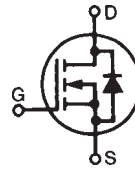


# PolarHV™ HiPerFET Power MOSFET

IXFK 48N60P  
IXFX 48N60P

$V_{DSS} = 600\text{ V}$   
 $I_{D2} = 48\text{ A}$   
 $R_{DS(on)} \leq 135\text{ m}\Omega$   
 $t_{rr} \leq 200\text{ ns}$

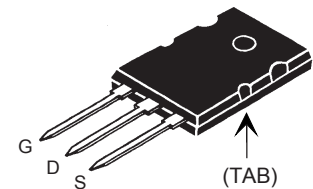
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



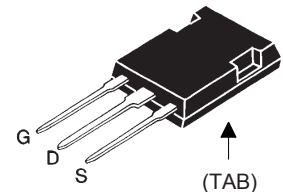
Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	600	V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1\text{ M}\Omega$	600	V
$V_{GSS}$	Continuous	$\pm 30$	V
$V_{GSM}$	Transient	$\pm 40$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	48	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$	110	A
$I_{AR}$	$T_C = 25^\circ\text{C}$	48	A
$E_{AR}$	$T_C = 25^\circ\text{C}$	70	mJ
$E_{AS}$	$T_C = 25^\circ\text{C}$	2.0	J
$dv/dt$	$I_S \leq I_{DM}$ , $di/dt \leq 100\text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ , $R_G = 4\ \Omega$	20	V/ns
$P_D$	$T_C = 25^\circ\text{C}$	830	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$M_d$	Mounting torque (TO-264)	1.13/10 Nm/lb.in.	
Weight	TO-264	10	g
	PLUS247	6	g
$T_L$	1.6 mm (0.062 in.) from case for 10 s	300	$^\circ\text{C}$
$T_{SOLD}$	Plastic body for 10 s	260	$^\circ\text{C}$

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\ \mu\text{A}$	600		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 8\text{ mA}$	3.0		5.0 V
$I_{GSS}$	$V_{GS} = \pm 30\text{ V}_{DC}$ , $V_{DS} = 0$			$\pm 200\text{ nA}$
$I_{DSS}$	$V_{DS} = V_{DSS}$ $V_{GS} = 0\text{ V}$ $T_J = 125^\circ\text{C}$			25 $\mu\text{A}$
				1000 $\mu\text{A}$
$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 0.5 I_{D25}$ Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$			135 $\text{m}\Omega$

TO-264 (IXFK)



PLUS247 (IXFX)



G = Gate    D = Drain  
S = Source    Tab = Drain

## Features

- † International standard packages
- † Fast recovery diode
- † Unclamped Inductive Switching (UIS) rated
- † Low package inductance
- easy to drive and to protect

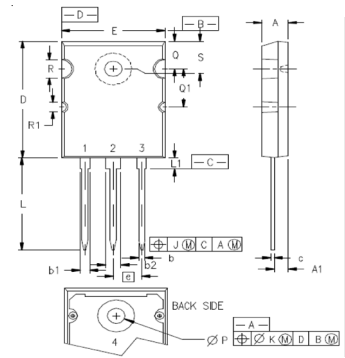
## Advantages

- † Easy to mount
- † Space savings
- † High power density

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}$ , pulse test	35	53	S
$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		8860	pF
$C_{oss}$			850	pF
$C_{rss}$			60	pF
$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 I_{D25}$ $R_G = 2\ \Omega$ (External)		30	ns
$t_r$			25	ns
$t_{d(off)}$			85	ns
$t_f$			22	ns
$Q_{g(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$		150	nC
$Q_{gs}$			50	nC
$Q_{gd}$			50	nC
$R_{thJC}$	TO-264 and PLUS247			0.15 °C/W
$R_{thCs}$			0.15	°C/W

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$I_S$	$V_{GS} = 0\text{ V}$			48 A
$I_{SM}$	Repetitive			110 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
$t_{rr}$	$I_F = 25\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}$ $V_R = 100\text{ V}$			200 ns
$Q_{RM}$			0.8	$\mu\text{C}$
$I_{RM}$			6.0	A

