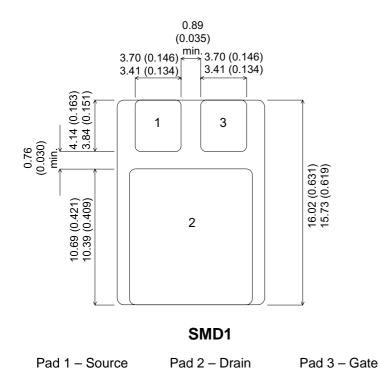


### IRFN130SMD

#### **MECHANICAL DATA**

Dimensions in mm (inches)



# **N-CHANNEL POWER MOSFET** FOR HI-REL **APPLICATIONS**

V<sub>DSS</sub> 100V I<sub>D(cont)</sub> 11A  $0.19\Omega$ R<sub>DS(on)</sub>

#### **FEATURES**

- HERMETICALLY SEALED
- SIMPLE DRIVE REQUIREMENTS
- LIGHTWEIGHT
- SCREENING OPTIONS AVAILABLE
- ALL LEADS ISOLATED FROM CASE

# **ABSOLUTE MAXIMUM RATINGS** (T<sub>case</sub> = 25°C unless otherwise stated)

$V_{GS}$	Gate – Source Voltage	±20V
$I_{D}$	Continuous Drain Current @ T <sub>case</sub> = 25°C	11A
$I_D$	Continuous Drain Current @ T <sub>case</sub> = 100°C	7A
$I_{DM}$	Pulsed Drain Current	44A
$P_{D}$	Power Dissipation @ T <sub>case</sub> = 25°C	45W
	Linear Derating Factor	0.36W/°C
$T_J$ , $T_stg$	Operating and Storage Temperature Range	−55 to 150°C
$R_{ hetaJC}$	Thermal Resistance Junction to Case	2.8°C/W max.

<sup>\*</sup> Also available as IRF130SM with Pin1(Source) and Pin3 (Gate) reversed.



