

# HF150N06A / HFW50N06A

## 60V N-Channel MOSFET

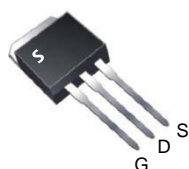
### Features

- Superior Avalanche Rugged Technology
- Robust Gate Oxide Technology
- Very Low Intrinsic Capacitances
- Excellent Switching Characteristics
- 100% Avalanche Tested
- RoHS Compliant

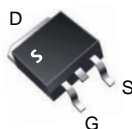
### Key Parameters

Parameter	Value	Unit
$BV_{DSS}$	60	V
$I_D$	50	A
$R_{DS(on), Typ}$	18	m $\Omega$
$Qg, Typ$	27	nC

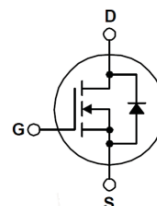
**HF150N06A**  
TO-262



**HFW50N06A**  
TO-263



**Symbol**



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

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	60	V
$I_D$	Drain Current – Continuous ( $T_C = 25^\circ\text{C}$ )	50.0	A
	Drain Current – Continuous ( $T_C = 100^\circ\text{C}$ )	30.4	A
$I_{DM}$	Drain Current – Pulsed (Note 1)	200	A
$V_{GS}$	Gate-Source Voltage	$\pm 25$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	490	mJ
$I_{AR}$	Avalanche Current (Note 1)	50	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	12	mJ
$P_D$	Power Dissipation ( $T_A = 25^\circ\text{C}$ )*	3.13	W
	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	120	W
	- Derate above $25^\circ\text{C}$	0.8	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

### Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction-to-Case, Max.	1.24	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient (minimum pad of 2 oz copper), Max.	62.5	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient (* 1 in <sup>2</sup> pad of 2 oz copper), Max.	40	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>On Characteristics</b>						
$V_{GS}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	2.0	--	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 25 \text{ A}$	--	18	22	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 25 \text{ V}, I_D = 25 \text{ A}$	--	22	--	S
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	60	--	--	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 48 \text{ V}, T_C = 125^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS} = \pm 25 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	$\pm 100$	nA
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$	--	1290	1675	pF
$C_{oss}$	Output Capacitance		--	445	580	pF
$C_{rss}$	Reverse Transfer Capacitance		--	84	110	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 30 \text{ V}, I_D = 25 \text{ A},$ $R_G = 25 \Omega$  (Note 4,5)	--	15	40	ns
$t_r$	Turn-On Rise Time		--	105	220	ns
$t_{d(off)}$	Turn-Off Delay Time		--	80	180	ns
$t_f$	Turn-Off Fall Time		--	85	180	ns
$Q_g$	Total Gate Charge	$V_{DS} = 48 \text{ V}, I_D = 25 \text{ A},$ $V_{GS} = 10 \text{ V}$  (Note 4,5)	--	27	34	nC
$Q_{gs}$	Gate-Source Charge		--	5.0	--	nC
$Q_{gd}$	Gate-Drain Charge		--	10.2	--	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current		--	--	50	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		--	--	200	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 50 \text{ A}$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_S = 50 \text{ A}$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	--	45	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	70	--	$\mu\text{C}$

**Notes :**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L=230\mu\text{H}, I_{AS}=50\text{A}, V_{DD}=25\text{V}, R_G=25\Omega,$  Starting  $T_J=25^\circ\text{C}$
3.  $I_{SD}\leq 50\text{A}, di/dt\leq 300\text{A}/\mu\text{s}, V_{DD}\leq BV_{DSS},$  Starting  $T_J=25^\circ\text{C}$
4. Pulse Test : Pulse Width  $\leq 300\mu\text{s},$  Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature

