



### Description

The IRFHM9331PbF uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is well suited for high current load applications.

### General Features

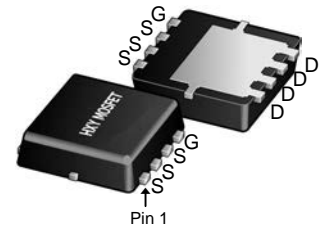
$V_{DS} = -30V, I_D = -40A$

$R_{DS(ON)} < 15m\Omega @ V_{GS} = -10V$

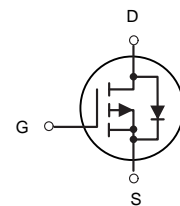
$R_{DS(ON)} < 26m\Omega @ V_{GS} = -4.5V$

### Application

High side switch for full bridge converter  
DC/DC converter for LCD display



DFN3X3-8L



P-Channel MOSFET

### Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
IRFHM9331PbF	DFN3X3-8L	HXY MOSFET	5000

### Absolute Maximum Ratings@ $T_J = 25^\circ C$ (unless otherwise specified)

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	-30	V
V <sub>GS</sub>	Gate-Source Voltage	+25	V
I <sub>D</sub> @T <sub>A</sub> =25°C	Drain Current <sup>3</sup> , V <sub>GS</sub> @ 10V	-40	A
I <sub>D</sub> @T <sub>A</sub> =70°C	Drain Current <sup>3</sup> , V <sub>GS</sub> @ 10V	-25	A
IDM	Pulsed Drain Current <sup>1</sup>	-120	A
P <sub>D</sub> @T <sub>A</sub> =25°C	Total Power Dissipation	15	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C
R <sub>thj-c</sub>	Maximum Thermal Resistance, Junction-case	6	°C/W
R <sub>thj-a</sub>	Maximum Thermal Resistance, Junction-ambient <sup>3</sup>	66	°C/W



**Electrical Characteristics** ( $T_J=25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-30V, V_{GS}=0V,$	-	-	-1	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.6	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance Note3	$V_{GS}=-10V, I_D=-10A$	-	12	15	m $\Omega$
		$V_{GS}=-4.5V, I_D=-5A$	-	18	26	
$C_{iss}$	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V,$ $f=1.0MHz$	-	1330	-	pF
$C_{oss}$	Output Capacitance		-	183	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	156	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=-15V, I_D=-5A,$ $V_{GS}=-10V$	-	22	-	nC
$Q_{gs}$	Gate-Source Charge		-	1.0	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	1.8	-	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=-15V, I_D=-10A,$ $V_{GS}=-10V, R_{GEN}=2.5\Omega$	-	9	-	ns
$t_r$	Turn-on Rise Time		-	13	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	48	-	ns
$t_f$	Turn-off Fall Time		-	20	-	ns
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	-40	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-90	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=-15A$	-	-0.8	-1.2	V
$t_{rr}$	Reverse Recovery Time	$T_J=25^\circ\text{C},$	-	64	-	ns
$Q_{rr}$	Reverse Recovery Charge	$V_{DD}=-24V, I_F=-2.8A,$ $di/dt=-100A/\mu s$	-	25	-	nC

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

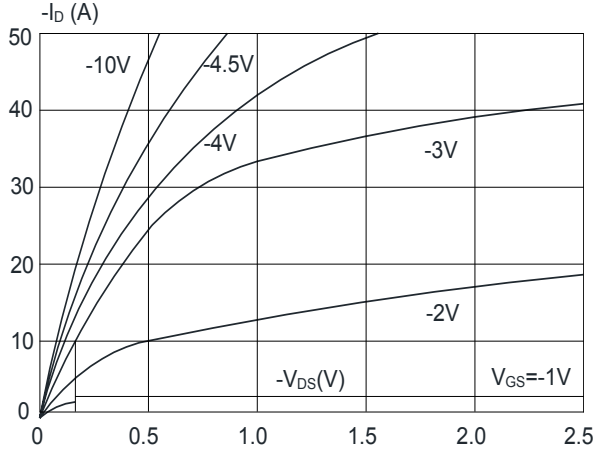
2. EAS condition:  $T_J=25^\circ\text{C}, V_{GS}=10V, R_G=25\Omega, L=0.5mH, I_{AS}=-12.7A$

3. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$

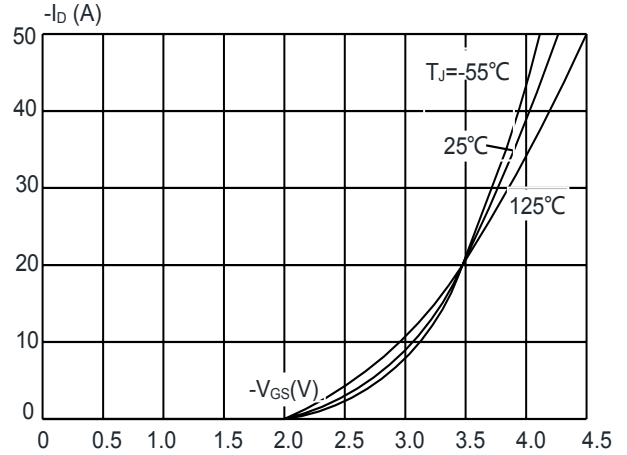


## Typical Performance Characteristics

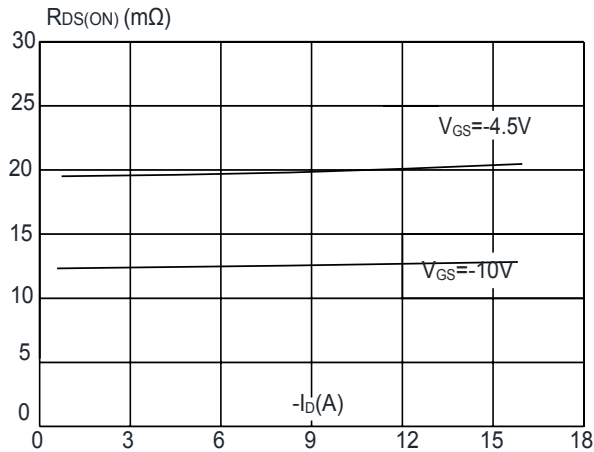
**Figure 1: Output Characteristics**



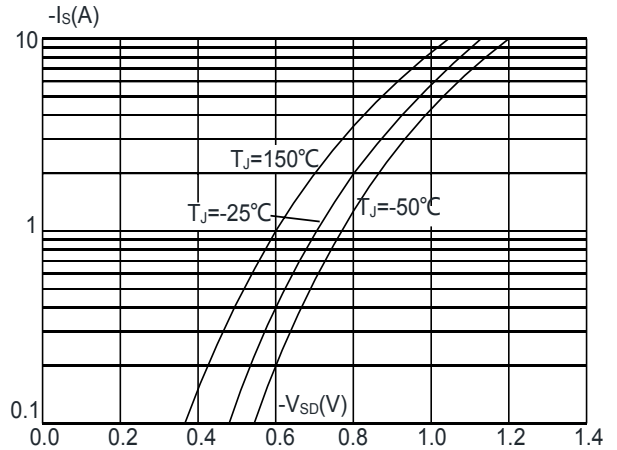
**Figure 2: Typical Transfer Characteristics**



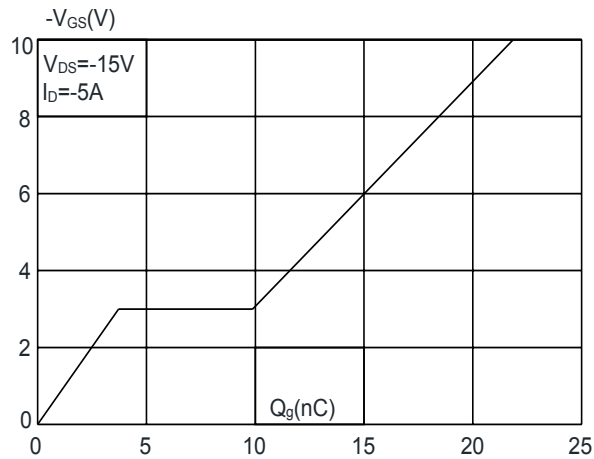
**Figure 3: On-resistance vs. Drain Current**



