April 2016

SemiHow
Know-How for Semiconductor

HRLP43N06H

60V 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

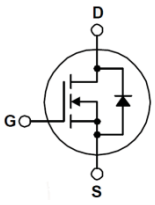
Parameter	Value	Unit
BV_{DSS}	60	V
I_D	140	A
$R_{DS(on),\ typ\ @10V}$	3.6	mΩ
$R_{DS(on),\ typ\ @4.5V}$	4.6	mΩ

Application

- ❑ Synchronous Rectification in SMPS
- ❑ Hard Switching and High Speed Circuit
- ❑ Power Tools
- ❑ UPS, Motor Control

Package & Internal Circuit

TO-220



Absolute Maximum Ratings

T_J=25℃ unless otherwise specified

Symbol	Parameter		Value	Units
V_{DSS}	Drain-Source Voltage		60	V
V_{GS}	Gate-Source Voltage		±20	V
I_D	Drain Current	T_C = 25℃	140	A
		T_C = 100℃	100	A
I_{DM}	Pulsed Drain Current		410	A
E_{AS}	Single Pulsed Avalanche Energy	L=0.1mH	211	mJ
P_D	Power Dissipation	T_C= 25℃	176	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	℃

Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	--	0.85	℃/W
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	℃/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	--	3.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 20 A	--	3.6	4.3	mΩ
		V_{GS} = 4.5 V, I_D = 20 A	--	4.6	6.0	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5, I_D = 20 A	--	42	--	S
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	60	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 60 V, T_J = 100℃	--	--	100	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} = 30 V, V_{GS} = 0 V, f = 1.0 MHz	--	3250	--	pF
C_{oss}	Output Capacitance		--	1200	--	pF
C_{rss}	Reverse Transfer Capacitance		--	50	--	pF
R_g	Gate Resistance	V_{GS} = 0 V, V_{DS} = 0 V, f = 1MHz	--	1.6	--	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	V_{DS} = 30 V, I_D = 20 A, R_G = 10 Ω	--	12	--	ns
t_r	Turn-On Rise Time		--	10	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	55	--	ns
t_f	Turn-Off Fall Time		--	15	--	ns
$Q_{g\ (10V)}$	Total Gate Charge	V_{DS} = 30 V, I_D = 20 A, V_{GS} = 10 V	--	49	--	nC
$Q_{g\ (4.5V)}$	Total Gate Charge		--	24	--	nC
Q_{gs}	Gate-Source Charge		--	8	--	nC
Q_{gd}	Gate-Drain Charge		--	9	--	nC
Source-Drain Diode Maximum Ratings and Characteristics						
I_S	Continuous Source-Drain Diode Forward Current		--	--	140	A
I_{SM}	Pulsed Source-Drain Diode Forward Current		--	--	410	
V_{SD}	Source-Drain Diode Forward Voltage	I_S = 20 A, V_{GS} = 0 V	--	0.9	1.2	V
trr	Reverse Recovery Time	I_S = 20 A, V_{GS} = 0 V, di_F/dt = 300 A/μs	--	50	--	ns
Qrr	Reverse Recovery Charge		--	120	--	nC

