

# HRLFS72N06P

## 65V N-Channel Trench MOSFET

### Features

- High Speed Power Switching, Logic Level
- Enhanced Body diode dv/dt capability
- Enhanced Avalanche Ruggedness
- 100% UIS Tested, 100% Rg Tested
- Lead free, Halogen Free

### Application

- Synchronous Rectification in SMPS
- Hard Switching and High Speed Circuit
- DC/DC in Telecoms and Industrial

### Key Parameters

Parameter	Value	Unit
$BV_{DSS}$	65	V
$I_D$	58	A
$R_{DS(on)}$ , typ @10V	6.0	m $\Omega$
$R_{DS(on)}$ , typ @4.5V	9.6	m $\Omega$

### Package & Internal Circuit



### Absolute Maximum Ratings $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Value	Units	
$V_{DSS}$	Drain-Source Voltage	65	V	
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V	
$I_D$	Drain Current	$T_C = 25^\circ\text{C}$	58	A
		$T_C = 100^\circ\text{C}$	37	A
$I_{DM}$	Pulsed Drain Current	232	A	
$E_{AS}$	Single Pulsed Avalanche Energy	L=0.1mH	140	mJ
$V_{SPIKE}$	$V_{DS}$ Spike	10us	80	V
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	61.2	W
		$T_A = 25^\circ\text{C}$	2.0	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$	

### Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	--	2.04	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient (steady state)	--	62	$^\circ\text{C/W}$

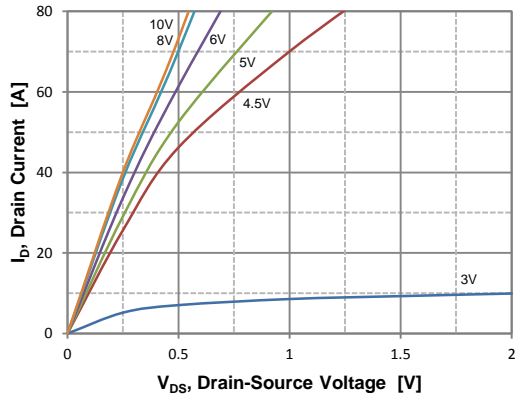
**Electrical Characteristics**  $T_J=25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>On Characteristics</b>						
$V_{GS}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	1.0	--	2.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 20 \text{ A}$	--	6.0	7.2	m $\Omega$
		$V_{GS} = 4.5 \text{ V}, I_D = 15 \text{ A}$	--	9.6	12.5	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 3 \text{ A}$	--	10	--	S
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	65	--	--	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 48 \text{ V}, T_J = 85^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	$\pm 1$	$\mu\text{A}$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, f = 1.0 \text{ MHz}$	--	1910	--	pF
$C_{oss}$	Output Capacitance		--	520	--	pF
$C_{rss}$	Reverse Transfer Capacitance		--	30	--	pF
$R_g$	Gate Resistance	$V_{GS} = 0 \text{ V}, V_{DS} = 0 \text{ V}, f = 1\text{MHz}$	--	1.2	--	$\Omega$
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 30 \text{ V}, I_D = 10 \text{ A}, R_G = 10 \Omega$	--	10.2	--	ns
$t_r$	Turn-On Rise Time		--	16	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	42	--	ns
$t_f$	Turn-Off Fall Time		--	38	--	ns
$Q_g$	Total Gate Charge	$V_{DS} = 30 \text{ V}, I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}$	--	34.7	--	nC
$Q_{gs}$	Gate-Source Charge		--	4.9	--	nC
$Q_{gd}$	Gate-Drain Charge		--	11.1	--	nC
<b>Source-Drain Diode Characteristics</b>						
$V_{SD}$	Source-Drain Diode Forward Voltage	$I_S = 1 \text{ A}, V_{GS} = 0 \text{ V}$	--	--	1.0	V
$t_{rr}$	Reverse Recovery Time	$I_S = 10 \text{ A}, V_{GS} = 10 \text{ V}, di_F/dt = 100 \text{ A}/\mu\text{s}$	--	48.4	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	54.2	--	nC

