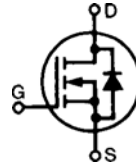


# HiPerFET™ Power MOSFETs

N-Channel Enhancement Mode  
High dv/dt, Low  $t_{rr}$ , HDMOS™ Family

**Obsolete:**  
**IXFM10N90**  
**IXFM12N90**

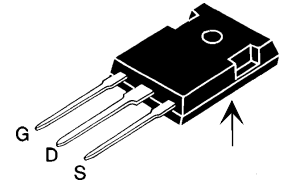
~~IXFH/IXFM 10 N90~~  
~~IXFH/IXFM 12 N90~~  
IXFH/IXFT 13 N90



$V_{DSS}$	$I_{D25}$	$R_{DS(on)}$
900 V	10 A	1.1 $\Omega$
900 V	12 A	0.9 $\Omega$
900 V	13 A	0.8 $\Omega$

$t_{rr} \leq 250$  ns

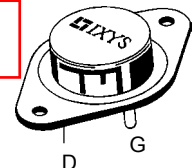
TO-247 AD (IXFH)



(TAB)

~~TO-204 AA (IXFM)~~

**Package  
unavailable**



TO-268 (IXFT)



G = Gate, D = Drain,  
S = Source, TAB = Drain

Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	900	V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1$ M $\Omega$	900	V
$V_{GS}$	Continuous	$\pm 20$	V
$V_{GSM}$	Transient	$\pm 30$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	10N90 10 12N90 12 13N90 13	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$	10N90 40 12N90 48 13N90 52	A
$I_{AR}$	$T_C = 25^\circ\text{C}$	10N90 10 12N90 12 13N90 13	A
$E_{AR}$	$T_C = 25^\circ\text{C}$	30	mJ
dv/dt	$I_S \leq I_{DM}$ , di/dt $\leq 100$ A/ $\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ , $R_G = 2$ $\Omega$	5	V/ns
$P_D$	$T_C = 25^\circ\text{C}$	300	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$T_L$	1.6 mm (0.062 in.) from case for 10 s	300	$^\circ\text{C}$
$M_d$	Mounting torque	1.13/10	Nm/lb.in.
Weight		TO-204 = 18 g, TO-247 = 6 g	

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_{DSS}$	$V_{GS} = 0$ V, $I_D = 3$ mA	900		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 4$ mA	2.0		4.5 V
$I_{GSS}$	$V_{GS} = \pm 20$ V $_{DC}$ , $V_{DS} = 0$			$\pm 100$ nA
$I_{DSS}$	$V_{DS} = V_{DSS}$ , $T_J = 25^\circ\text{C}$ $V_{GS} = 0$ V, $T_J = 125^\circ\text{C}$			25 $\mu\text{A}$ 1 mA
$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 0.5 \cdot I_{D25}$	10N90 12N90 13N90		1.1 $\Omega$ 0.9 $\Omega$ 0.8 $\Omega$
	Pulse test, $t \leq 300$ $\mu\text{s}$ , duty cycle $d \leq 2$ %			

### Features

- International standard packages
- Low  $R_{DS(on)}$  HDMOS™ process
- Rugged polysilicon gate cell structure
- Unclamped Inductive Switching (UIS) rated
- Low package inductance - easy to drive and to protect
- Fast intrinsic Rectifier

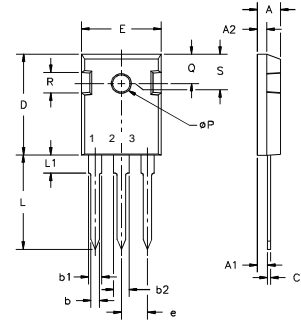
### Applications

- DC-DC converters
- Synchronous rectification
- Battery chargers
- Switched-mode and resonant-mode power supplies
- DC choppers
- AC motor control
- Temperature and lighting controls
- Low voltage relays

### Advantages

- Easy to mount with 1 screw (TO-247) (isolated mounting screw hole)
- Space savings
- High power density

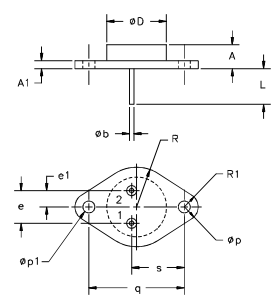
Symbol	Test Conditions	Characteristic Values (T <sub>J</sub> = 25°C, unless otherwise specified)		
		min.	typ.	max.
g <sub>fs</sub>	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 0.5 • I <sub>D25</sub> , pulse test	6	12	S
C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz	4200		pF
C <sub>oss</sub>		315		pF
C <sub>rss</sub>		90		pF
t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub> R <sub>G</sub> = 2 Ω (External)	18	50	ns
t <sub>r</sub>		12	50	ns
t <sub>d(off)</sub>		51	100	ns
t <sub>f</sub>		18	50	ns
Q <sub>g(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub>	123	155	nC
Q <sub>gs</sub>		27	45	nC
Q <sub>gd</sub>		49	80	nC
R <sub>thJC</sub>	(IXFH/IXFM)			0.42 K/W
R <sub>thCK</sub>		0.25		K/W