Typical Characteristics

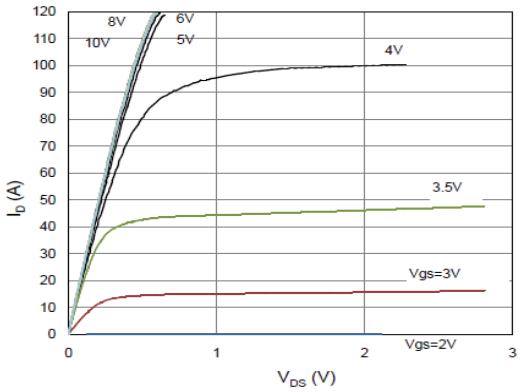


Figure 1. On Region Characteristics

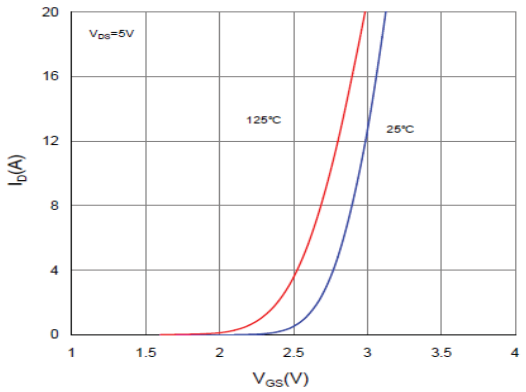


Figure 2. Transfer Characteristics

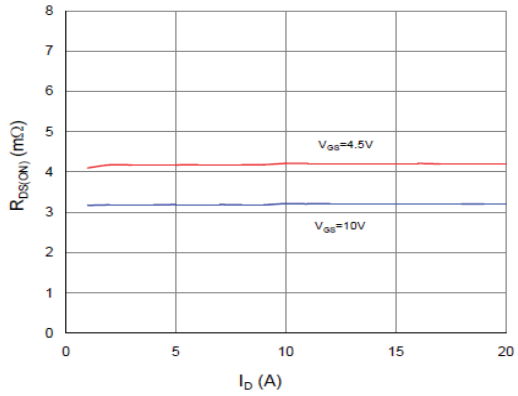


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

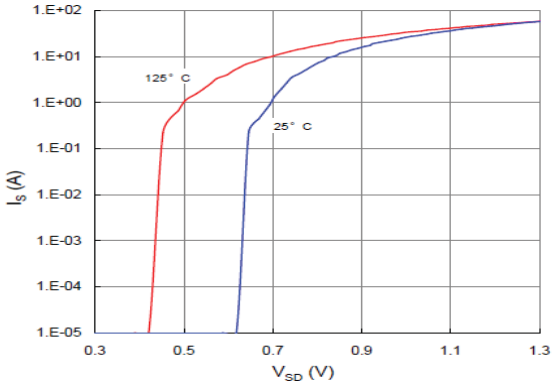


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

