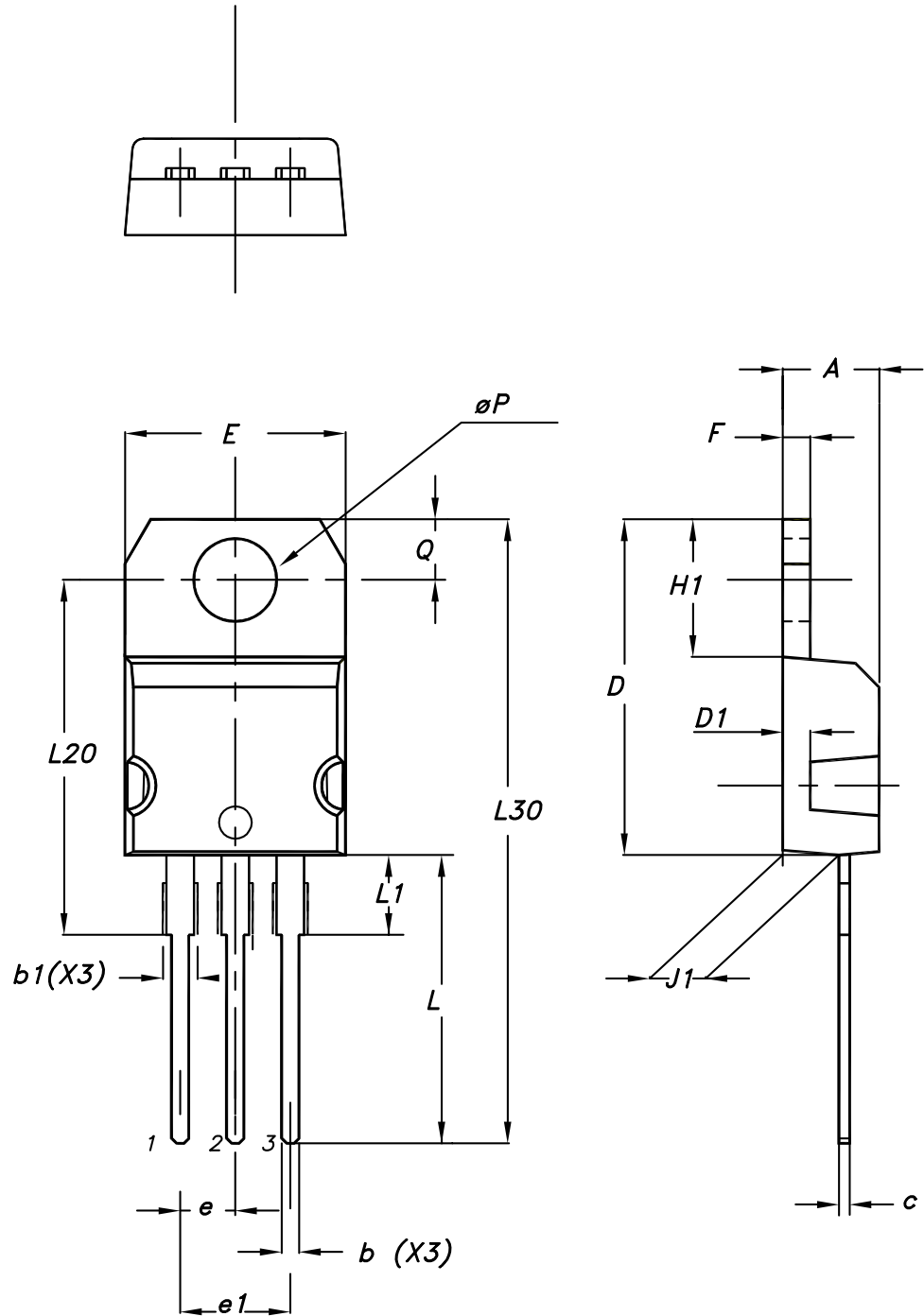
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## 4 Package information

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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](http://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

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