



**Description**

The IRFHM9331TRPBF 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**

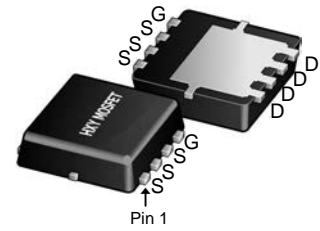
$V_{DS} = -30V, I_D = -40A$

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

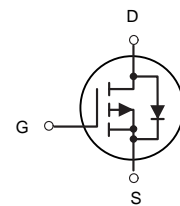
$R_{DS(ON)} < 26m\Omega @ V_{GS} = -4.5V$

**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	Marking	Qty(PCS)
IRFHM9331TRPBF	DFN3X3-8L	9331 XXXX	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
I <sub>DM</sub>	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<sub>J</sub>=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA	-30	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -30V, V <sub>GS</sub> =0V,	-	-	-1	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V	-	-	±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1.0	-1.6	-2.5	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>Note3</small>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A	-	12	15	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A	-	18	26	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -15V, V <sub>GS</sub> =0V, f=1.0MHz	-	1330	-	pF
C <sub>oss</sub>	Output Capacitance		-	183	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	156	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -15V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -10V	-	22	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	1.0	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	1.8	-	nC
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = -15V, I <sub>D</sub> = -10A, V <sub>GS</sub> =-10V, R <sub>GEN</sub> =2.5Ω	-	9	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	13	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	48	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	20	-	ns
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	-40	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-90	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> = -15A	-	-0.8	-1.2	V
trr	Reverse Recovery Time	T <sub>J</sub> =25°C,	-	64	-	ns
Qrr	Reverse Recovery Charge	V <sub>DD</sub> = -24V, I <sub>F</sub> =-2.8A, di/dt=-100A/μs	-	25	-	nC

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

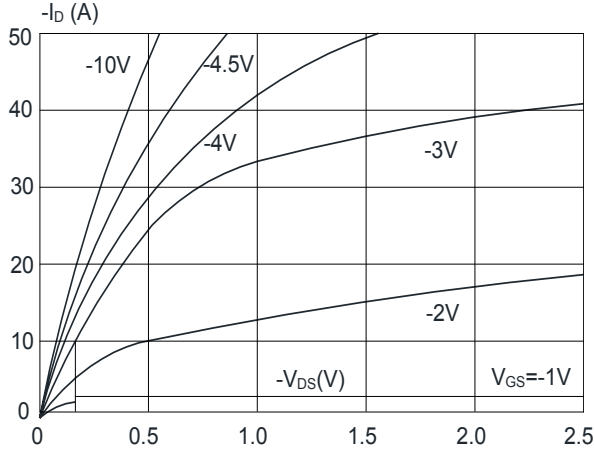
2. EAS condition: T<sub>J</sub>=25°C, V<sub>GS</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH, I<sub>AS</sub>=-12.7A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