**TO-247 AD (IXFH) Outline**


Terminals: 1 - Gate     2 - Drain  
              3 - Source     Tab - Drain

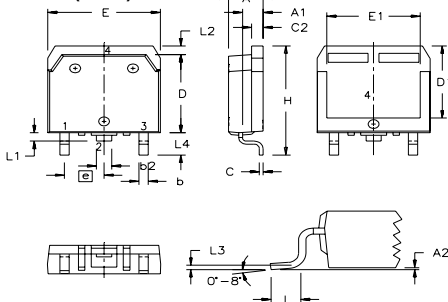
Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.7	5.3	.185	.209
A <sub>1</sub>	2.2	2.54	.087	.102
A <sub>2</sub>	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b <sub>1</sub>	1.65	2.13	.065	.084
b <sub>2</sub>	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L <sub>1</sub>	4.50		.177	
ØP	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15 BSC		.242 BSC	

Symbol	Test Conditions	Characteristic Values (T <sub>J</sub> = 25°C, unless otherwise specified)		
		min.	typ.	max.
I <sub>S</sub>	V <sub>GS</sub> = 0 V	10N90 12N90 13N90		10 A 12 A 13 A
I <sub>SM</sub>	Repetitive; pulse width limited by T <sub>JM</sub>	10N90 12N90 13N90		40 A 48 A 52 A
V <sub>SD</sub>	I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V, Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %			1.5 V
t <sub>rr</sub>	I <sub>F</sub> = I <sub>S</sub> , -di/dt = 100 A/μs, V <sub>R</sub> = 100 V	T <sub>J</sub> = 25°C		250 ns
		T <sub>J</sub> = 125°C		400 ns
Q <sub>RM</sub>		T <sub>J</sub> = 25°C	1	μC
		T <sub>J</sub> = 125°C	2	μC
I <sub>RM</sub>		T <sub>J</sub> = 25°C	10	A
		T <sub>J</sub> = 125°C	15	A

**TO-204 AA (IXFM) Outline**


Pins 1 - Gate     2 - Source  
Case - Drain

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	6.4	11.4	.250	.450
A <sub>1</sub>		3.42		.135
Øb	.97	1.09	.038	.043
ØD	22.22		.875	
e	10.67	11.17	.420	.440
e <sub>1</sub>	5.21	5.71	.205	.225
L	7.93		.312	
Øp	3.84	4.19	.151	.165
Øp <sub>1</sub>	3.84	4.19	.151	.165
q	30.15 BSC		1.187 BSC	
R	13.33		.525	
R <sub>1</sub>	4.77		.188	
s	16.64	17.14	.655	.675

**TO-268 (IXFT) Outline**


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.193	.201	4.90	5.10
A <sub>1</sub>	.106	.114	2.70	2.90
A <sub>2</sub>	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b <sub>2</sub>	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C <sub>2</sub>	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D <sub>1</sub>	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E <sub>1</sub>	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L <sub>1</sub>	.047	.055	1.20	1.40
L <sub>2</sub>	.039	.045	1.00	1.15
L <sub>3</sub>	.010 BSC		0.25 BSC	
L <sub>4</sub>	.150	.161	3.80	4.10

IXYS reserves the right to change limits, test conditions, and dimensions.