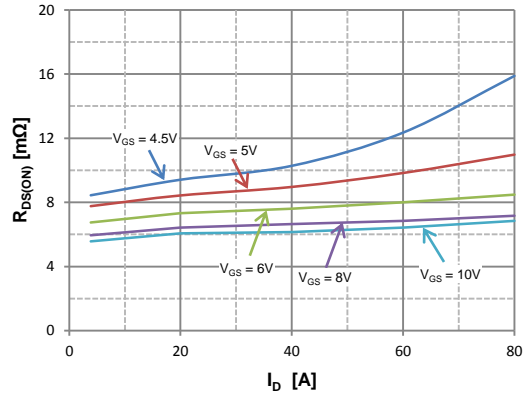
**Notes :**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L=0.1\text{mH}, I_{AS}=53\text{A}, V_{DD}=25\text{V}, R_G=25\Omega,$  Starting  $T_J=25^\circ\text{C}$

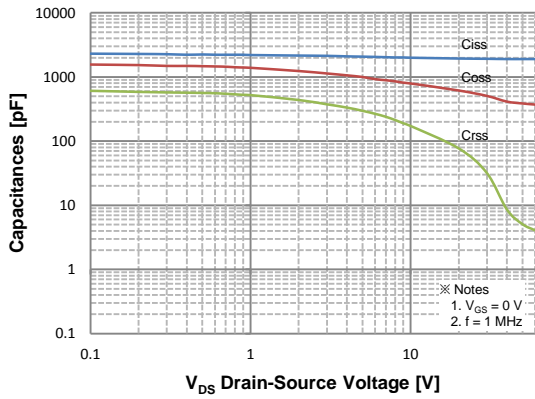
## Typical Characteristics



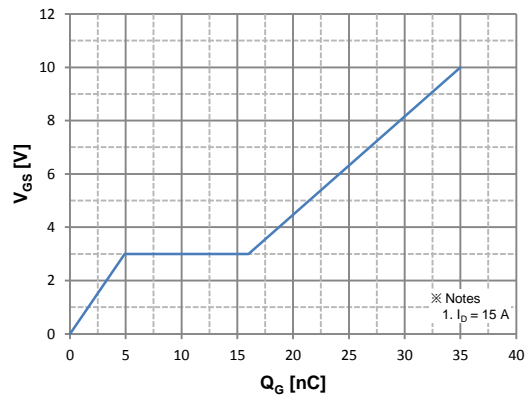
**Figure 1. On Region Characteristics**



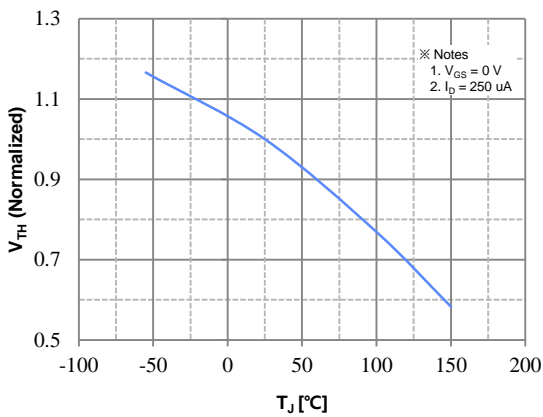
**Figure 2. On Resistance Variation vs Drain Current and Gate Voltage**



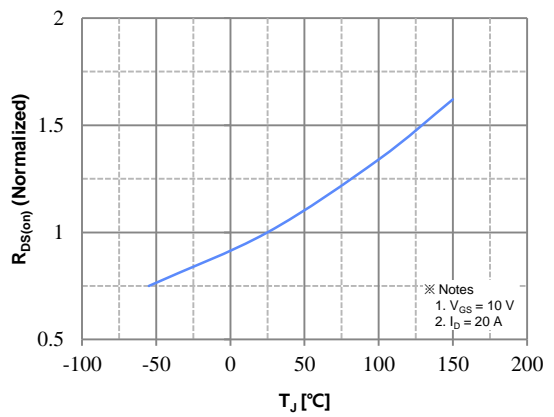
**Figure 3. Capacitance Characteristics**