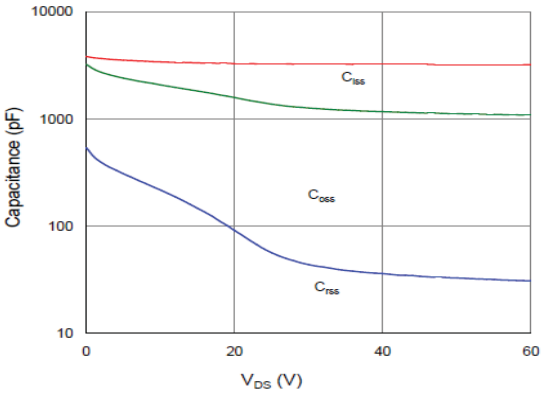


Figure 5. Capacitance Characteristics

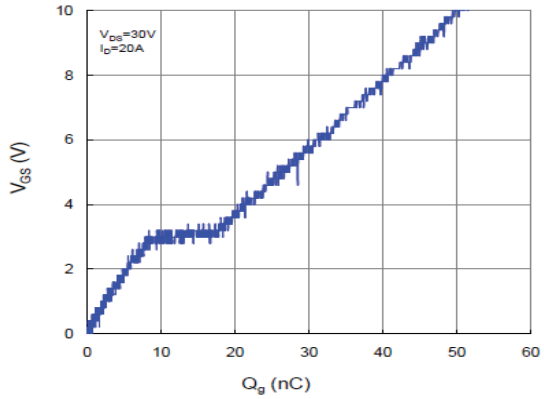


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

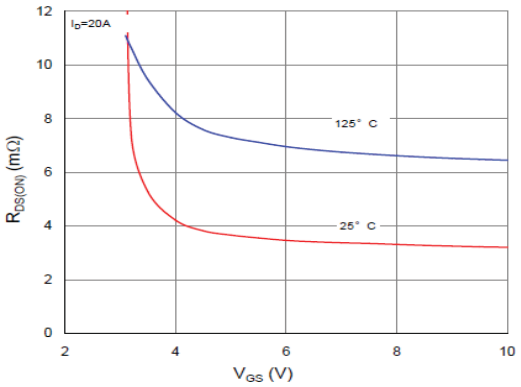


Figure 7. On-Resistance Variation vs Gate-Source Voltage

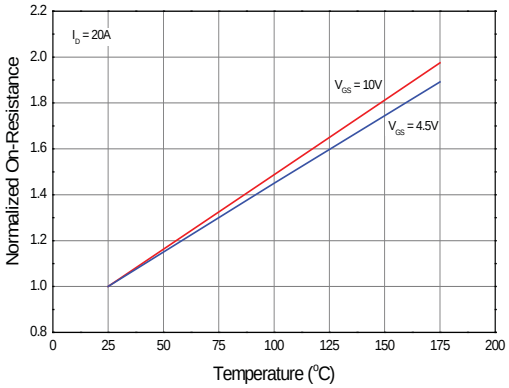