Fig. 1. Output Characteristics

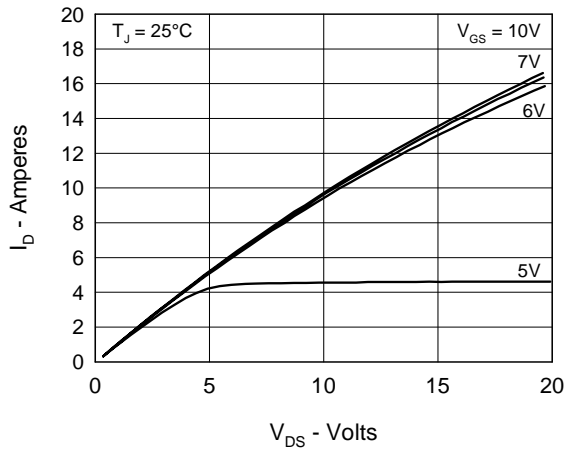


Fig. 2. Input Admittance

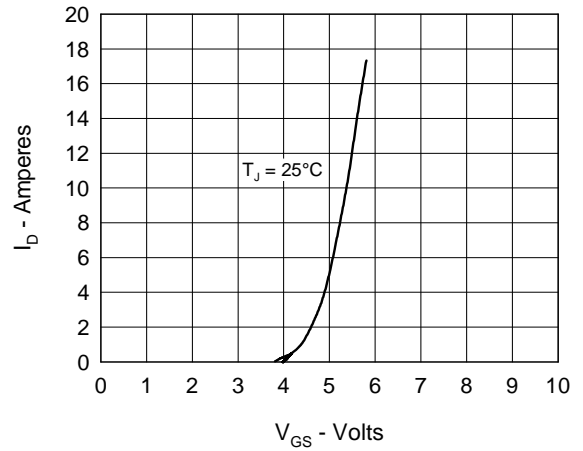


Fig. 3.  $R_{DS(on)}$  vs. Drain Current

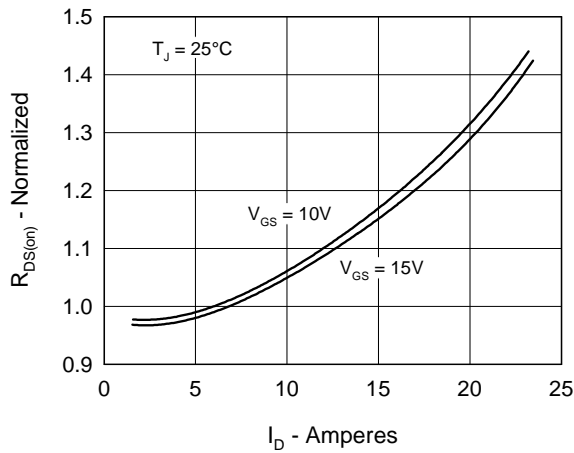


Fig. 4. Temperature Dependence of Drain to Source Resistance

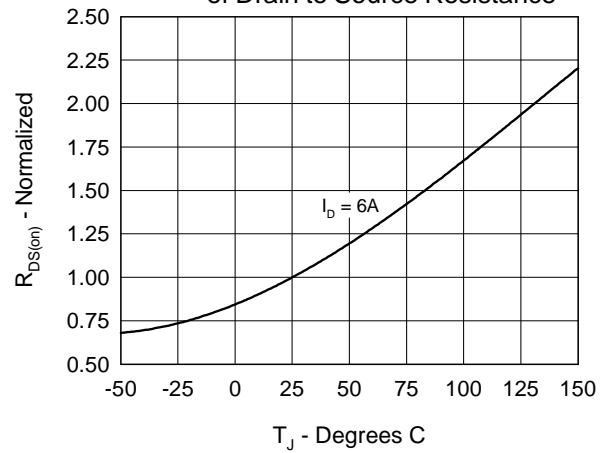


Fig. 5. Drain Current vs. Case Temperature

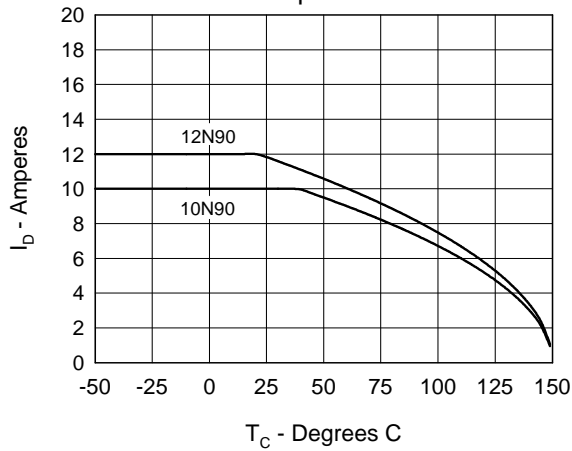


Fig. 6. Temperature Dependence of Breakdown and Threshold Voltage