**Figure 4. Gate Charge Characteristics**

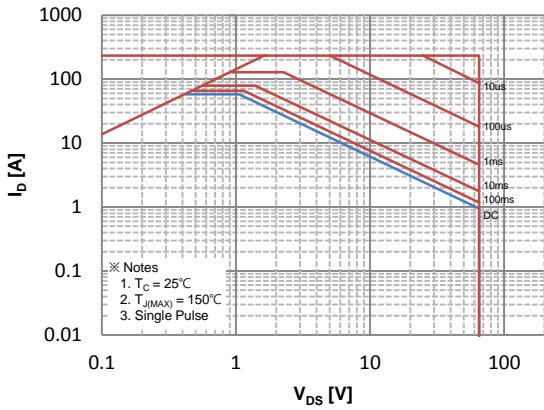


**Figure 4. Gate Threshold Voltage vs Temperature**

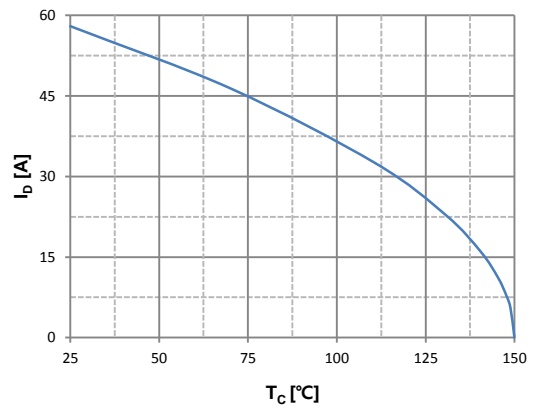


**Figure 6. On-Resistance Variation vs Temperature**

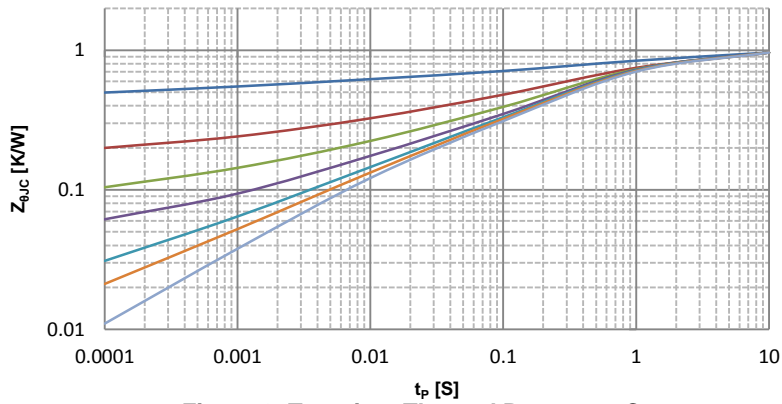
**Typical Characteristics (continued)**



**Figure 7. Maximum Safe Operating Area**

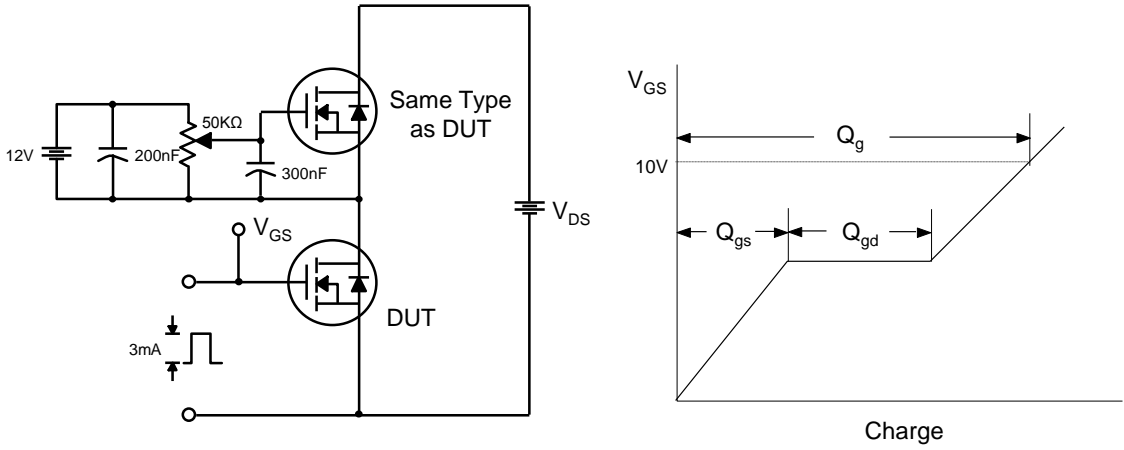