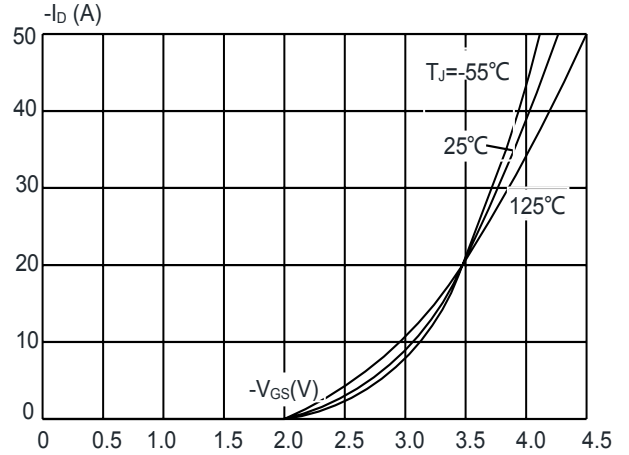


## Typical Performance Characteristics

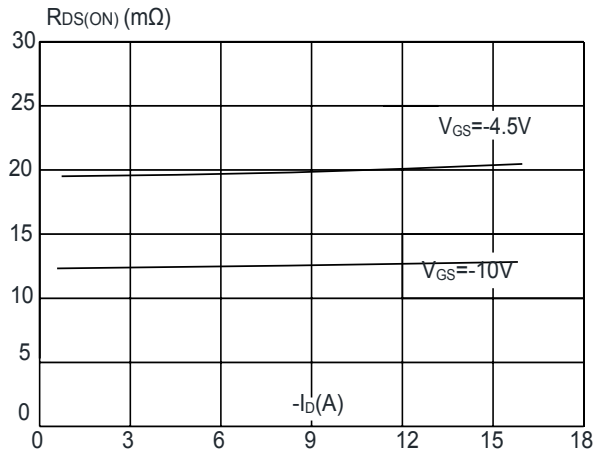
**Figure 1: Output Characteristics**



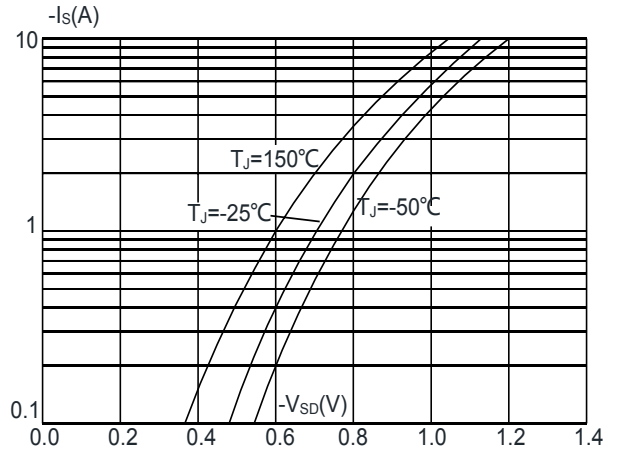
**Figure 2: Typical Transfer Characteristics**



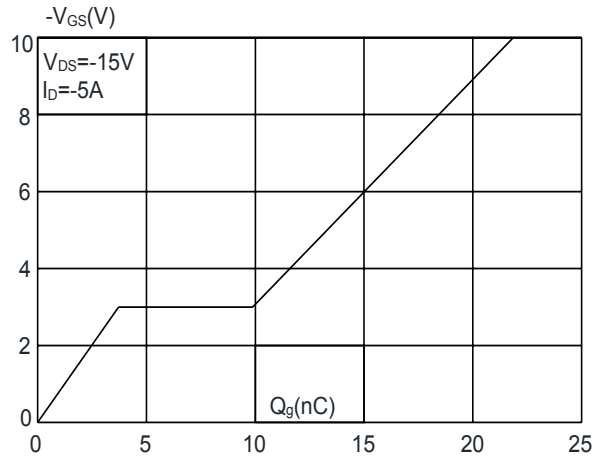
**Figure 3: On-resistance vs. Drain Current**



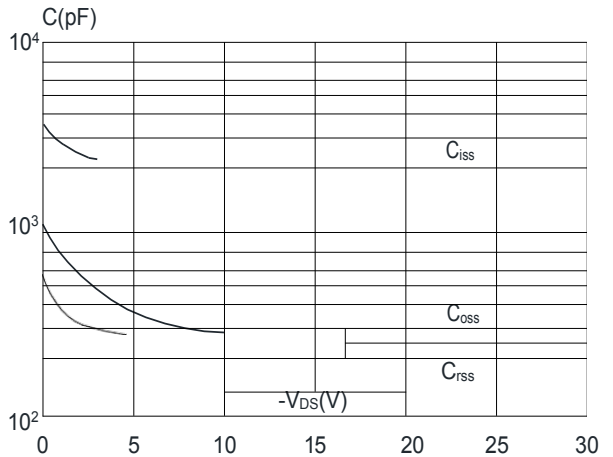
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**

