

# HiPerFET™ Power MOSFETs

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

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

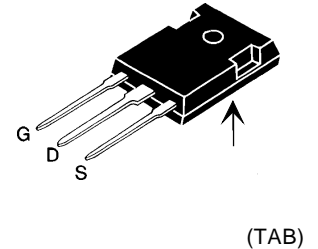
~~IXFH/IXFM 10 N90~~  
~~IXFH/IXFM 12 N90~~  
IXFH/IXFT 13 N90



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

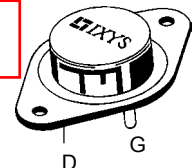
$t_{rr} \leq 250$  ns

TO-247 AD (IXFH)



~~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
$I_{DSS}$	$V_{DS} = V_{DSS}$ , $V_{GS} = 0$ V $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			25 $\mu\text{A}$ 1 mA
$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 0.5 \cdot I_{D25}$ Pulse test, $t \leq 300$ $\mu\text{s}$ , duty cycle $d \leq 2$ %	10N90: 1.1 12N90: 0.9 13N90: 0.8		$\Omega$

### 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

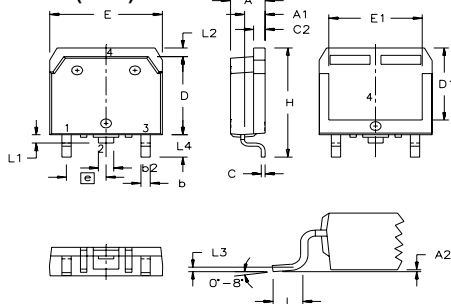
### Advantages

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

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$g_{fs}$	$V_{DS} = 10\text{ V}$ ; $I_D = 0.5 \cdot I_{D25}$ , pulse test	6	12	S
$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		4200	pF
$C_{oss}$			315	pF
$C_{rss}$			90	pF
$t_{d(on)}$	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$ $R_G = 2\ \Omega$ (External)		18	50
$t_r$			12	50
$t_{d(off)}$			51	100
$t_f$			18	50
$Q_{g(on)}$	$V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$		123	155
$Q_{gs}$			27	45
$Q_{gd}$			49	80
$R_{thJC}$				0.42
$R_{thCK}$	(IXFH/IXFM)		0.25	K/W

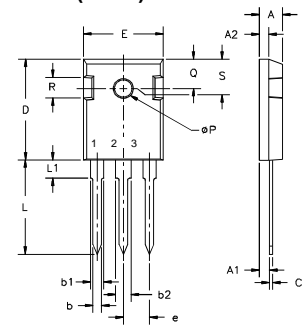
Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$I_S$	$V_{GS} = 0\text{ V}$	10N90		10 A
		12N90		12 A
		13N90		13 A
$I_{SM}$	Repetitive; pulse width limited by $T_{JM}$	10N90		40 A
		12N90		48 A
		13N90		52 A
$V_{SD}$	$I_F = I_S$ , $V_{GS} = 0\text{ V}$ , Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$			1.5 V
$t_{tr}$	$I_F = I_S$ $-di/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 100\text{ V}$	$T_J = 25^\circ\text{C}$		250 ns
		$T_J = 125^\circ\text{C}$		400 ns
$Q_{RM}$		$T_J = 25^\circ\text{C}$	1	$\mu\text{C}$
		$T_J = 125^\circ\text{C}$	2	$\mu\text{C}$
$I_{RM}$		$T_J = 25^\circ\text{C}$	10	A
		$T_J = 125^\circ\text{C}$	15	A

### TO-268 (IXFT) Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.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
L1	.047	.053	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010 BSC 0.25 BSC			
L4	.150	.161	3.80	4.10

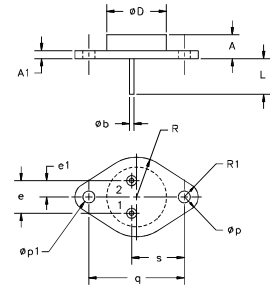
### TO-247 AD (IXFH) Outline



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	.087	.102
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
L1	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

### 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
A1		3.42		.135
Øb	.97	1.09	.038	.043
ØD	22.22		.875	
e	10.67	11.17	.420	.440
e1	5.21	5.71	.205	.225
L	7.93		.312	
Øp	3.84	4.19	.151	.165
Øp1	3.84	4.19	.151	.165
q	30.15 BSC		1.187 BSC	
R	13.33		.525	
R1	4.77		.188	
s	16.64	17.14	.655	.675