### IRFN130SMD

### **ELECTRICAL CHARACTERISTICS** ( $T_C = 25$ °C unless otherwise stated)

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Threshold Voltage rd Transconductance Gate Voltage Drain Current rd Gate – Source Leakage se Gate – Source Leakage MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{GS} = 0$ Reference to 25 $I_D = 1 \text{mA}$ $V_{GS} = 10 \text{V}$ $V_{GS} = 10 \text{V}$ $V_{DS} = V_{GS}$ $V_{DS} \ge 15 \text{V}$ $V_{GS} = 0$ $V_{GS} = 20 \text{V}$ $V_{GS} = -20 \text{V}$ $V_{GS} = 10 \text{V}$ $V_{GS} = 10 \text{V}$ $V_{GS} = 10 \text{V}$	I <sub>D</sub> = 7A	2 3	0.1 650 240	0.19 0.22 4 25 250 100 -100	V V/°C Ω V S(℧) μA nA
$ \begin{array}{c c} \Delta BV_{DSS} \\ \hline \Delta T_J \\ \hline & Breakd \\ \hline R_{DS(on)} \\ \hline & Resista \\ \hline V_{GS(th)} \\ \hline & Gate\ TI \\ \hline g_{fs} \\ \hline & Forward \\ \hline I_{DSS} \\ \hline & Forward \\ \hline I_{GSS} \\ \hline & Forward \\ \hline & DYNAM \\ \hline C_{iss} \\ \hline & DYNAM \\ \hline C_{iss} \\ \hline & C_{rss} \\ \hline & Q_g \\ \hline & Total\ G_s \\ \hline Q_{gd} \\ \hline & Gate\ - \\ \hline Q_{gd} \\ \hline & Gate\ - \\ \hline & U_{d(on)} \\ \hline & U_{r} \\ \hline & U$	erature Coefficient of down Voltage Drain – Source On–State ance Threshold Voltage rd Transconductance Gate Voltage Drain Current rd Gate – Source Leakage se Gate – Source Leakage MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	Reference to 25 $I_D = 1 \text{mA}$ $V_{GS} = 10 \text{V}$ $V_{GS} = 10 \text{V}$ $V_{DS} = V_{GS}$ $V_{DS} \ge 15 \text{V}$ $V_{GS} = 0$ $V_{GS} = 20 \text{V}$ $V_{GS} = -20 \text{V}$ $V_{GS} = 10 \text{V}$	$I_D = 7A$ $I_D = 11A$ $I_D = 250\mu A$ $I_{DS} = 7A$ $V_{DS} = 0.8BV_{DSS}$	2	650	0.22 4 25 250 100	V/°C Ω V S(℧) μA nA
	down Voltage Drain – Source On–State ance Threshold Voltage rd Transconductance Gate Voltage Drain Current rd Gate – Source Leakage se Gate – Source Leakage MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$\begin{split} I_D &= 1 \text{mA} \\ V_{GS} &= 10 \text{V} \\ V_{GS} &= 10 \text{V} \\ V_{DS} &= 10 \text{V} \\ V_{DS} &= 10 \text{V} \\ V_{DS} &= 10 \text{V} \\ V_{GS} &= 10 \text{V} \\ V_{DS} &= 10 \text{V} \\ V_{DS$	$I_D = 7A$ $I_D = 11A$ $I_D = 250\mu A$ $I_{DS} = 7A$ $V_{DS} = 0.8BV_{DSS}$		650	0.22 4 25 250 100	Ω V S(\overline{\sigma}) \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
$\begin{array}{c} \text{R}_{DS(on)} \\ \text{R}_{esista} \\ \text{V}_{GS(th)} \\ \text{Gate TI} \\ \text{G}_{fs} \\ \text{Forward} \\ \text{I}_{DSS} \\ \text{Zero Gate TI} \\ \text{I}_{GSS} \\ \text{Forward} \\ \text{I}_{GSS} \\ \text{Reverse} \\ \hline \begin{array}{c} \textbf{DYNAM} \\ \textbf{C}_{iss} \\ \text{Input Cate Coss} \\ \textbf{Output Gate Coss} \\ \textbf{Q}_{g} \\ \text{Total Gate TI} \\ \textbf{Q}_{gs} \\ \textbf{Gate - Q}_{gd} \\ \textbf{Gate - Q}_{gd} \\ \textbf{Gate - Q}_{gd} \\ \textbf{Turn-Cate Coss} \\ \textbf{Turn-Cate Coss} \\ \textbf{Turn-Cate Coss} \\ \textbf{Turn-Cate Coss} \\ \textbf{Source} \\ \textbf{C}_{gs} \\ \textbf{C}_{gs}$	Drain – Source On–State ance Threshold Voltage rd Transconductance Gate Voltage Drain Current rd Gate – Source Leakage se Gate – Source Leakage MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{GS} = 10V$ $V_{GS} = 10V$ $V_{DS} = V_{GS}$ $V_{DS} \ge 15V$ $V_{GS} = 0$ $V_{GS} = 20V$ $V_{GS} = -20V$ $V_{GS} = 0$ $V_{DS} = 10V$	$I_D = 11A$ $I_D = 250\mu A$ $I_{DS} = 7A$ $V_{DS} = 0.8BV_{DSS}$		650	0.22 4 25 250 100	Ω V S(℧) μA nA
$\begin{array}{c cccc} R_{DS(on)} & Resista \\ V_{GS(th)} & Gate TI \\ g_{fs} & Forward \\ I_{DSS} & Zero Gate \\ I_{GSS} & Forward \\ I_{GSS} & Reverse \\ \hline & DYNAM \\ C_{iss} & Input Cate \\ C_{oss} & Output Gate \\ C_{rss} & Reverse \\ Q_{g} & Total Gate \\ Q_{gd} & Gate - \\ Q_{gd} & Gate - \\ Q_{gd} & Gate - \\ t_{d(on)} & Turn-Cate \\ t_{r} & Rise Tire \\ t_{d(off)} & Turn-Cate \\ t_{f} & Fall Tire \\ \hline SOURGE \\ \hline \end{array}$	ance Threshold Voltage rd Transconductance Gate Voltage Drain Current rd Gate – Source Leakage se Gate – Source Leakage MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{GS} = 10V$ $V_{DS} = V_{GS}$ $V_{DS} \ge 15V$ $V_{GS} = 0$ $V_{GS} = 20V$ $V_{GS} = -20V$ $V_{GS} = 0$ $V_{DS} = 25V$ $f = 1MHz$	$I_D = 11A$ $I_D = 250\mu A$ $I_{DS} = 7A$ $V_{DS} = 0.8BV_{DSS}$			0.22 4 25 250 100	V S(τ) μA nA
$\begin{array}{c cccc} V_{GS(th)} & \text{Gate TI} \\ \hline g_{fs} & \text{Forward} \\ \hline I_{DSS} & \text{Zero Gate} \\ \hline I_{GSS} & \text{Forward} \\ \hline I_{GSS} & \text{Revers} \\ \hline \hline \begin{array}{c} DYNAM \\ \hline C_{iss} & \text{Input Cate} \\ \hline C_{oss} & \text{Output Gate} \\ \hline C_{rss} & \text{Reverse} \\ \hline Q_{g} & \text{Total Gate} \\ \hline Q_{gd} & \text{Gate} - \\ \hline Q_{gd} & \text{Gate} - \\ \hline t_{d(on)} & \text{Turn-Cate} \\ \hline t_{f} & \text{Fall Tinh} \\ \hline \begin{array}{c} SOURG \\ \hline \end{array}$	Threshold Voltage rd Transconductance Gate Voltage Drain Current rd Gate – Source Leakage se Gate – Source Leakage MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{DS} = V_{GS}$ $V_{DS} \ge 15V$ $V_{GS} = 0$ $V_{GS} = 20V$ $V_{GS} = -20V$ $V_{GS} = 0$ $V_{DS} = 25V$ $f = 1MHz$	$I_D = 250\mu A$ $I_{DS} = 7A$ $V_{DS} = 0.8BV_{DSS}$			25 250 100	V S(σ) μA nA
Green Forward  IDSS Zero Green  IGSS Forward  IGSS Revers  DYNAM  Ciss Input Creen  Coss Output Creen  Creen  Qg Total Green  Qgd Gate —  Qgd Gate —  td(on) Turn—Creen  tr Rise Tire  td(off) Turn—Creen  tf Fall Tire  SOURCE	rd Transconductance  Gate Voltage Drain Current  rd Gate – Source Leakage se Gate – Source Leakage  MIC CHARACTERISTICS  Capacitance  Capacitance se Transfer Capacitance	$V_{DS} \ge 15V$ $V_{GS} = 0$ $V_{GS} = 20V$ $V_{GS} = -20V$ $V_{GS} = 0$ $V_{DS} = 25V$ $f = 1MHz$	$I_{DS} = 7A$ $V_{DS} = 0.8BV_{DSS}$			25 250 100	S(℧) μA nA