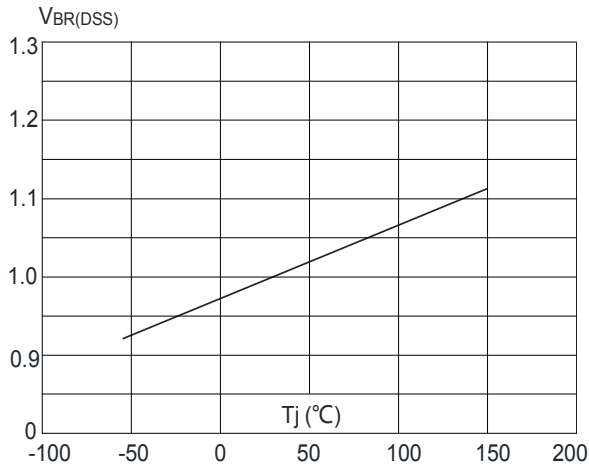


**Figure 6: Capacitance Characteristics**

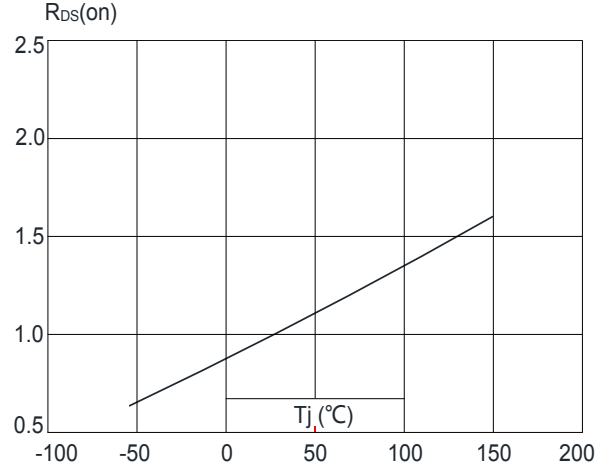




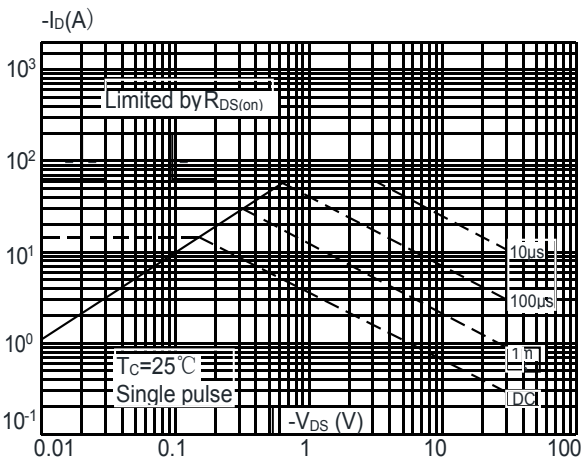
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



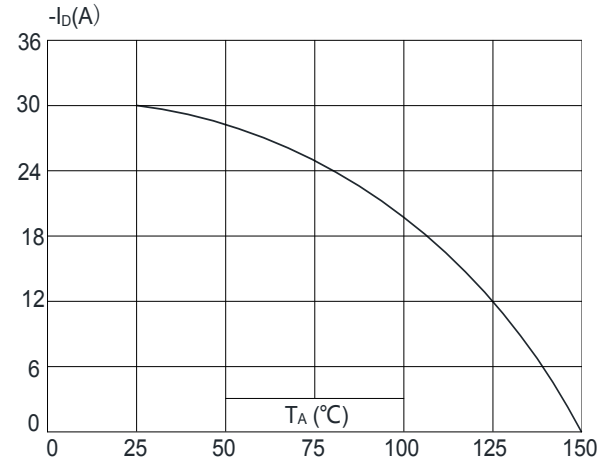
**Figure 8:** Normalized on Resistance vs. Junction Temperature



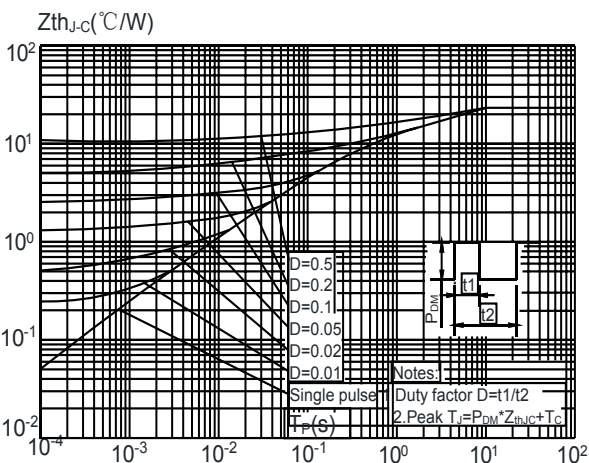
**Figure 9:** Maximum Safe Operating Area



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



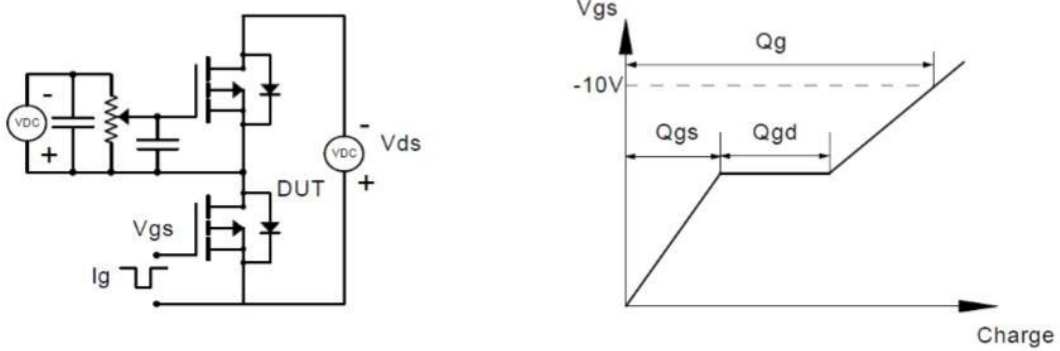
**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



