

# **IRF740**

# N-channel 400V - 0.46Ω - 10A TO-220 PowerMESH™ II Power MOSFET

### **General features**

Туре	V <sub>DSS</sub> (@Tjmax) R <sub>DS(on)</sub>		I <sub>D</sub>
IRF740	400V	<0.55Ω	10A

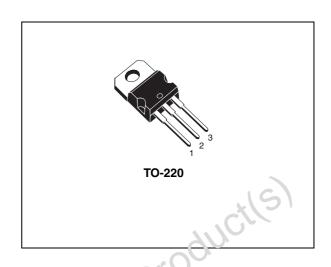
- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge
- Very low intrinsic capacitances

### **Description**

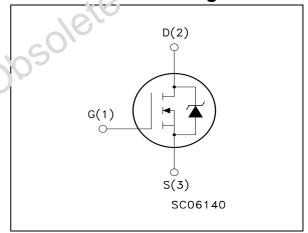
The PowerMESH™II is the evolution of the first generation of MESH OVERLAY™. The layout refinements introduced greatly improve the Ron\*area figure of merit while keeping the device at the leading edge for what concerns swithing speed, gate charge and ruggedness.

# **Applications**

■ Switching application



## Internal schematic diagram



### **Order codes**

Part number	number Marking Package		Packaging
IRF740	IRF740@	TO-220	Tube

Contents IRF740

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**IRF740 Electrical ratings** 

#### **Electrical ratings** 1

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage (V <sub>GS</sub> = 0)	400	V
V <sub>DGR</sub>	Drain-gate voltage ( $R_{GS}$ = 20 kΩ)	400	V
V <sub>GS</sub>	Gate- source voltage	± 20	V
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 25°C	10	А
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 100°C	6.3	А
I <sub>DM</sub> <sup>(1)</sup>	Drain current (pulsed)	40	А
P <sub>tot</sub>	Total dissipation at T <sub>C</sub> = 25°C	125	W
	Derating Factor	1.0	W/°C
dv/dt (2)	Peak diode recovery voltage slope	4.0	V/ns
T <sub>stg</sub>	Storage temperature	-65 to 150	°C
Tj	Max. operating junction temperature	-03 (0 150	C

<sup>1.</sup> Pulse width limited by safe operating area.

Table 2. Thermal data

l <sub>j</sub>	Max. operating junction temperature						
1. Pulse width lim	Pulse width limited by safe operating area.						
2. I <sub>SD</sub> ₫0A, di/dt ₫	300A/µs, V <sub>DD</sub> ≤V <sub>(BR)DSS</sub> , Tj ≤T <sub>JMAX</sub>						
	94						
Table 2. Th	Table 2. Thermal data						
Rthj-case	Thermal resistance junction-case max	1	°C/W				
Rthj-amb	Thermal resistance junction-ambient max 62.5 °C/V		°C/W				
T <sub>J</sub>	Maximum lead temperature for soldering purpose 300		°C				

Table 3. **Avalanche characteristics** 

Symbol	Parameter	Value	Unit
I <sub>AR</sub>	Avalanche current, repetitive or not-repetitive (pulse width limited by Tj Max)	10	Α
E <sub>AS</sub>	Single pulse avalanche energy (starting Tj=25°C, Id=lar, Vdd=50V)	520	mJ

<sup>2.</sup>  $I_{SD} \leq 0A$ , di/dt  $\leq 00A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $Tj \leq T_{JMAX}$ 

**Electrical characteristics IRF740** 

#### **Electrical characteristics** 2

(T<sub>CASE</sub>=25°C unless otherwise specified)

On/off states Table 4.