Figure 8. On-Resistance Variation vs Temperature

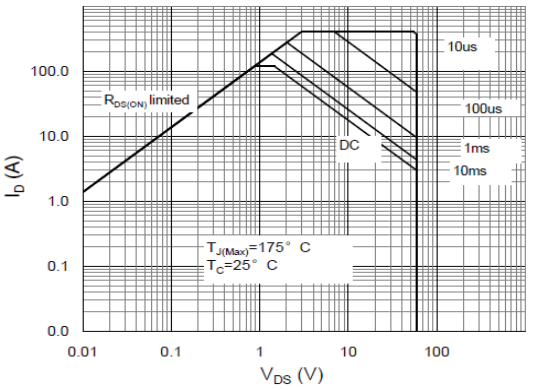


Figure 9. Maximum Safe Operating Area

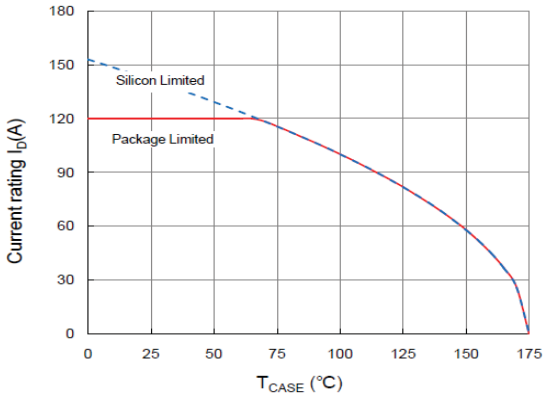


Figure 10. Maximum Drain Current vs Case Temperature

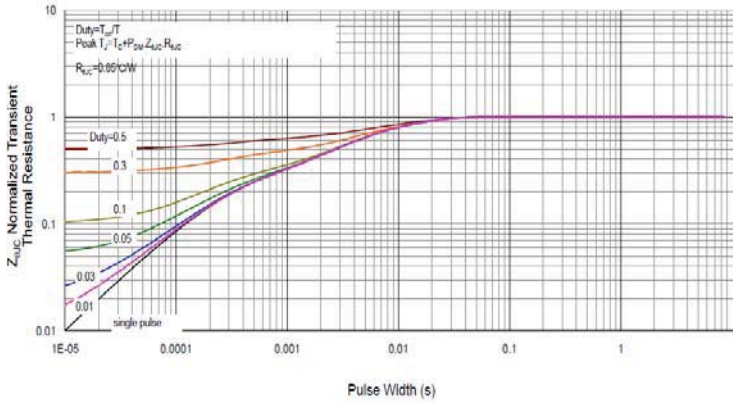


Figure 11. Transient Thermal Response Curve

Fig 12. Gate Charge Test Circuit & Waveform

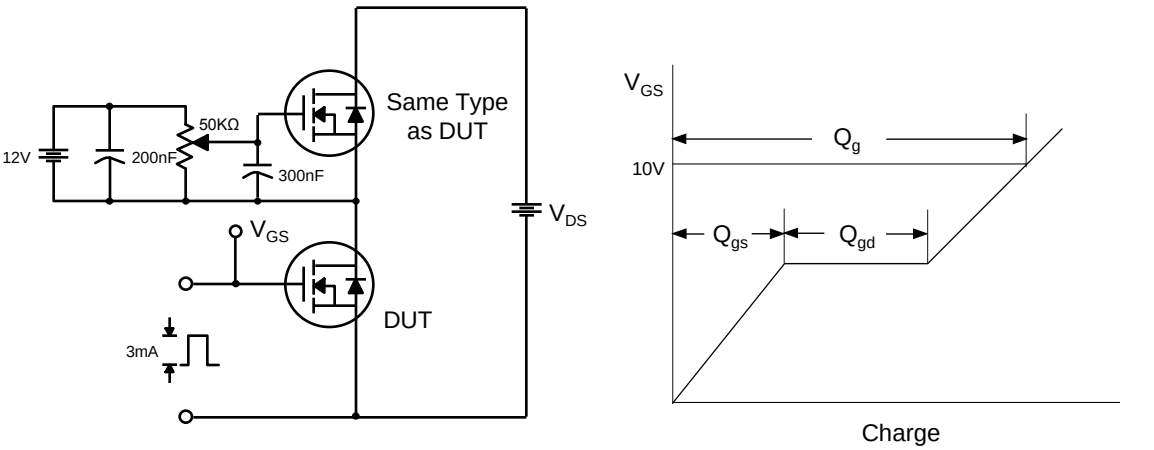