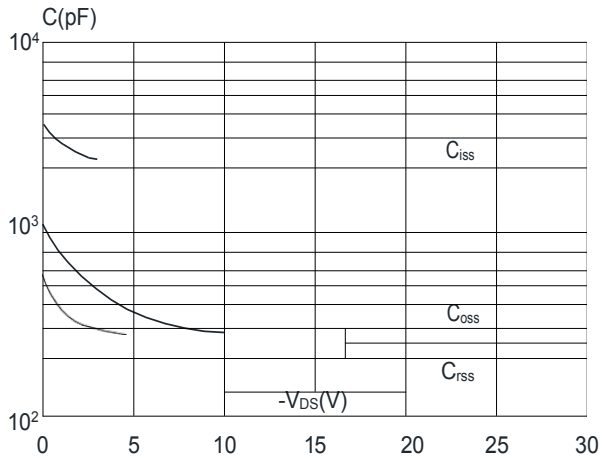
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**

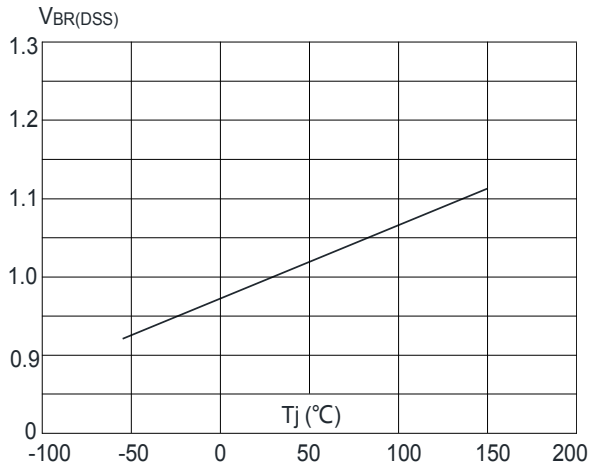


**Figure 6: Capacitance Characteristics**

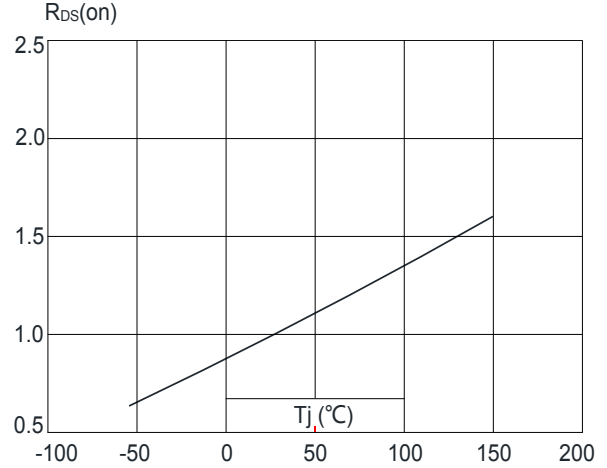




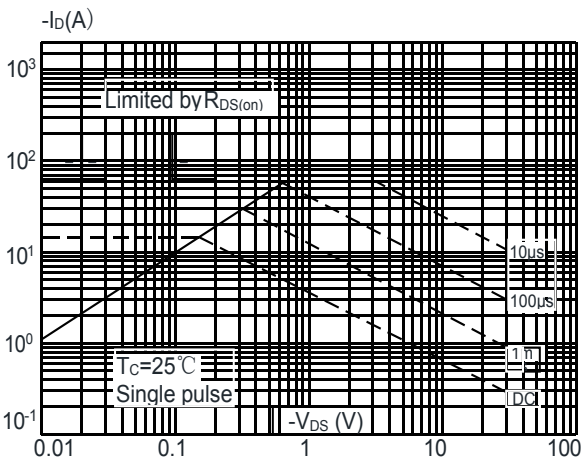
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