# Typical Characteristics

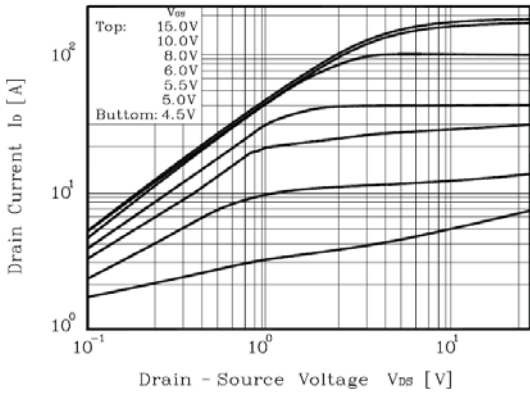


Figure 1. On Region Characteristics

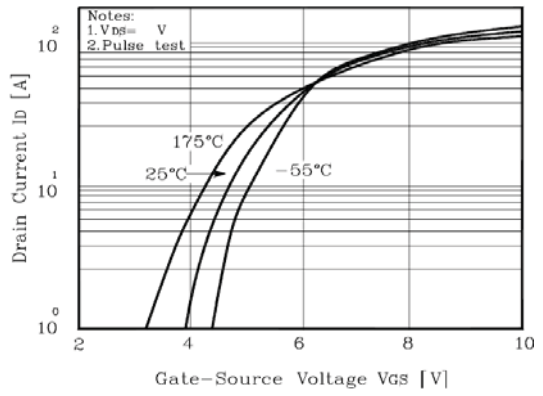


Figure 2. Transfer Characteristics

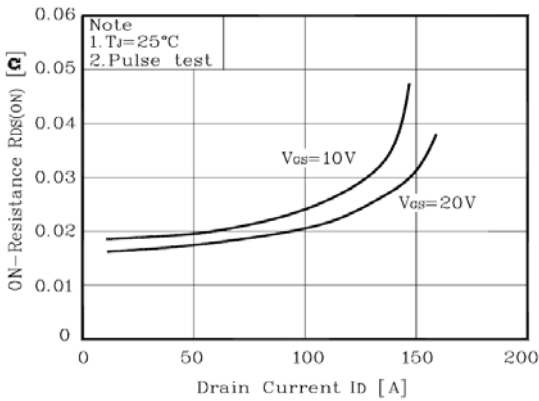


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

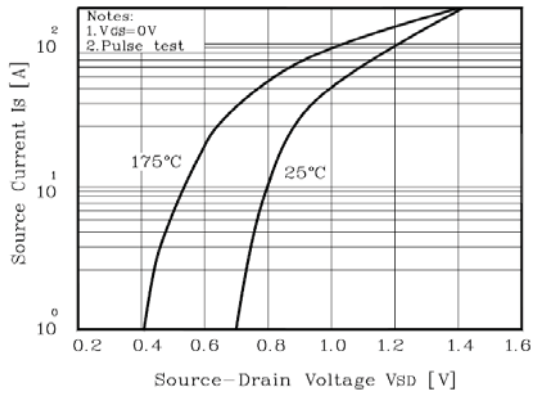


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

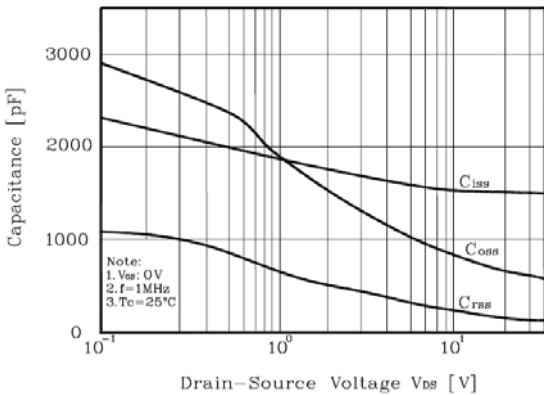


Figure 5. Capacitance Characteristics