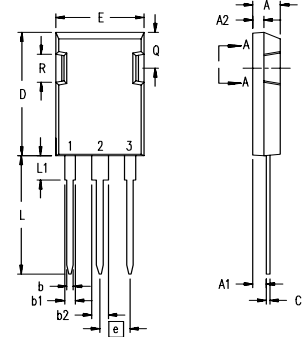
### TO-264 (IXFK) Outline



- 1 - GATE
- 2, 4 - DRAIN (COLLECTOR)
- 3 - SOURCE (EMITTER)

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.209	4.70	5.31
A1	.102	.118	2.59	3.00
b	.037	.055	0.94	1.40
b1	.087	.102	2.21	2.59
b2	.110	.126	2.79	3.20
c	.017	.029	0.43	0.74
D	1.007	1.047	25.58	26.59
E	.760	.799	19.30	20.29
e	.215 BSC		5.46 BSC	
J	.000	.010	0.00	0.25
K	.000	.010	0.00	0.25
L	.779	.842	19.79	21.39
L1	.087	.102	2.21	2.59
ØP	.122	.138	3.10	3.51
Q	.240	.256	6.10	6.50
Q1	.330	.346	8.38	8.79
ØR	.155	.187	3.94	4.75
ØR1	.085	.093	2.16	2.36
S	.243	.253	6.17	6.43