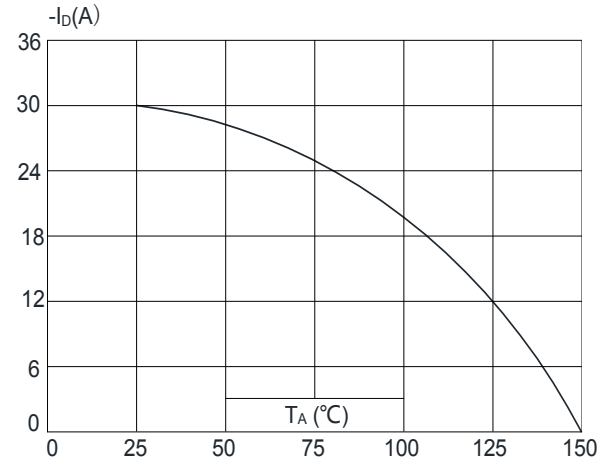
**Figure 8:** Normalized on Resistance vs. Junction Temperature



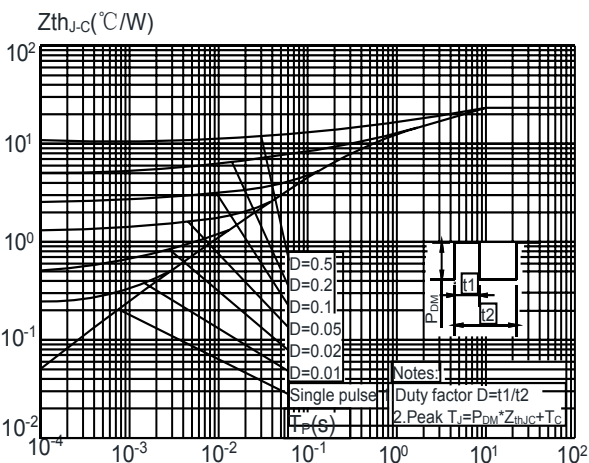
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature



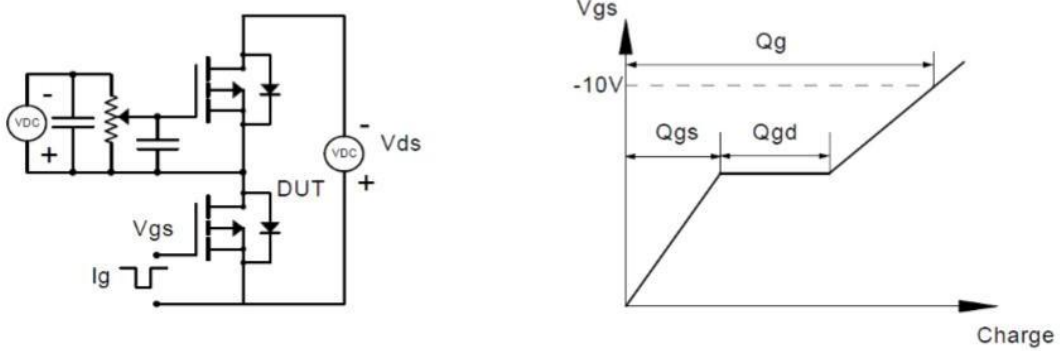
**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