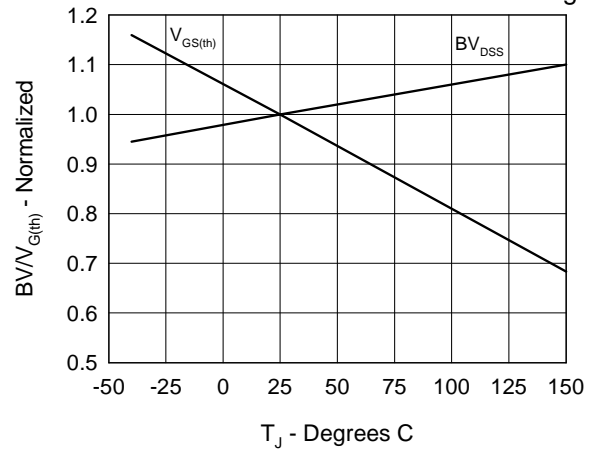


Fig.7. Gate Charge Characteristic Curve

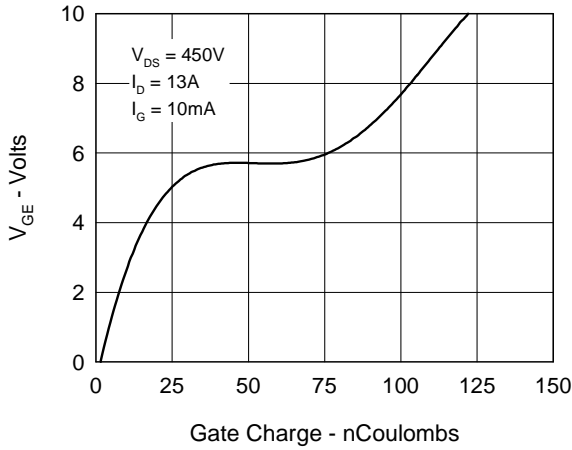


Fig.8. Capacitance Curves

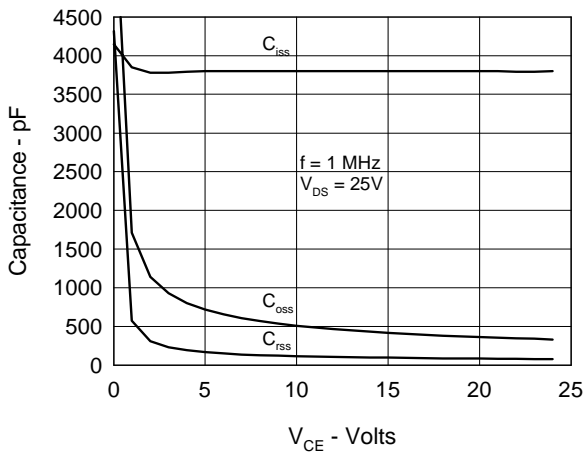


Fig.9. Source Current vs. Source to Drain Voltage

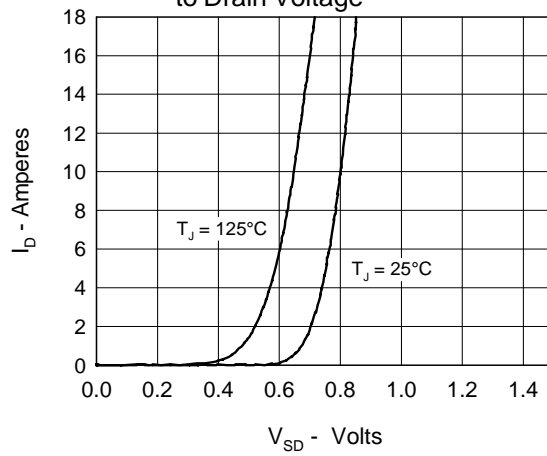
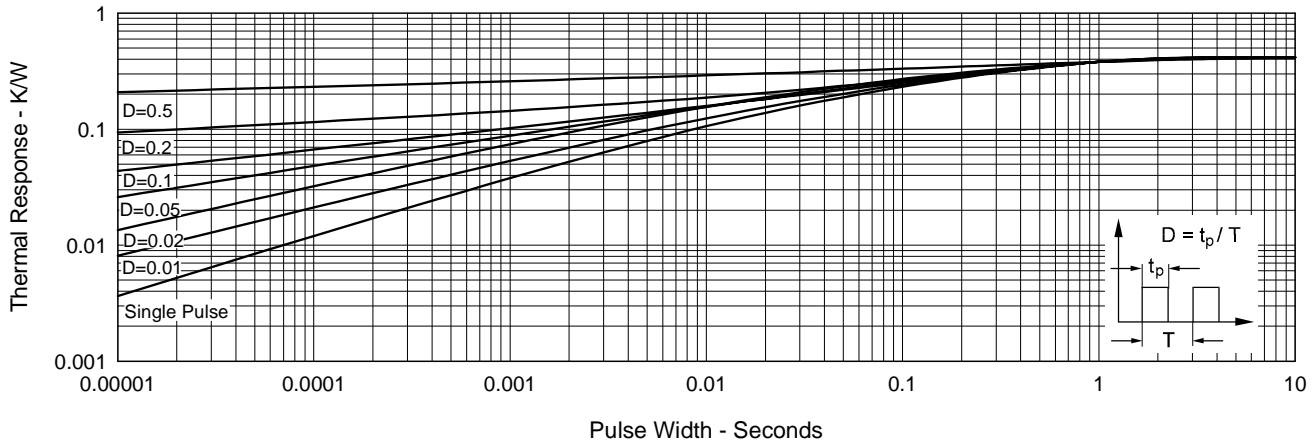


Fig.10. Transient Thermal Impedance



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