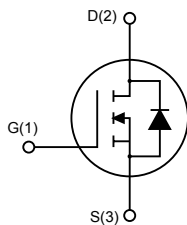


N-channel 200 V, 0.29 Ω typ., 9 A, STripFET™ Power MOSFET in a TO-220FP package



TO-220FP



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Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
IRF630FP	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.

Product status link

[IRF630FP](#)

Product summary

Order code	IRF630FP
Marking	IRF630FP
Package	TO-220FP
Packing	Tube

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 $T_{\text{C}} = 25 \text{ }^\circ\text{C}$	36	W
$E_{\text{AS}}^{(2)}$	Single pulse avalanche energy	110	mJ
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink ($t = 1 \text{ s}$, $T_{\text{C}} = 25 \text{ }^\circ\text{C}$)	2000	V
$dv/dt^{(3)}$	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	4.17	$^\circ\text{C}/\text{W}$
$R_{\text{thj-amb}}$	Thermal resistance junction-ambient	62.5	$^\circ\text{C}/\text{W}$

2 Electrical characteristics

$T_{CASE} = 25\text{ }^{\circ}\text{C}$ 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
		$V_{GS} = 0\text{ V}, V_{DS} = 200\text{ V},$ $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$			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_{riss}	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 Figure 17. Switching time waveform)	-	6.6		A

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

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2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