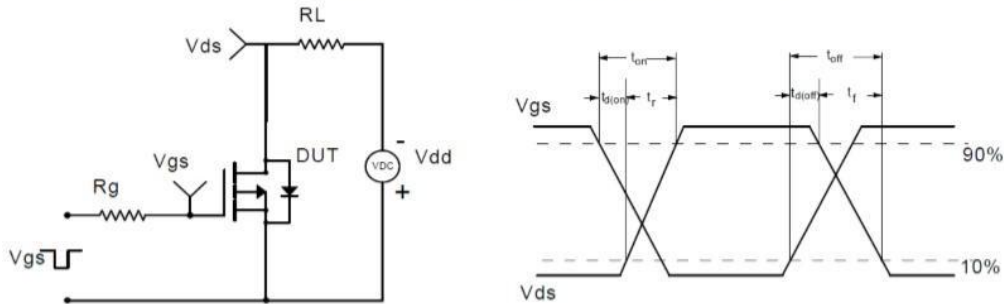


## Test Circuit

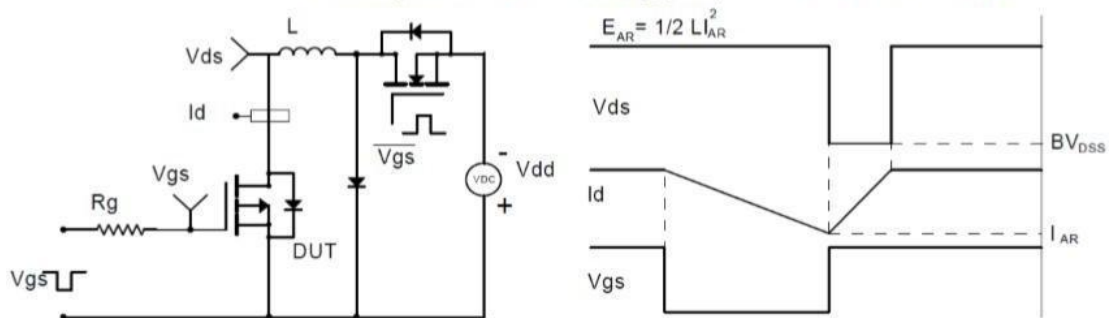
### Gate Charge Test Circuit & Waveform



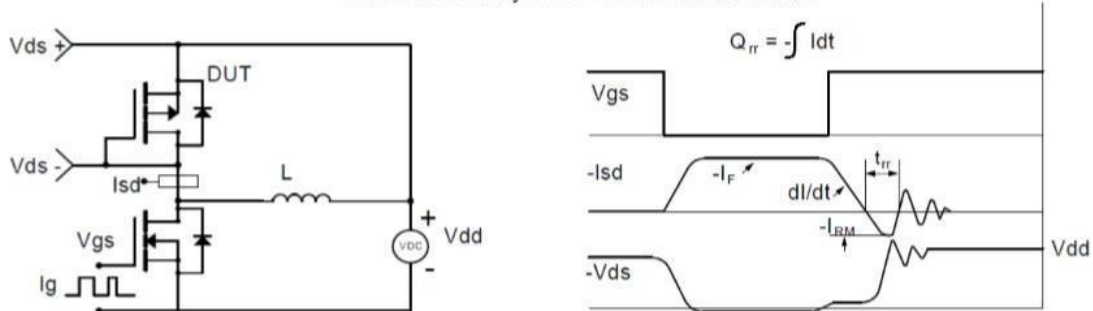
### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

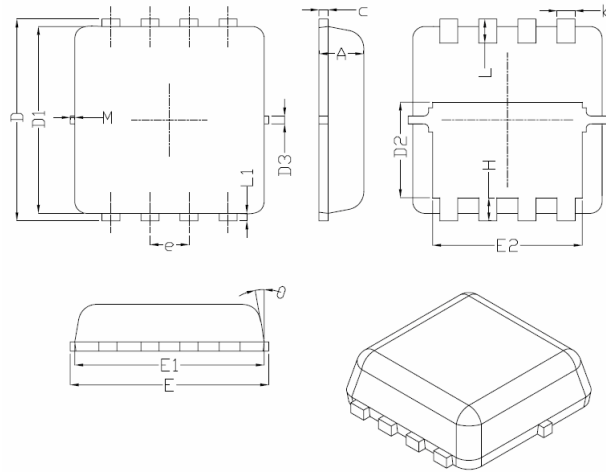


### Diode Recovery Test Circuit & Waveforms





### DFN3X3-8L Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.48	1.58	1.68
D3	-	0.13	-
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
M	*	*	0.15
θ		10°	12°



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