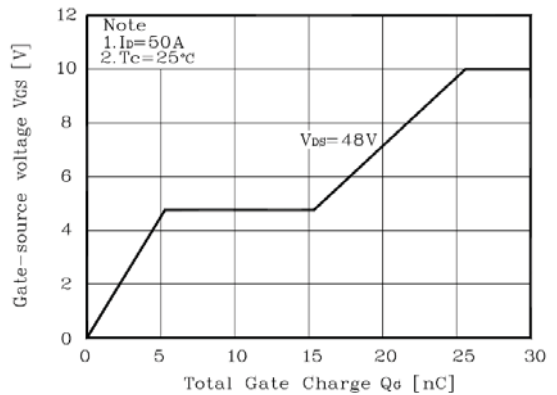
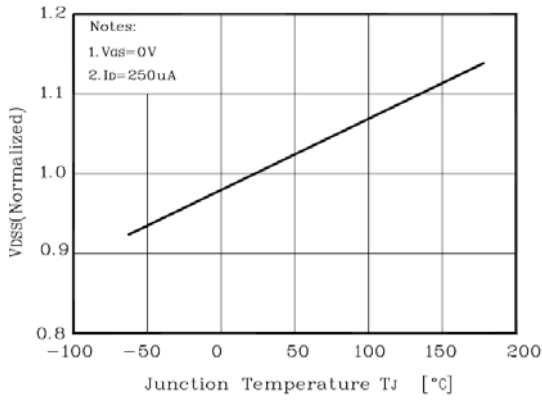
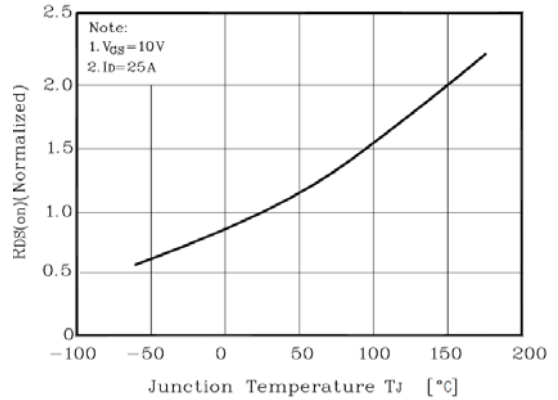


Figure 6. Gate Charge Characteristics

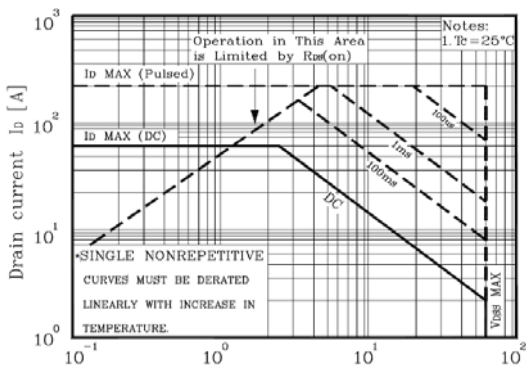
**Typical Characteristics (continued)**



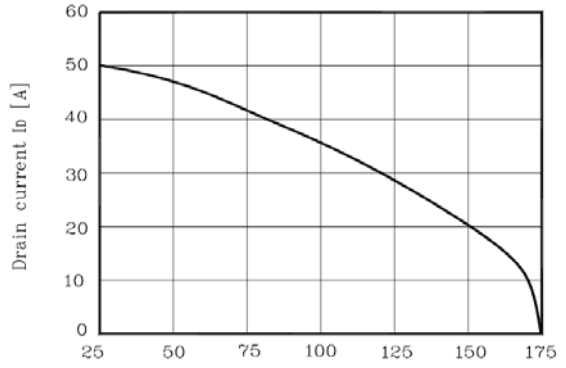
**Figure 7. Breakdown Voltage Variation vs Temperature**



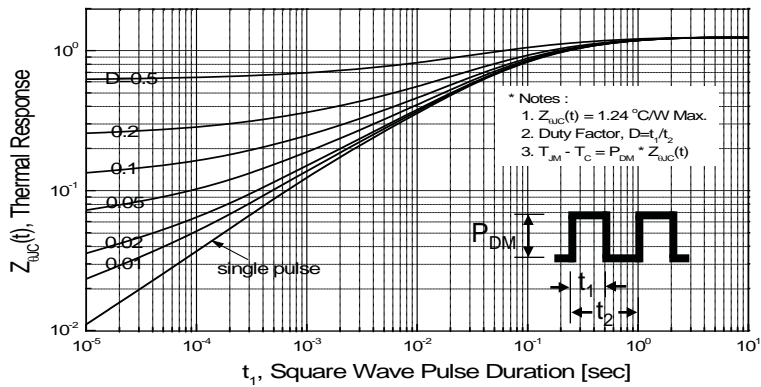
**Figure 8. On-Resistance Variation vs Temperature**



