May 2020

SemiHow
Know-How for Semiconductor

HRLFS136N10P

100V 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

Key Parameters

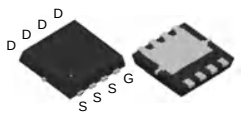
Parameter	Value	Unit
BV_{DSS}	100	V
I_D	48	A
$R_{DS(on),\ typ\ @10V}$	11.3	mΩ
$R_{DS(on),\ typ\ @4.5V}$	16.7	mΩ

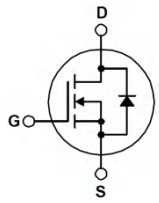
Application

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

Package & Internal Circuit

8DFN 3x3





Absolute Maximum Ratings

T_J=25℃ unless otherwise specified

Symbol	Parameter		Value	Units
V_{DSS}	Drain-Source Voltage		100	V
V_{GS}	Gate-Source Voltage		±20	V
I_D	Drain Current	T_C= 25℃	48	A
		T_C = 100℃	30	A
I_{DM}	Pulsed Drain Current		192	A
E_{AS}	Single Pulsed Avalanche Energy	L=1mH	60	mJ
V_{SPIKE}	V_{DS} Spike	10us	120	V
P_D	Power Dissipation	T_C = 25℃	61	W
		T_A = 25℃	2.0	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	℃

Thermal Resistance Characteristics

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

Electrical Characteristics T_J=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
V_{GS}	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	1.0	--	2.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 20 A	--	11.3	13.6	mΩ
		V_{GS} = 4.5 V, I_D = 15 A	--	16.7	22.0	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 3 A	--	8	--	S
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	100	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 100 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 80 V, T_J = 85℃	--	--	10	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	--	--	±100	nA
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1.0 MHz	--	1640	--	pF
C_{oss}	Output Capacitance		--	240	--	pF
C_{rss}	Reverse Transfer Capacitance		--	4	--	pF
R_g	Gate Resistance	V_{GS} = 0 V, V_{DS} = 0 V, f = 1MHz	--	1.2	--	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	V_{DS} = 50 V, I_D = 10 A, R_G = 6 Ω	--	14.2	--	ns
t_r	Turn-On Rise Time		--	20.8	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	42	--	ns
t_f	Turn-Off Fall Time		--	30	--	ns
Q_g	Total Gate Charge	V_{DS} = 50 V, I_D = 10 A, V_{GS} = 10 V	--	27.8	--	nC
Q_{gs}	Gate-Source Charge		--	3.5	--	nC
Q_{gd}	Gate-Drain Charge		--	8.8	--	nC
Source-Drain Diode Characteristics						
V_{SD}	Source-Drain Diode Forward Voltage	I_S = 1 A, V_{GS} = 0 V	--	--	1.0	V
trr	Reverse Recovery Time	I_S = 10 A, V_{GS} = 10 V di_F/dt = 100 A/μs	--	43.5	--	ns
Qrr	Reverse Recovery Charge		--	59.6	--	nC

Notes :

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=1mH, I_{AS}=11A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C