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

Fig. 1. Output Characteristics

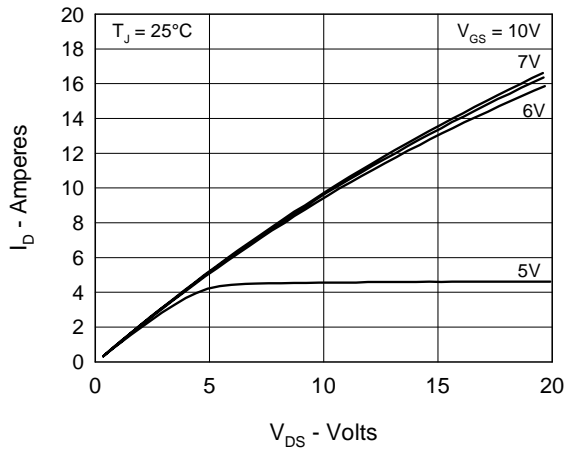


Fig. 2. Input Admittance

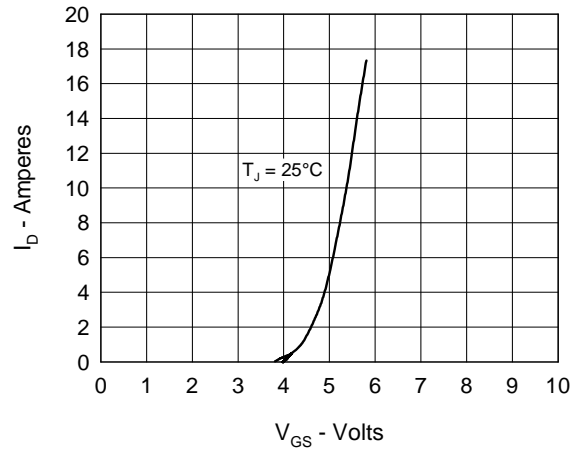


Fig. 3.  $R_{DS(on)}$  vs. Drain Current

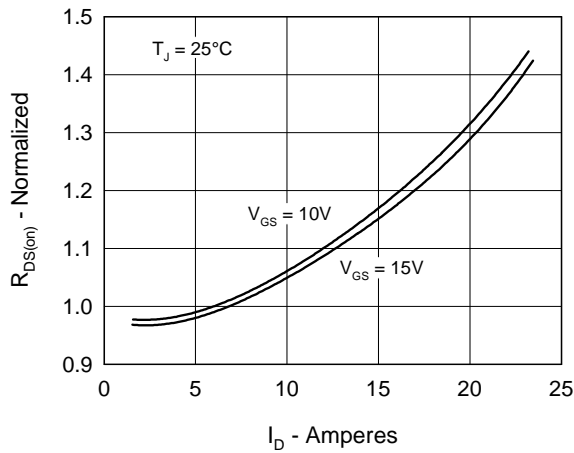


Fig. 4. Temperature Dependence of Drain to Source Resistance

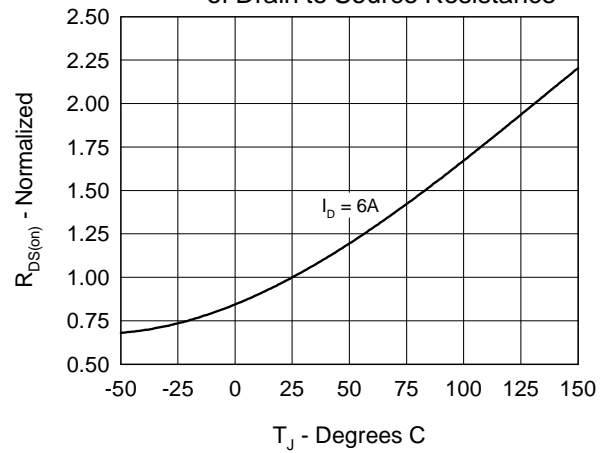


Fig. 5. Drain Current vs. Case Temperature

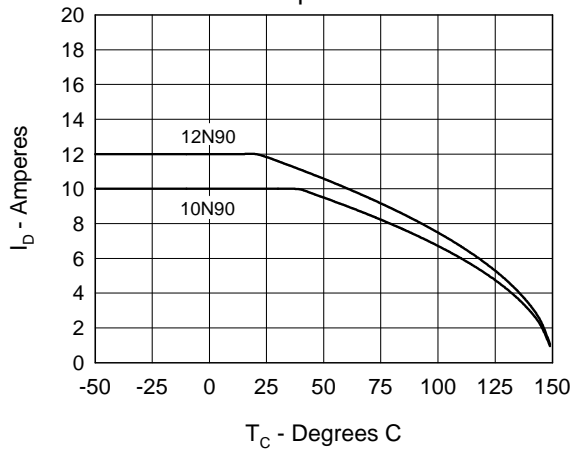