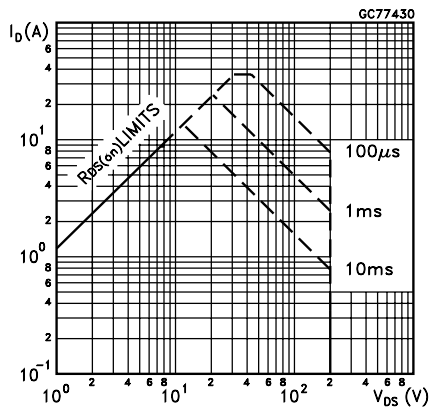


Figure 2. Thermal impedance

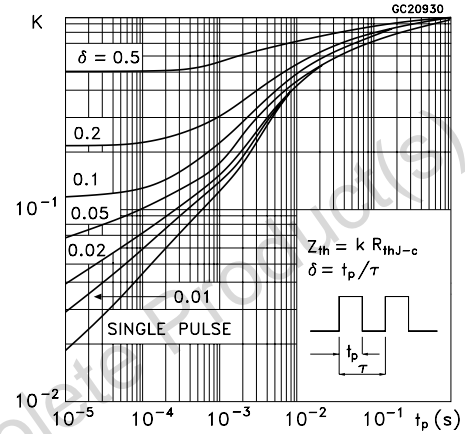


Figure 3. Output characteristics

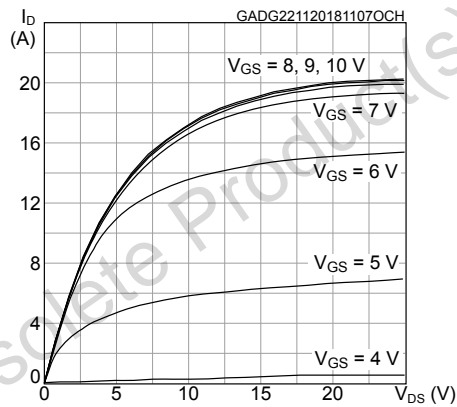


Figure 4. Transfer characteristics

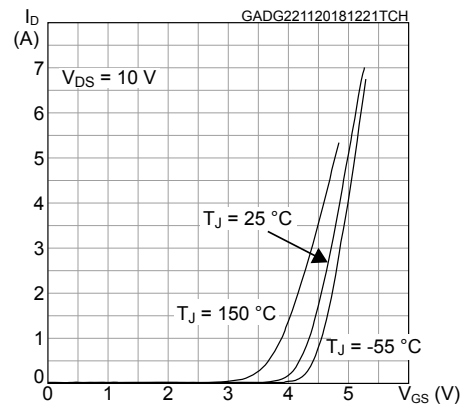


Figure 5. Gate charge vs gate-source voltage

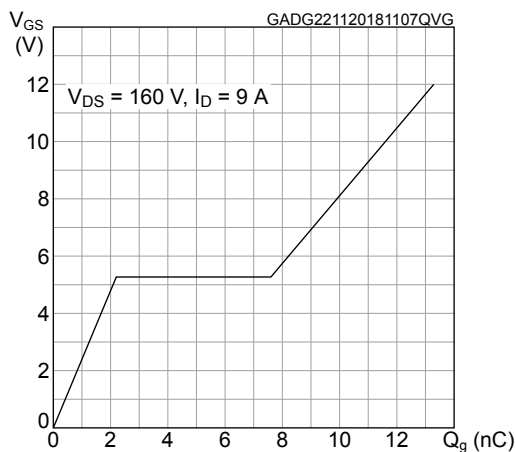


Figure 6. Static drain-source on-resistance

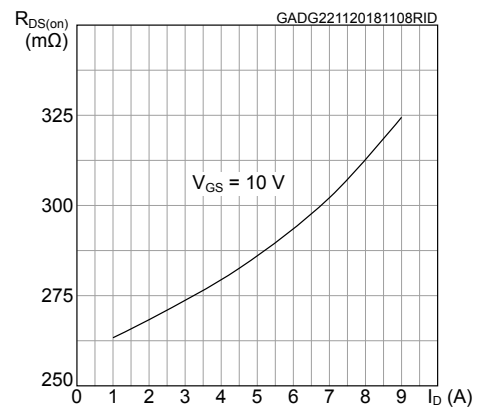
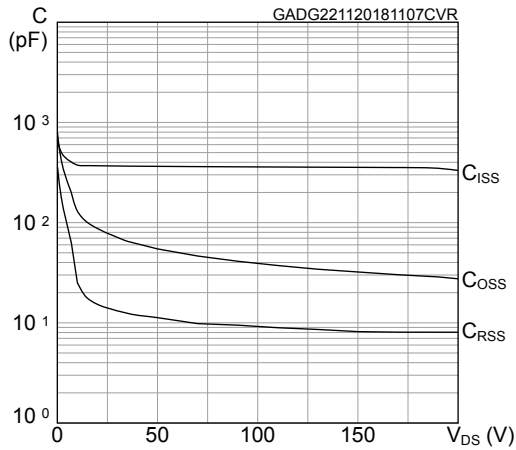
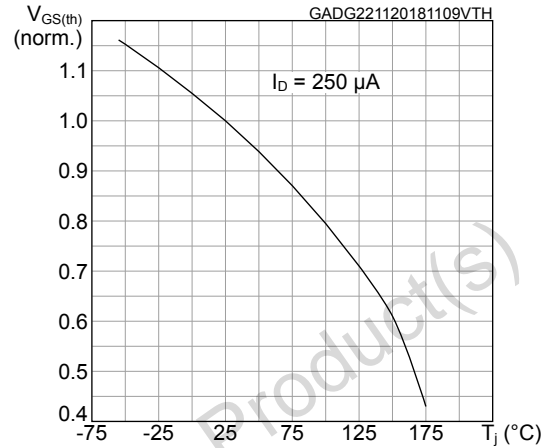
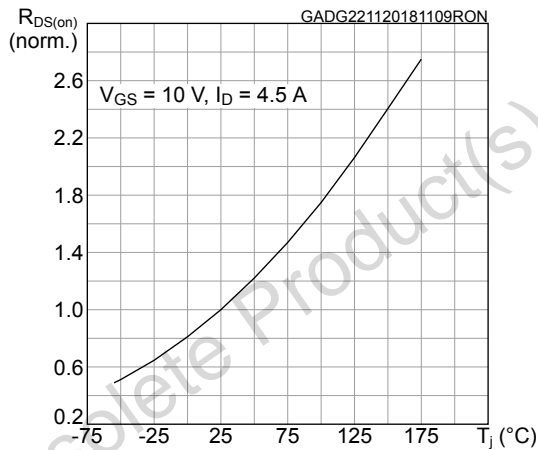
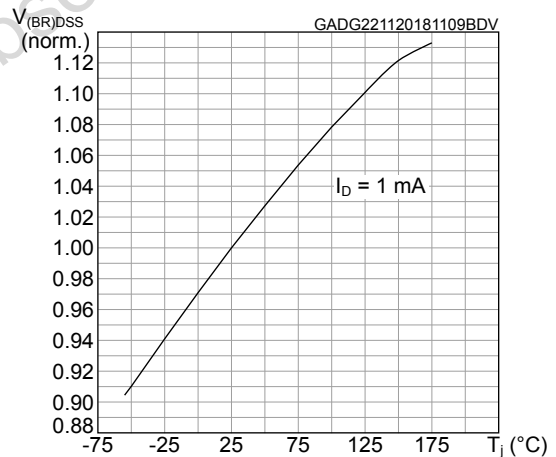
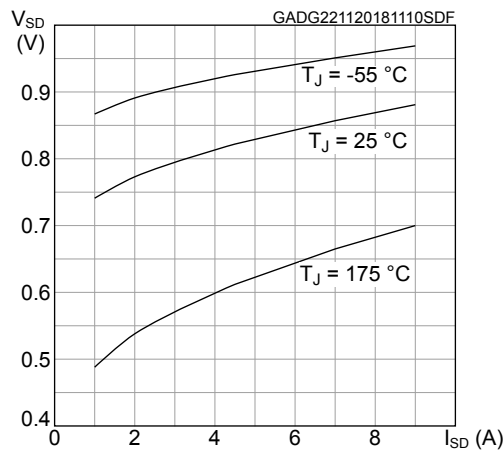
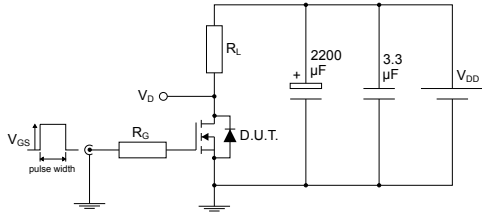
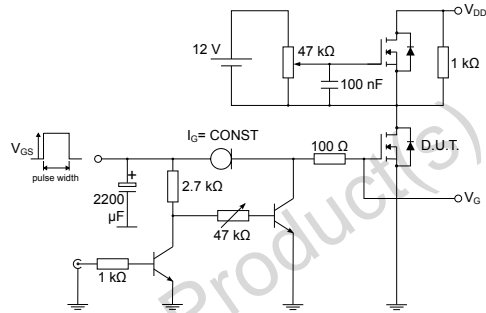