Typical Characteristics

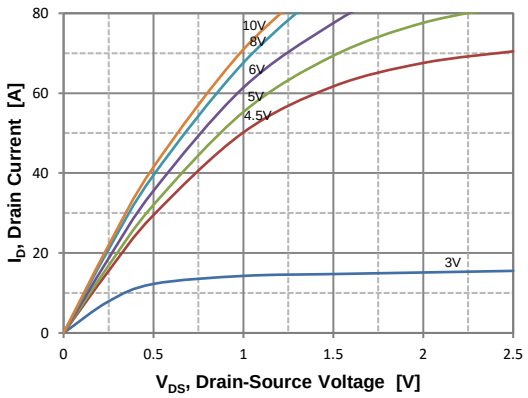


Figure 1. On Region Characteristics

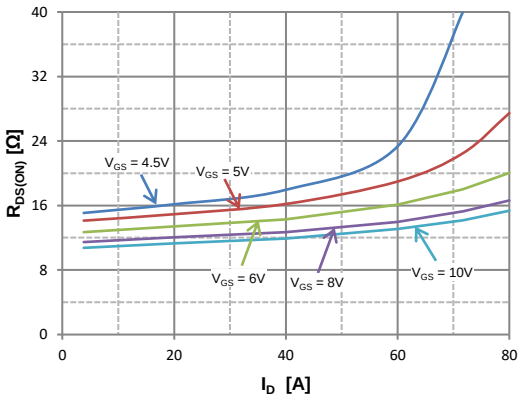


Figure 2. On Resistance Variation vs Drain Current and Gate Voltage

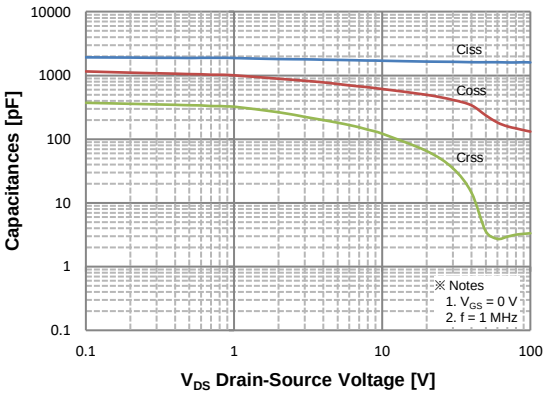


Figure 3. Capacitance Characteristics

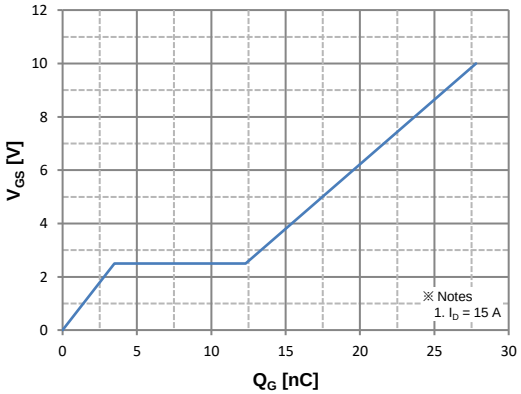


Figure 4. Gate Charge Characteristics

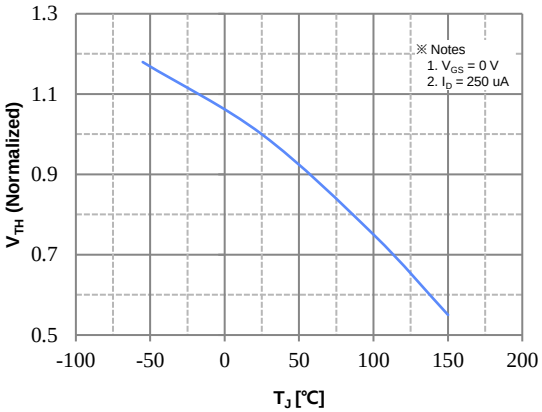


Figure 4. Gate Threshold Voltage vs Temperature

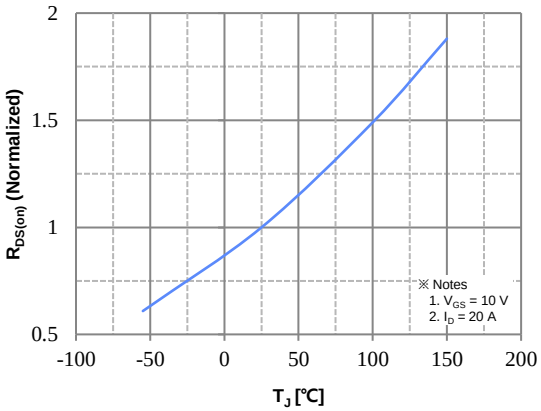


Figure 6. On-Resistance Variation vs Temperature

Typical Characteristics (continued)