**Figure 8. Maximum Drain Current vs Case Temperature**

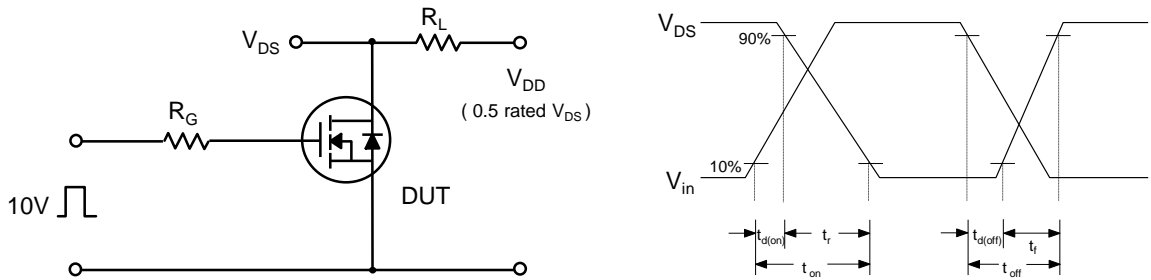


**Figure 9. Transient Thermal Response Curve**

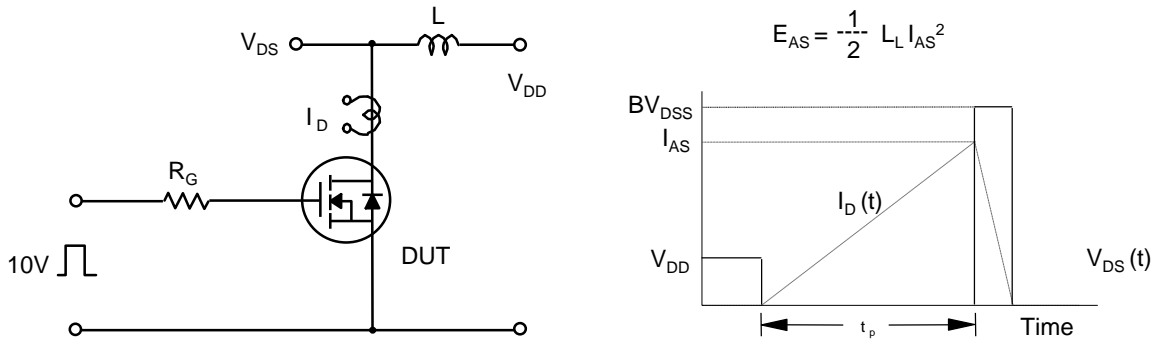
**Fig 12. Gate Charge Test Circuit & Waveform**



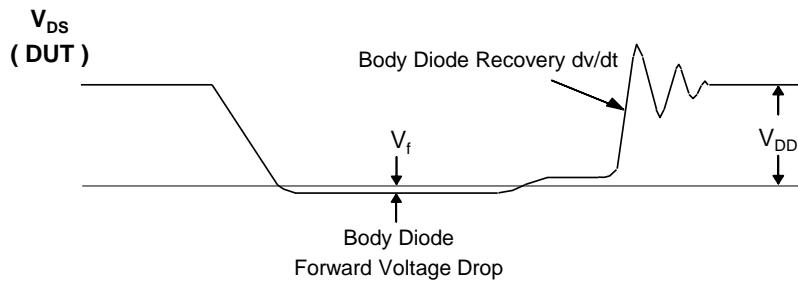
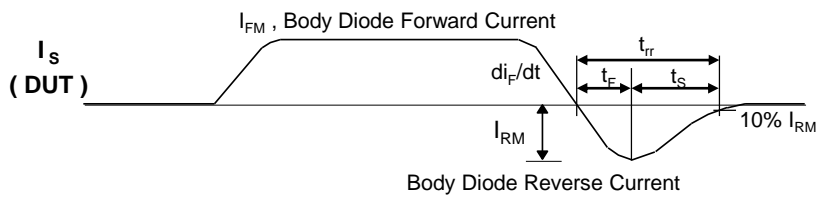
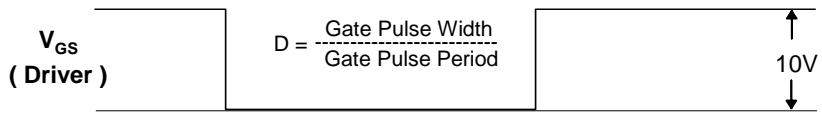
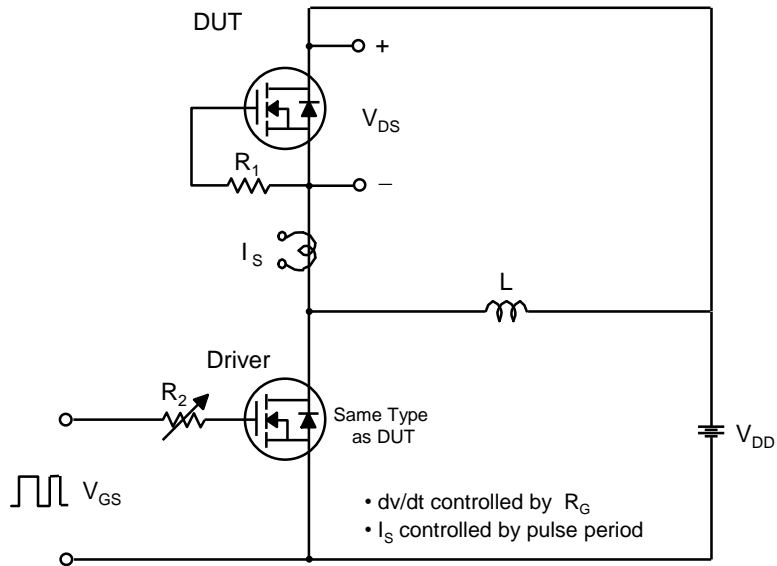
**Fig 13. Resistive Switching Test Circuit & Waveforms**



**Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**

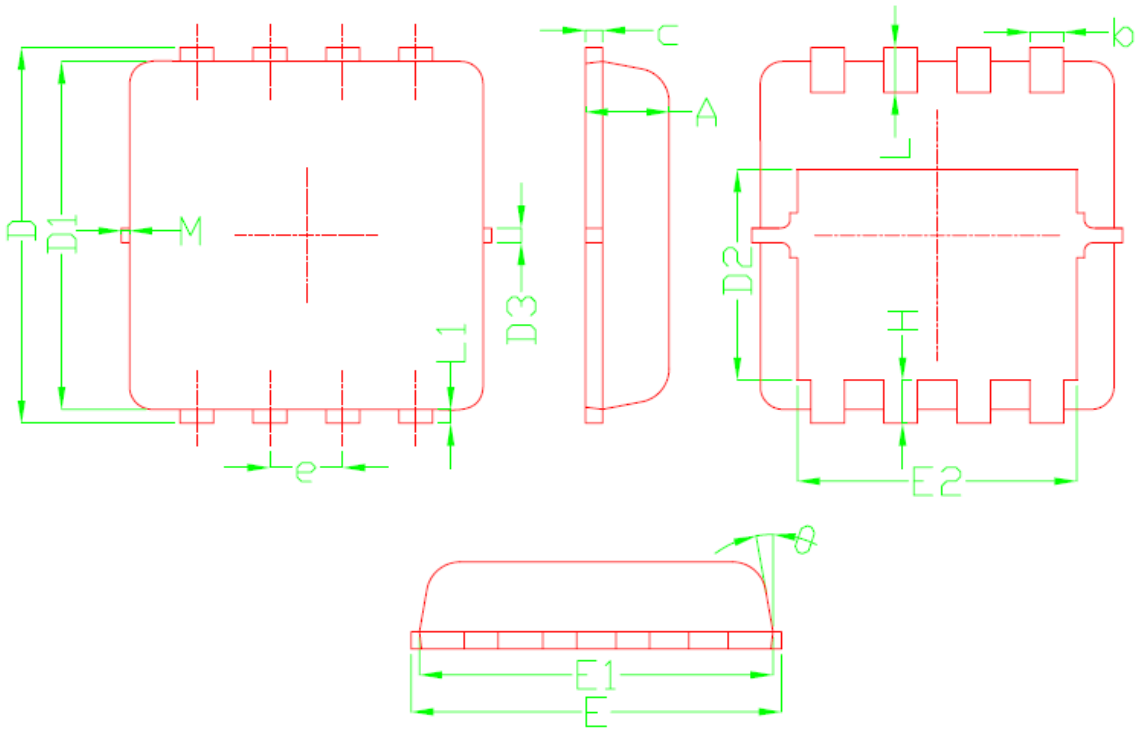


**Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms**



**Package Dimension**

**8DFN 3x3**



SYMBOL	DIMENSIONAL REOMTS		
	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	1.78	1.88	1.98
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	---
theta	---	10°	12°
M	*	*	0.15
* Not specified			