Figure 7. Capacitance variations

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


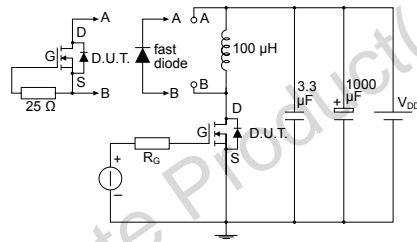
3 Test circuits

Figure 12. Test circuit for resistive load switching times


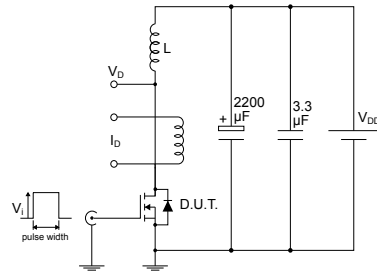
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Figure 13. Test circuit for gate charge behavior


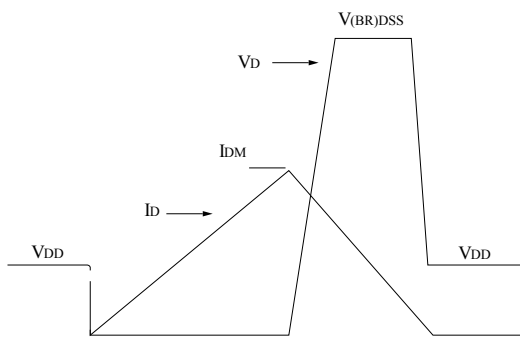
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Figure 14. Test circuit for inductive load switching and diode recovery times


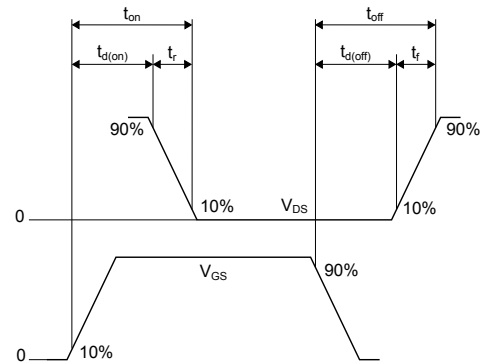
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Figure 15. Unclamped inductive load test circuit