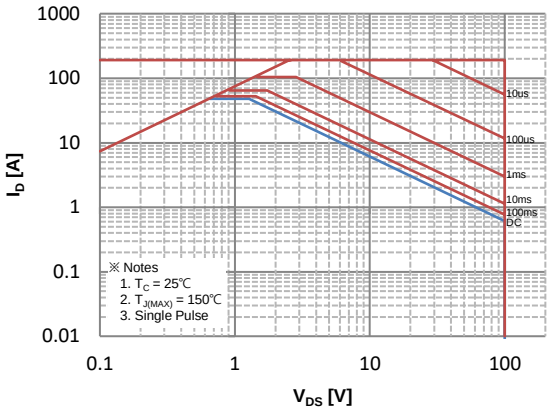


Figure 7. Maximum Safe Operating Area

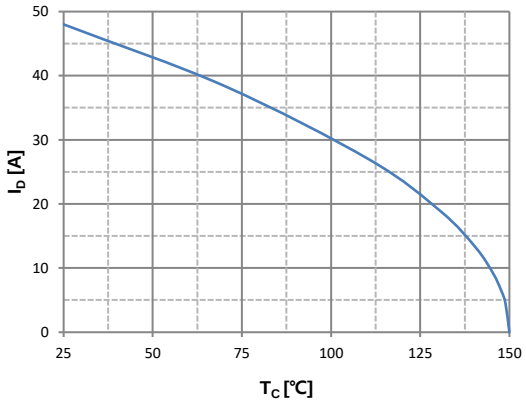


Figure 8. Maximum Drain Current vs Case Temperature

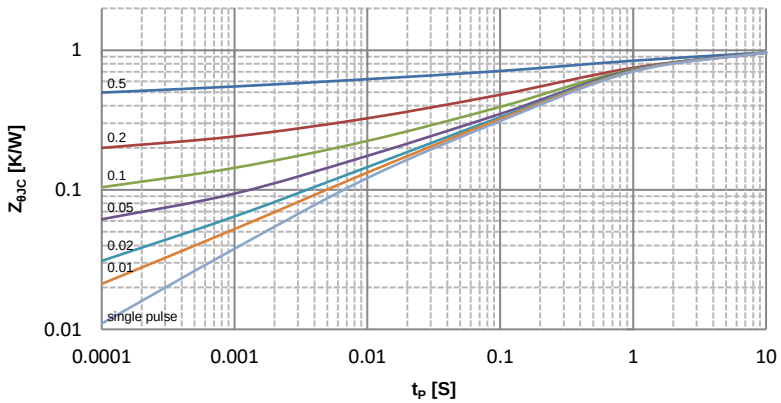
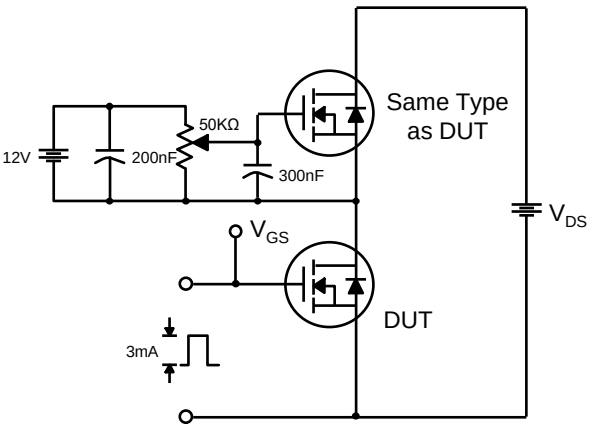


Figure 9. Transient Thermal Response Curve

Fig 12. Gate Charge Test Circuit & Waveform



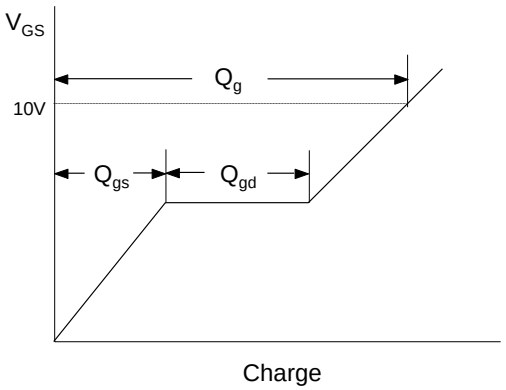
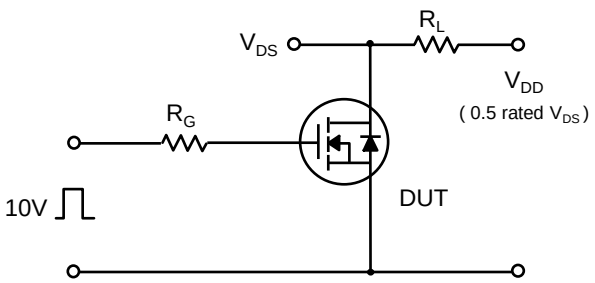