**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs Case Temperature**

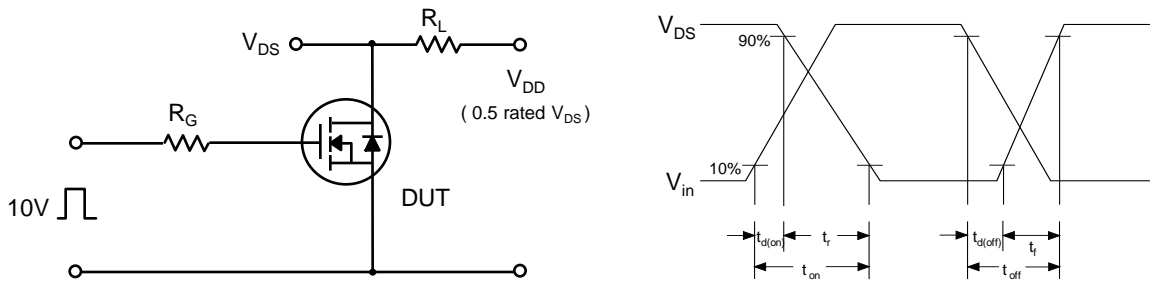


**Figure 11. Transient Thermal Response Curve**

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



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



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

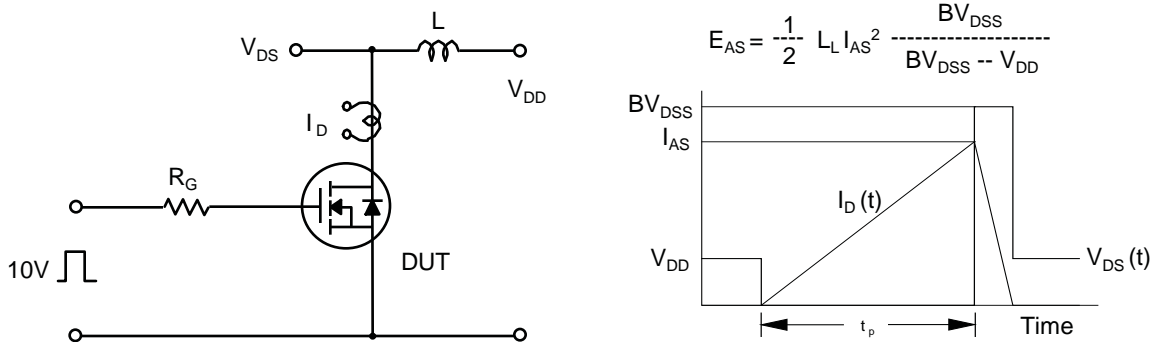
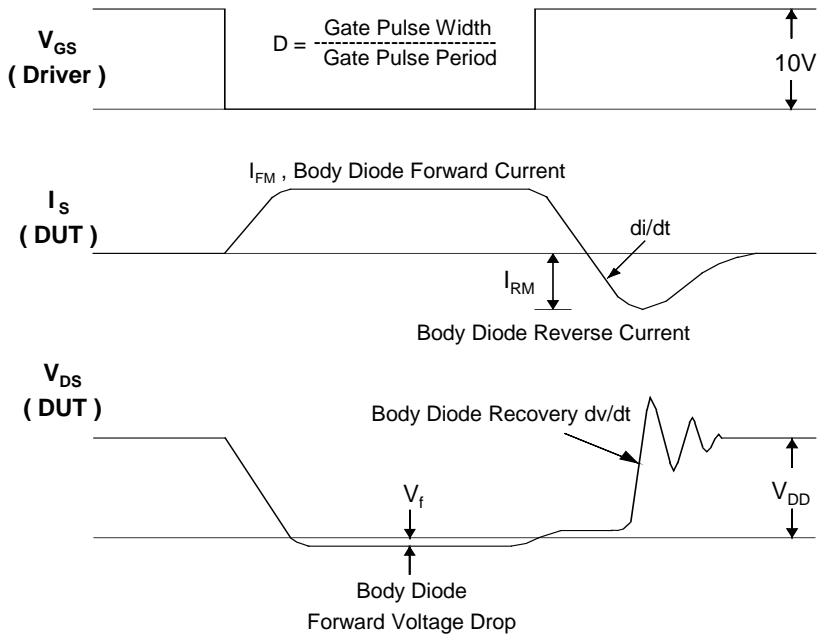
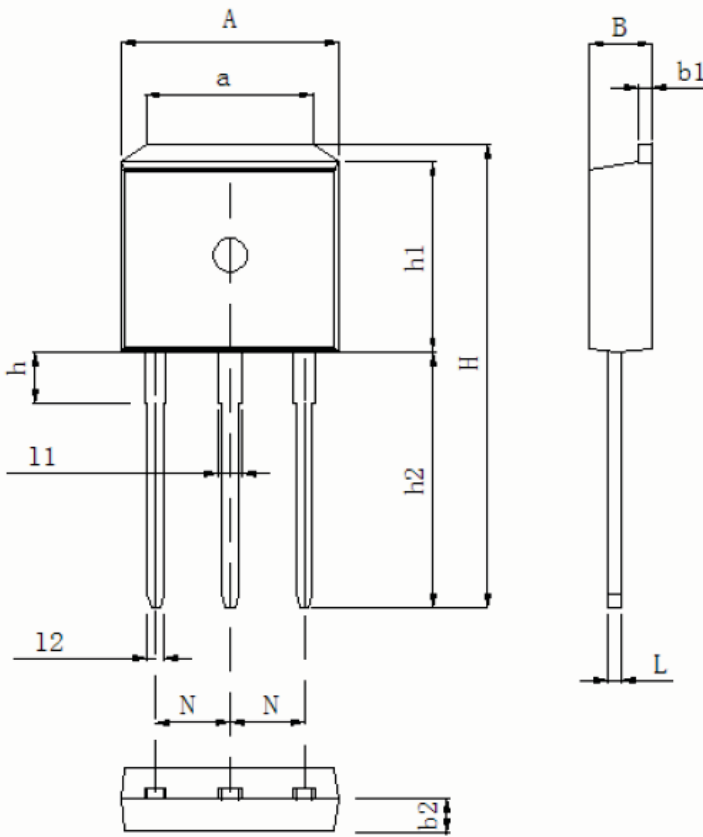