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Figure 16. Unclamped inductive waveform


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Figure 17. Switching time waveform


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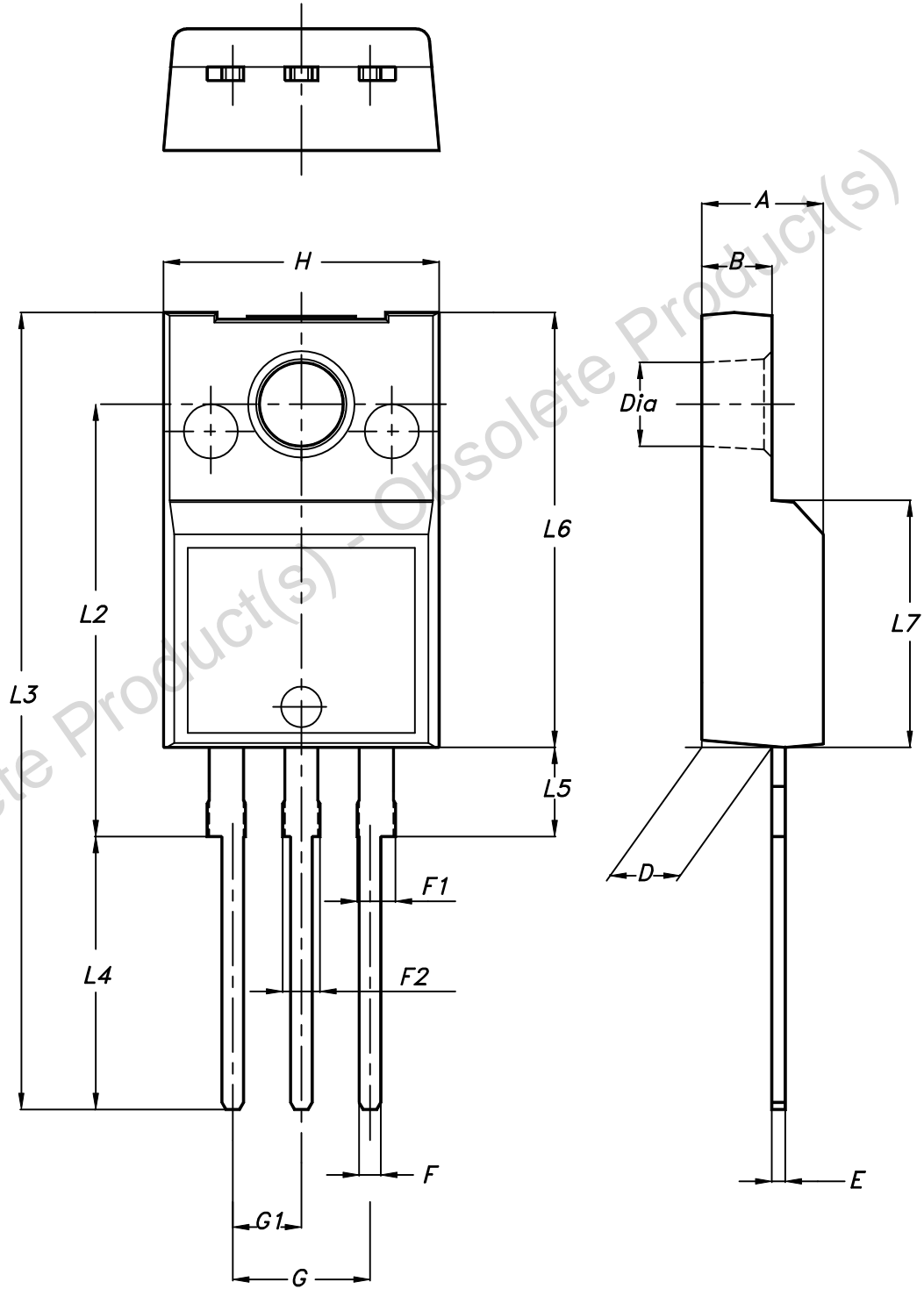
4 Package information

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.

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4.1 TO-220FP package information

Figure 18. TO-220FP package outline



7012510_Rev_12_B

Table 7. TO-220FP package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Revision history

Table 8. Document revision history

Date	Version	Changes
10-Jan-2019	1	First release. This part number was previously included in datasheet DS0668.

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