Symbol	Parameter	Min.	Тур.	Max.	Unit	
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	$I_D = 250 \ \mu A, \ V_{GS} = 0$	400			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	$V_{DS}$ = Max rating, $V_{DS}$ = Max rating @125°C			1 50	μ <b>Α</b> μ <b>Α</b>
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±20V			± 100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2	3	4	٧
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 5.3A		0.46	0.55	Ω

Table 5. **Dynamic** 

	Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
	9 <sub>fs</sub> <sup>(1)</sup>	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max},$ $I_D = 6A$		7		S
	C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input capacitance Output capacitance Reverse transfer capacitance	V <sub>DS</sub> =25V, f=1 MHz, V <sub>GS</sub> =0		1400 220 27		pF pF pF
	t <sub>d(on)</sub> t <sub>r</sub>	Turn-on delay time Rise Time	$V_{DD} = 200V, I_D = 5A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see Figure 12)		17 10		ns ns
	$egin{array}{c} Q_{ m g} \ Q_{ m gd} \end{array}$	Total gate charge Gate-source charge Gate-drain charge	V <sub>DD</sub> =320V, I <sub>D</sub> = 10.7A V <sub>GS</sub> =10V		35 11 12	43	nC nC nC
Obsole	4 Delasak	pulse duration=300μs, duty cycle	1.5%				

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Тур.	Max	Unit
I <sub>SD</sub>	Source-drain current				10	Α
I <sub>SDM</sub> <sup>(1)</sup>	Source-drain current (pulsed)				40	Α
V <sub>SD</sub> <sup>(2)</sup>	Forward on voltage	I <sub>SD</sub> =10A, V <sub>GS</sub> =0			1.6	٧
t <sub>rr</sub> Q <sub>rr</sub> I <sub>RRM</sub>	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}$ =10A, di/dt = 100A/ $\mu$ s, $V_{DD}$ =100V, Tj=150°C (see Figure 12)		370 3.2 17		ns µC A

- 1. Pulse width limited by safe operating area
- 2. Pulsed: pulse duration=300 jus; duty cycle 1.5%

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**Electrical characteristics IRF740** 

#### **Electrical characteristics (curves)** 2.1

Figure 1. Safe operating area

Figure 2. Thermal impedance ID(A 10 100 ms 0.01 10 SINGLE PULSE

Figure 3. Output characterisics

Figure 4. **Transfer characteristics** 

 $10^{-4}$ 

 $10^{-2}$ 

 $10^{-1} t_p(s)$ 

 $10^{-2}$ 

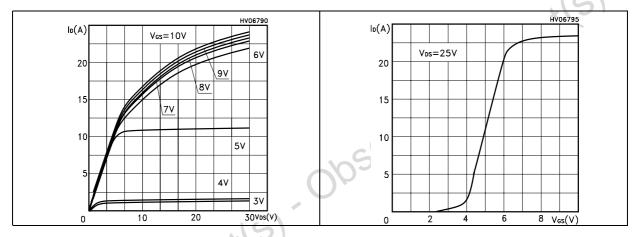


Figure 5. **Transconductance** 

Static drain-source on resistance

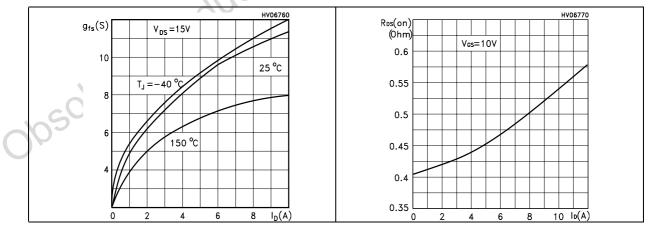


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

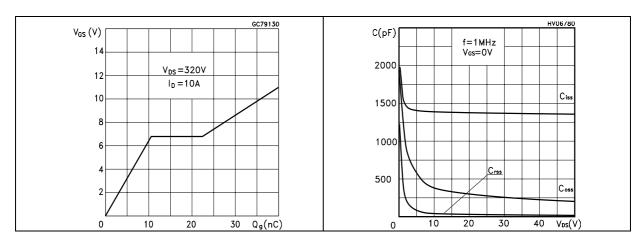


Figure 9. Normalized gate threshold voltage Figure 10. Normalized on resistance vs vs temperature temperature