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Gate Voltage Drain Current  rd Gate – Source Leakage se Gate – Source Leakage  MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{GS} = 0$ $V_{GS} = 20V$ $V_{GS} = -20V$ $V_{GS} = 0$ $V_{DS} = 25V$ $f = 1MHz$	$V_{DS} = 0.8BV_{DSS}$	3		250 100	μA nA
$\begin{array}{c c} I_{GSS} & Forward \\ I_{GSS} & Revers \\ \hline & \textbf{DYNAM} \\ C_{iss} & Input Ca \\ C_{oss} & Output Ca \\ C_{rss} & Reverse \\ Q_g & Total Ga \\ Q_{gd} & Gate - \\ Q_{gd} & Gate - \\ t_{d(on)} & Turn-Ca \\ t_r & Rise Tire \\ t_{d(off)} & Turn-Ca \\ t_f & Fall Tire \\ \hline & \textbf{SOURG} \end{array}$	rd Gate – Source Leakage se Gate – Source Leakage MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{GS} = 20V$ $V_{GS} = -20V$ $V_{GS} = 0$ $V_{DS} = 25V$ $f = 1MHz$				250 100	nA
$\begin{array}{c c} I_{GSS} & Forward \\ I_{GSS} & Revers \\ \hline & \textbf{DYNAM} \\ C_{iss} & Input Call \\ C_{oss} & Output Call \\ C_{rss} & Reverse \\ Q_g & Total Gall \\ Q_{gd} & Gate - \\ Q_{gd} & Gate - \\ C_{gd} & Gate - \\ C_{r} & Rise Tire \\ C_{r} & Rise Tire \\ C_{r} & Fall Tire \\ \hline \\ SOURGE \\ \hline \end{array}$	MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{GS} = -20V$ $V_{GS} = 0$ $V_{DS} = 25V$ $f = 1MHz$	I <sub>J</sub> = 125°C			100	
$\begin{array}{c c} I_{GSS} & Revers \\ \hline & \textbf{DYNAM} \\ \hline C_{iss} & Input Ca \\ \hline C_{oss} & Output Ca \\ \hline C_{rss} & Reverse \\ \hline Q_g & Total Ga \\ \hline Q_{gs} & Gate - \\ \hline Q_{gd} & Gate - \\ \hline t_{d(on)} & Turn-Ca \\ \hline t_r & Rise Till \\ \hline t_{d(off)} & Turn-Ca \\ \hline t_f & Fall Tin \\ \hline \textbf{SOURG} \end{array}$	MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{GS} = -20V$ $V_{GS} = 0$ $V_{DS} = 25V$ $f = 1MHz$					
$\begin{array}{c c} \textbf{DYNAM} \\ \textbf{C}_{iss} & \text{Input Ca} \\ \textbf{C}_{oss} & \text{Output Ga} \\ \textbf{C}_{rss} & \text{Reverse} \\ \textbf{Q}_g & \text{Total Ga} \\ \textbf{Q}_{gs} & \text{Gate} - \\ \textbf{Q}_{gd} & \text{Gate} - \\ \textbf{t}_{d(on)} & \text{Turn-Ca} \\ \textbf{t}_r & \text{Rise Tir} \\ \textbf{t}_{d(off)} & \text{Turn-Ca} \\ \textbf{t}_f & \text{Fall Tirn} \\ \textbf{SOURG} \end{array}$	MIC CHARACTERISTICS Capacitance Capacitance se Transfer Capacitance	$V_{GS} = 0$ $V_{DS} = 25V$ $f = 1MHz$				-100	
$\begin{array}{ccc} C_{iss} & \text{Input Ca} \\ C_{oss} & \text{Output of } \\ C_{rss} & \text{Reverse} \\ Q_g & \text{Total Ga} \\ Q_{gs} & \text{Gate} - \\ Q_{gd} & \text{Gate} - \\ t_{d(on)} & \text{Turn-C} \\ t_r & \text{Rise Til} \\ t_{d(off)} & \text{Turn-C} \\ t_f & \text{Fall Tin} \\ & \text{SOURG} \end{array}$	Capacitance Capacitance se Transfer Capacitance	$V_{DS} = 25V$ f = 1MHz	-				