Fig 13. Resistive Switching Test Circuit & Waveforms

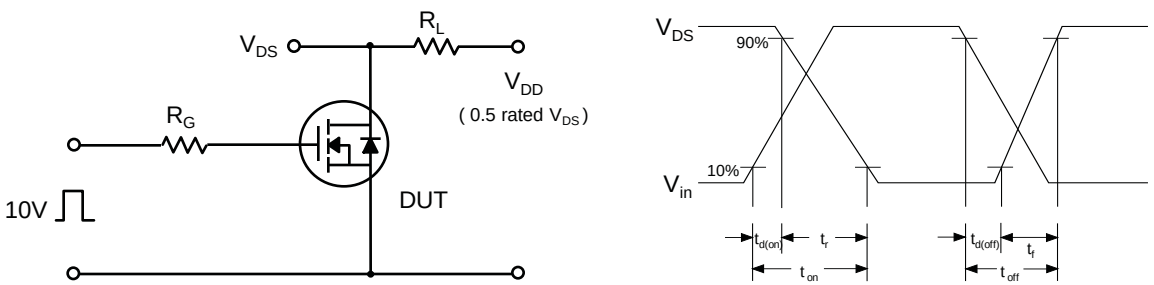


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

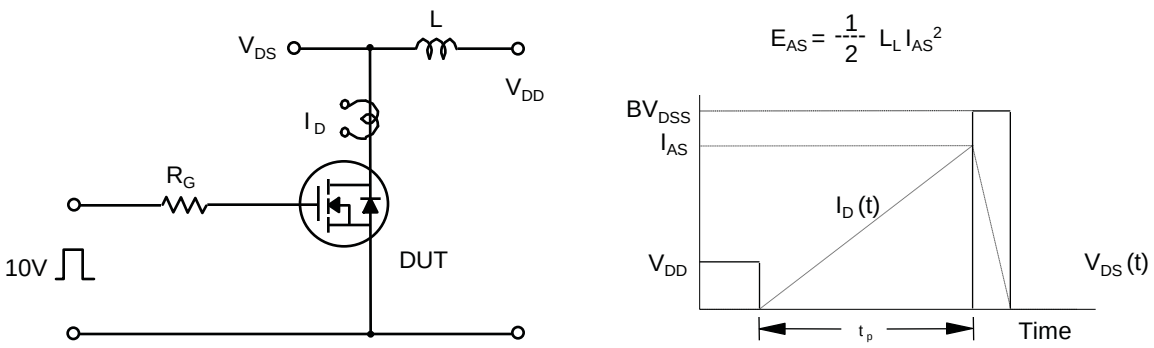
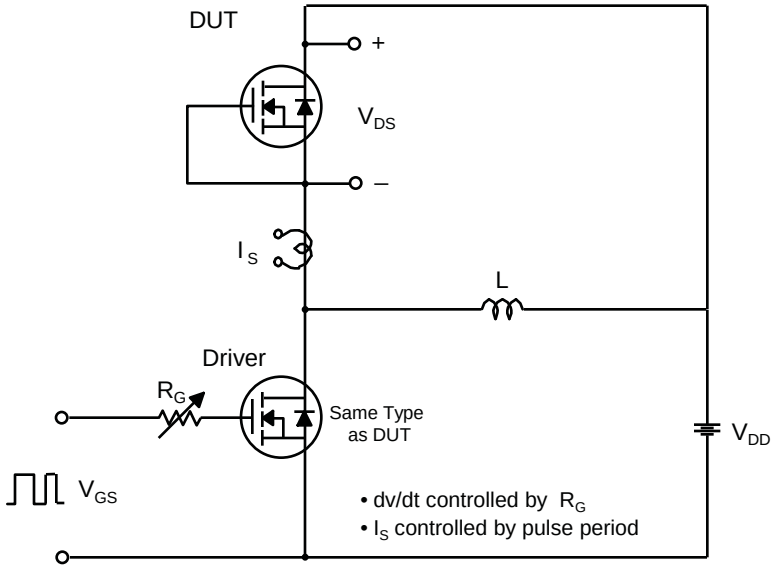
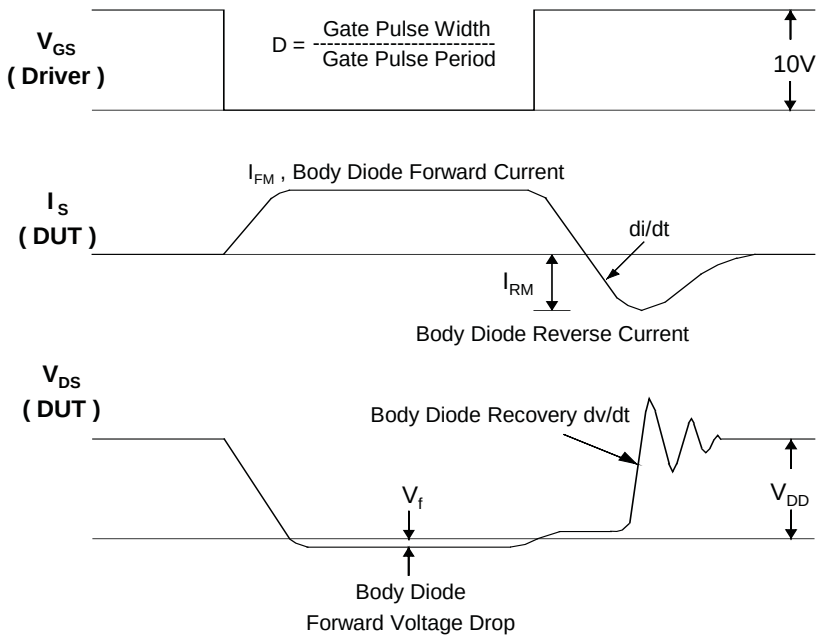


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimension

TO-220