Fig 13. Resistive Switching Test Circuit & Waveforms



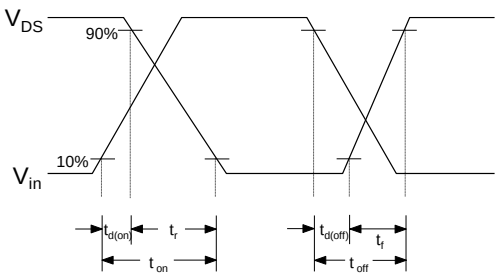
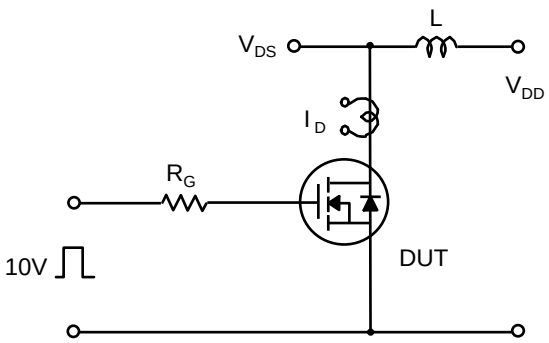


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2} L_L I_{AS}^2$$

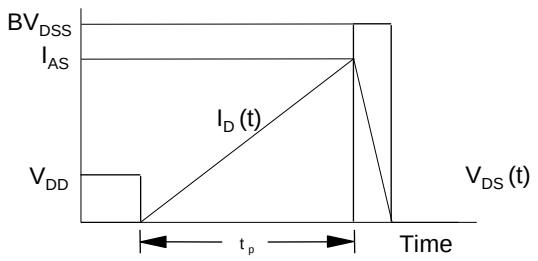
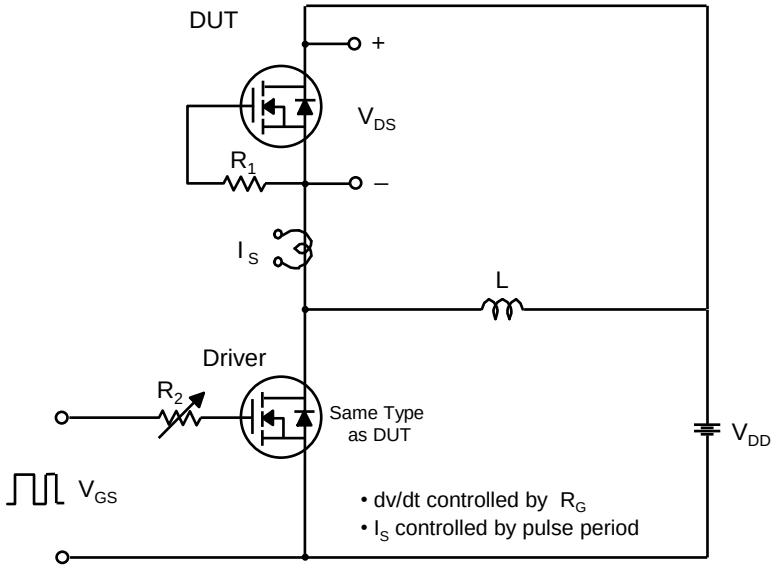
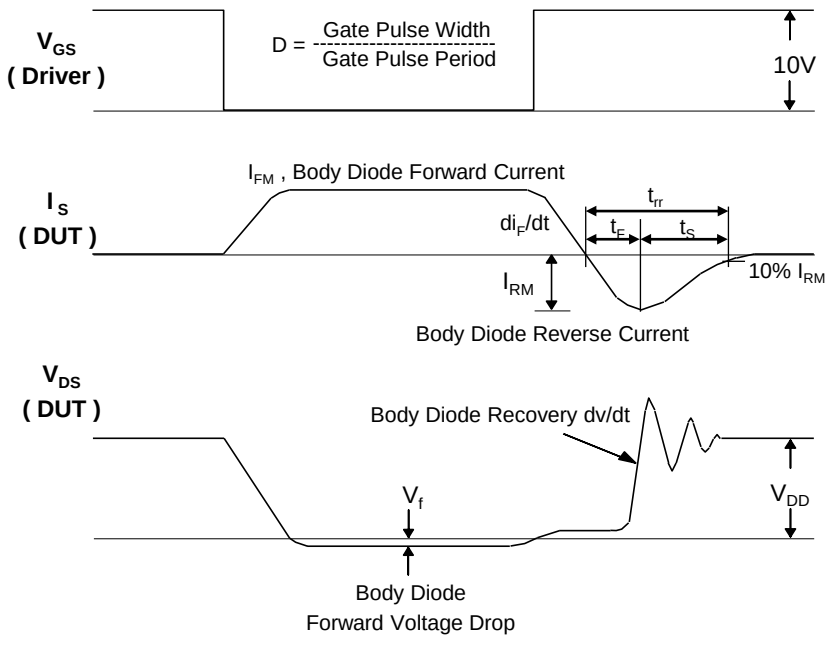