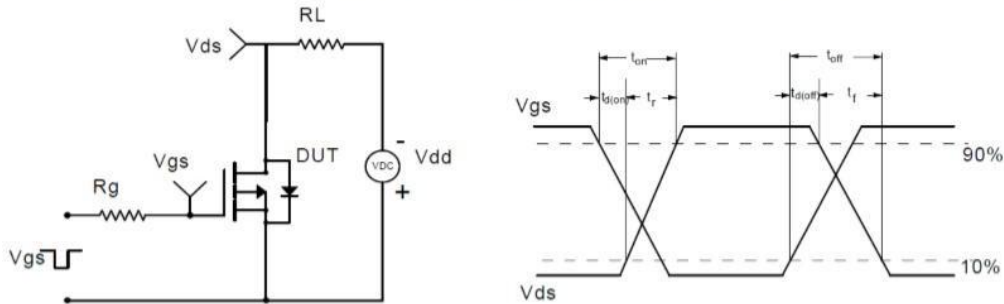


## Test Circuit

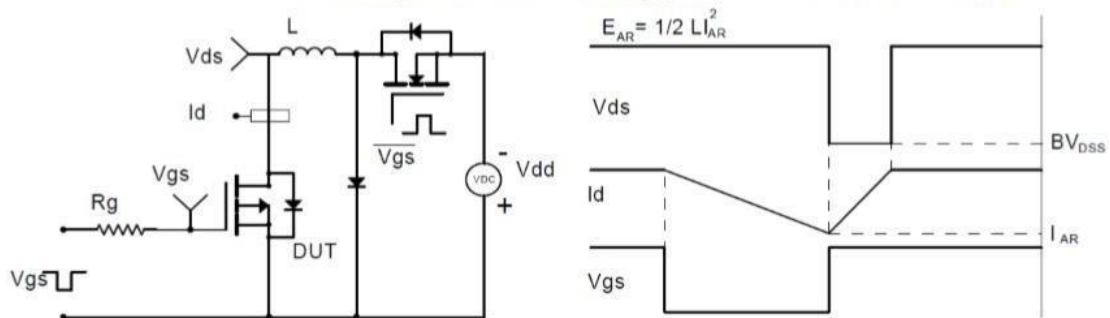
### Gate Charge Test Circuit & Waveform



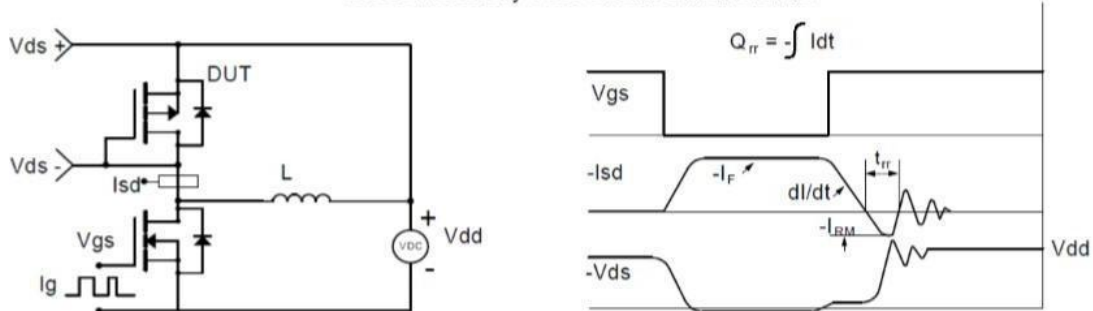
### Resistive Switching Test Circuit & Waveforms



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

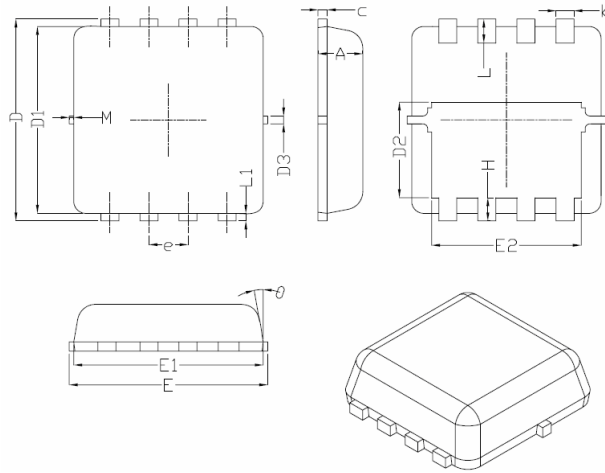


### Diode Recovery Test Circuit & Waveforms





### 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
$\theta$		10°	12°



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