Fig. 6. Temperature Dependence of Breakdown and Threshold Voltage

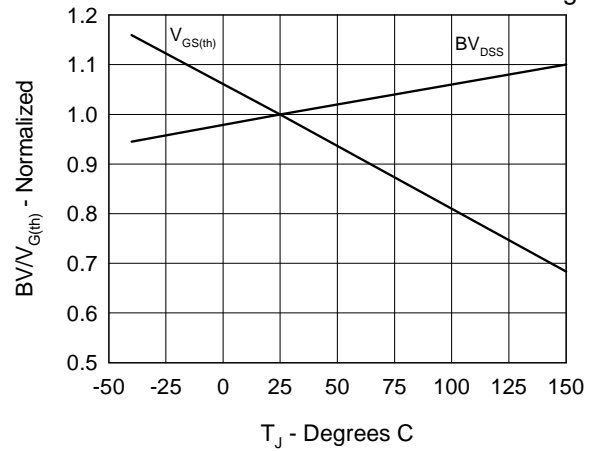


Fig.7. Gate Charge Characteristic Curve

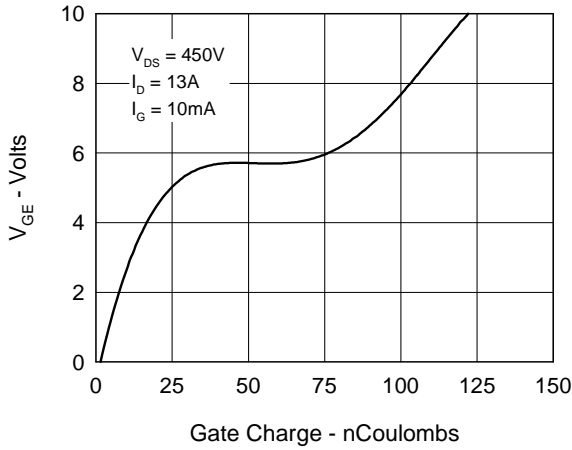


Fig.8. Capacitance Curves

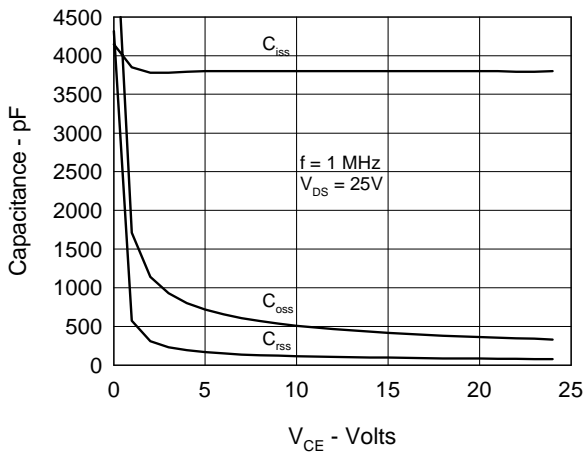


Fig.9. Source Current vs. Source to Drain Voltage

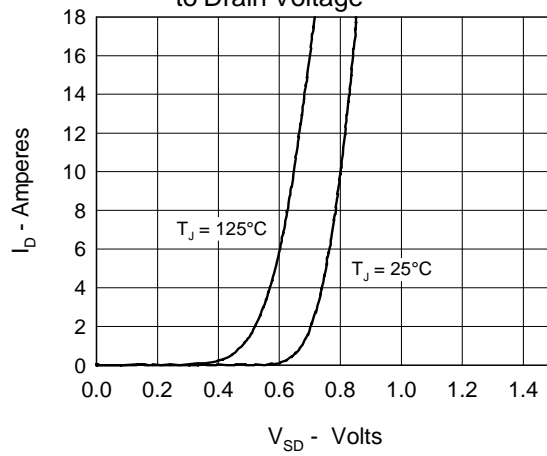
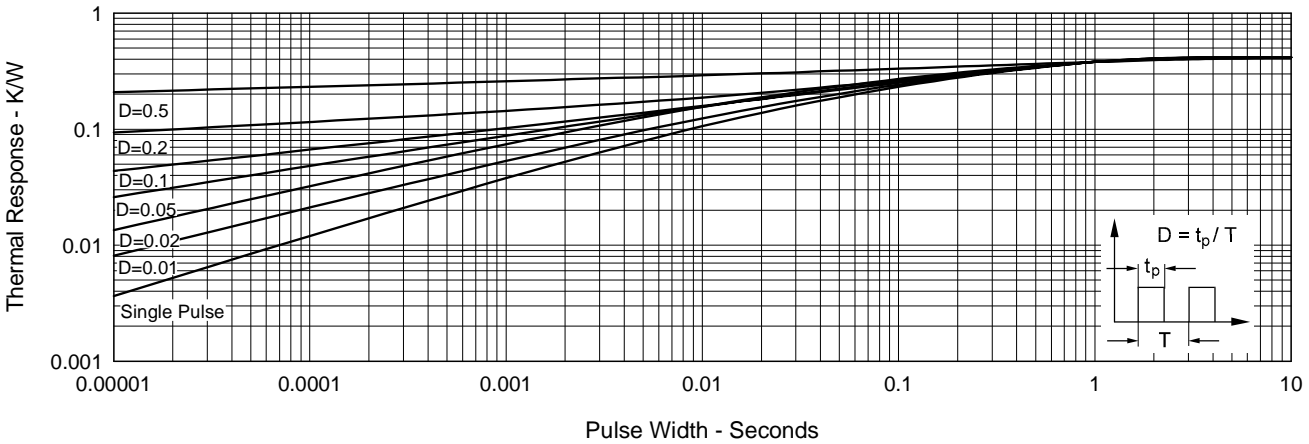


Fig.10. Transient Thermal Impedance



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