$\begin{array}{ccc} C_{oss} & \text{Output} \\ C_{rss} & \text{Reverse} \\ Q_g & \text{Total Ga} \\ Q_{gs} & \text{Gate} - \\ Q_{gd} & \text{Gate} - \\ t_{d(on)} & \text{Turn-C} \\ t_r & \text{Rise Tire} \\ t_{d(off)} & \text{Turn-C} \\ t_f & \text{Fall Tine} \\ & \text{SOURG} \\ \end{array}$	Capacitance se Transfer Capacitance	$V_{DS} = 25V$ f = 1MHz	-				
$\begin{array}{ccc} C_{rss} & \text{Reverse} \\ Q_g & \text{Total Ga} \\ Q_{gs} & \text{Gate} - \\ Q_{gd} & \text{Gate} - \\ t_{d(on)} & \text{Turn-C} \\ t_r & \text{Rise Tir} \\ t_{d(off)} & \text{Turn-C} \\ t_f & \text{Fall Tin} \\ & \text{SOURG} \end{array}$	se Transfer Capacitance	f = 1MHz			240		I ~ -
$\begin{array}{ccc} Q_g & Total \ G_s \\ Q_{gs} & Gate - \\ Q_{gd} & Gate - \\ t_{d(on)} & Turn - C_s \\ t_r & Rise \ Tir \\ t_{d(off)} & Turn - C_s \\ t_f & Fall \ Tin \\ \hline \textbf{SOURG} \end{array}$	- -				44		pF
$\begin{array}{ccc} Q_{gs} & \text{Gate} - \\ Q_{gd} & \text{Gate} - \\ t_{d(on)} & \text{Turn-C} \\ t_{r} & \text{Rise Tir} \\ t_{d(off)} & \text{Turn-C} \\ t_{f} & \text{Fall Tin} \\ \hline \textbf{SOURC} \end{array}$	Sate Charge	$V_{GS} = 10V$					
$\begin{array}{ccc} Q_{gs} & \text{Gate} - \\ Q_{gd} & \text{Gate} - \\ t_{d(on)} & \text{Turn-C} \\ t_{r} & \text{Rise Tir} \\ t_{d(off)} & \text{Turn-C} \\ t_{f} & \text{Fall Tin} \\ & \text{SOURG} \end{array}$	Total Gate Charge		_	12.8	12.8 28.	28.5	nC
$\begin{array}{ccc} & & & & \\ Q_{gd} & & Gate - \\ & t_{d(on)} & Turn-C \\ t_r & & Rise Til \\ & t_{d(off)} & Turn-C \\ t_f & & Fall Tin \\ & & & SOURC \\ \end{array}$		$V_{DS} = 0.5BV_{DSS}$	S			<del></del>	<u> </u>
$\begin{array}{ccc} & & & \\ t_{d(on)} & & Turn-C \\ t_r & & Rise\ Till \\ t_{d(off)} & & Turn-C \\ t_f & & Fall\ Tin \\ & & &$	Source Charge	I <sub>D</sub> = 11A		1.0		6.3	nC ns
$t_r$ Rise Tine $t_{d(off)}$ Turn—C $t_f$ Fall Tine SOURC	Drain ("Miller") Charge	$V_{DS} = 0.5BV_{DSS}$	S	3.8		16.6	
t <sub>d(off)</sub> Turn–C t <sub>f</sub> Fall Tin	On Delay Time	V <sub>DD</sub> = 50V				30	
t <sub>f</sub> Fall Tin	ïme	- I <sub>D</sub> = 11A				75	
SOUR	Off Delay Time	$R_G = 7.5\Omega$				40	
	me					45	
I <sub>S</sub> Continu	CE – DRAIN DIODE CHARAC	TERISTICS					
	uous Source Current					11	_
I <sub>SM</sub> Pulse S	Source Current					43	A
V <sub>SD</sub> Diode F	Forward Voltage	I <sub>S</sub> = 11A V <sub>GS</sub> = 0	T <sub>J</sub> = 25°C			1.5	V
t <sub>rr</sub> Revers		I <sub>S</sub> = 11A	T <sub>.J</sub> = 25°C			300	ns
••	se Recovery Time	_   d <sub>i</sub> / d <sub>t</sub> ≤ 100A/μs				3	μC
	se Recovery Time se Recovery Charge	1 ' '	טט				<u>.                                    </u>
	se Recovery Charge						
L <sub>S</sub> Internal	se Recovery Charge  AGE CHARACTERISTICS	rom 6mm down drain le	ead pad to centre of die)		8.7		nH