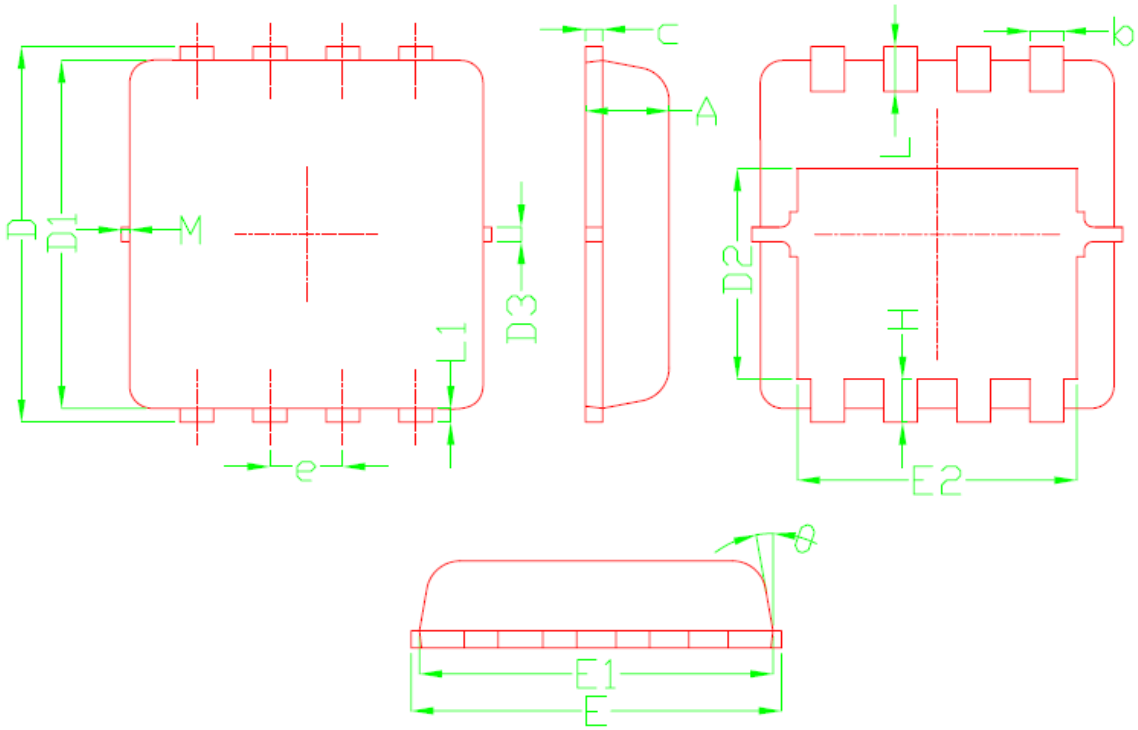
Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimension

8DFN 3x3



SYMBOL	DIMENSIONAL REQMTS		
	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	---
θ	---	10°	12°
M	*	*	0.15

* Not specified

Land Pattern
(Only for Reference)