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

I<sup>2</sup>-PAK  
(TO-262)

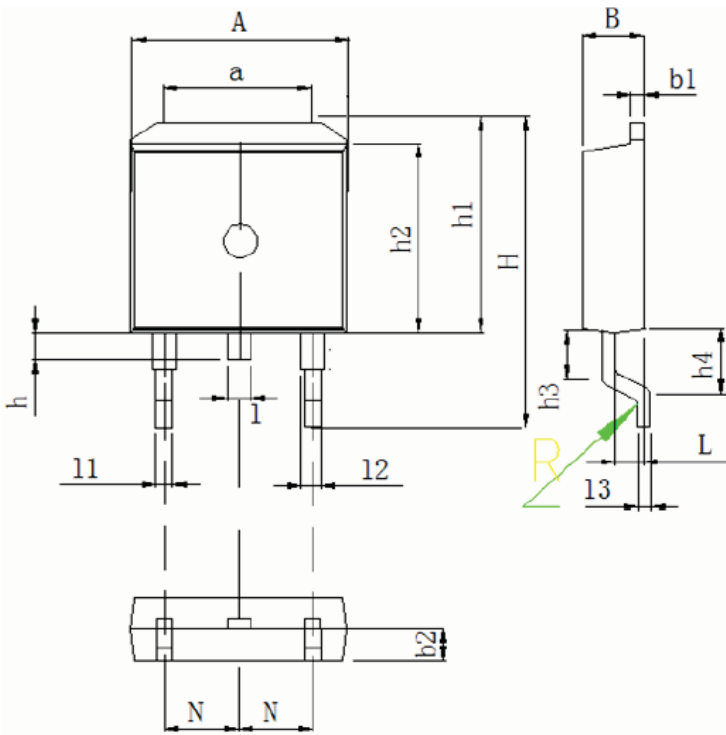


DIM	MILLIMETERS
A	9.8±0.2
a	7.4±0.2
B	4.5±0.2
b1	1.3±0.05
b2	2.4±0.2
H	24.2±0.3
h	3.1±0.2
h1	10.5±0.2
h2	13.2±0.2
L	0.5±0.1
l1	1.3±0.1
l2	0.8±0.1
N	2.45

Unit :mm

Package Dimension

D<sup>2</sup>-PAK  
(TO-263)



DIM	MILLIMETERS
A	9.8±0.2
a	7.4±0.2
B	4.5±0.2
b1	1.3±0.05
b2	2.4±0.2
H	15.5±0.3
h	1.54±0.2
h1	10.5±0.2
h2	9.2±0.1
h3	1.54±0.2
h4	2.7±0.2
L	2.4±0.2
1	1.3±0.1
11	0.8±0.1
12	1.3±0.1
13	0.5±0.1
N	2.45±0.05
R	0.5R±0.05

Unit :mm