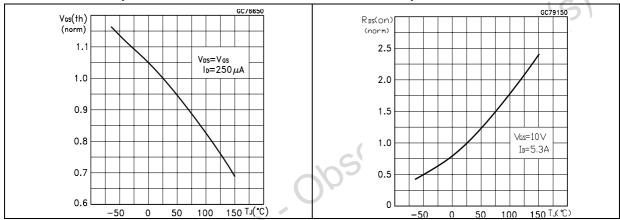
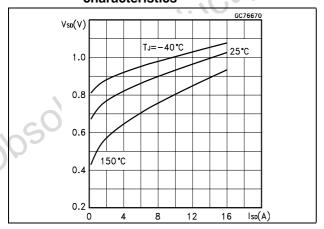


Figure 11. Source-drain diode forward characteristics



Test circuit IRF740

# 3 Test circuit

Figure 12. Switching times test circuit for resistive load

Figure 13. Gate charge test circuit

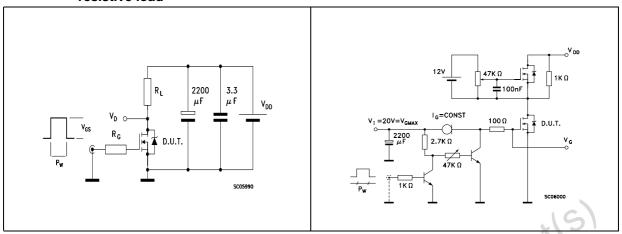


Figure 14. Test circuit for inductive load switching and diode recovery times

Figure 15. Unclamped Inductive load test circuit

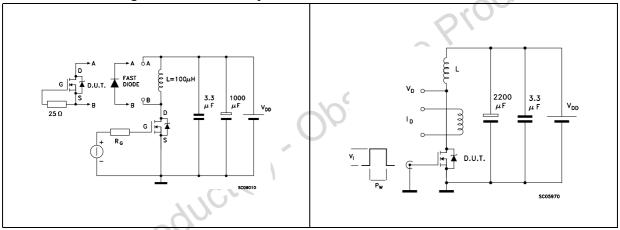
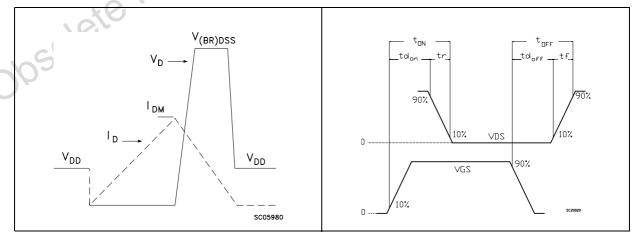


Figure 16. Unclamped inductive waveform

Figure 17. Switching time waveform



# 4 Package mechanical data

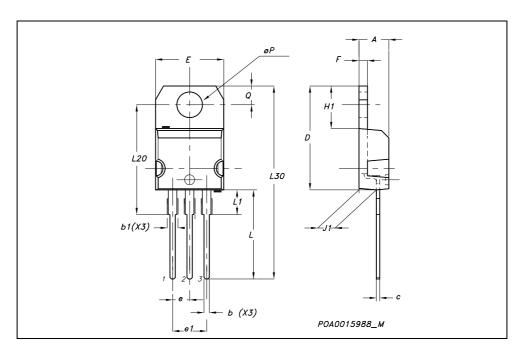
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

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### **TO-220 MECHANICAL DATA**

DIM		mm.			inch	
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
Α	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
С	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
Е	10		10.40	0.393		0.409
е	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øΡ	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



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IRF740 Revision history

# 5 Revision history

Table 7. Revision history

Date	Revision	Changes
09-Sep-2004	3	Complete version,new datasheet according to PCN DSG/CT/2C14. special marking: IRF740 @
03-Aug-2006	4	New template, no content change

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