### PLUS 247™ (IXFX) Outline

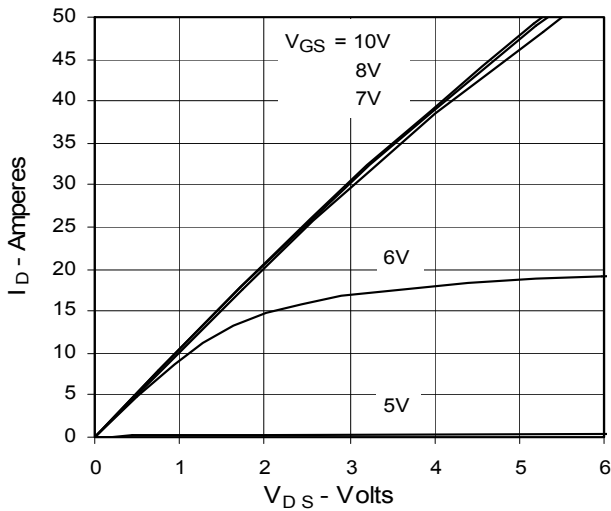
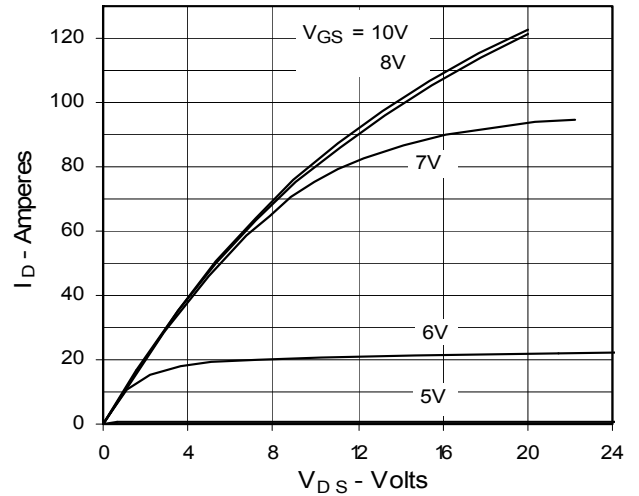
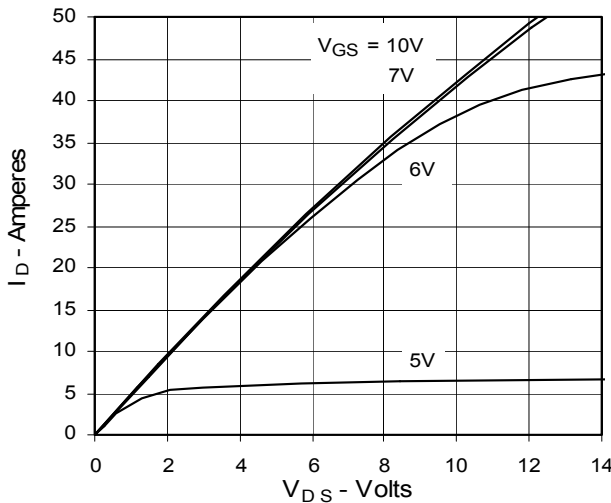
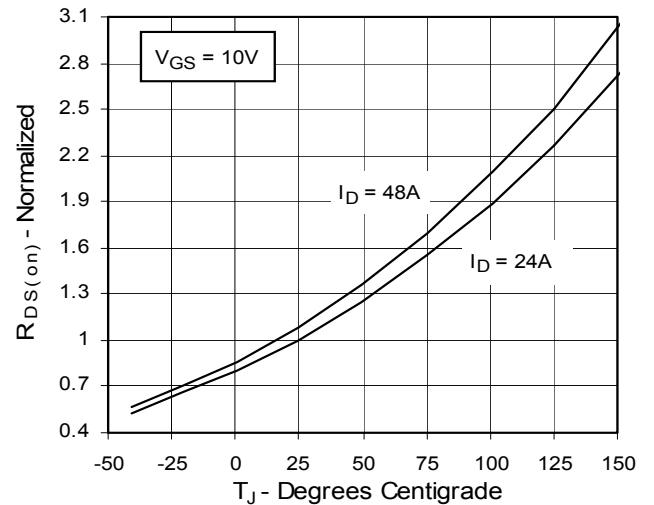
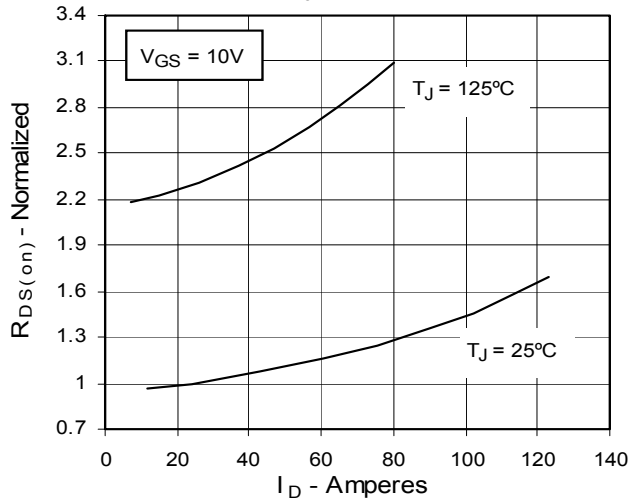
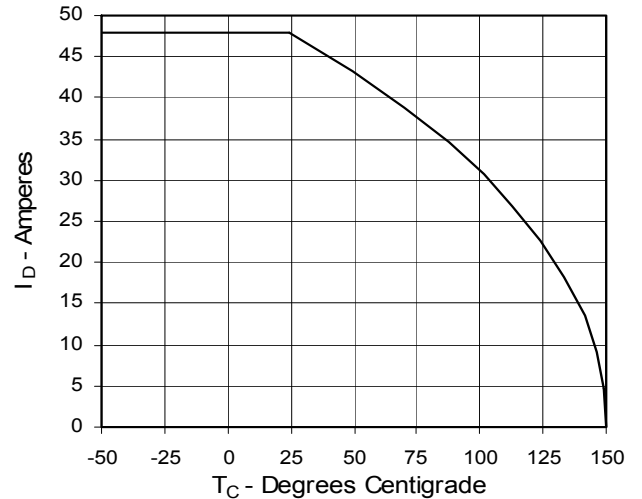


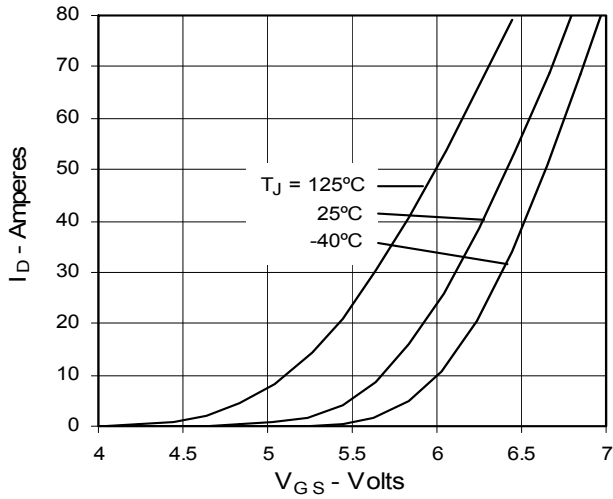
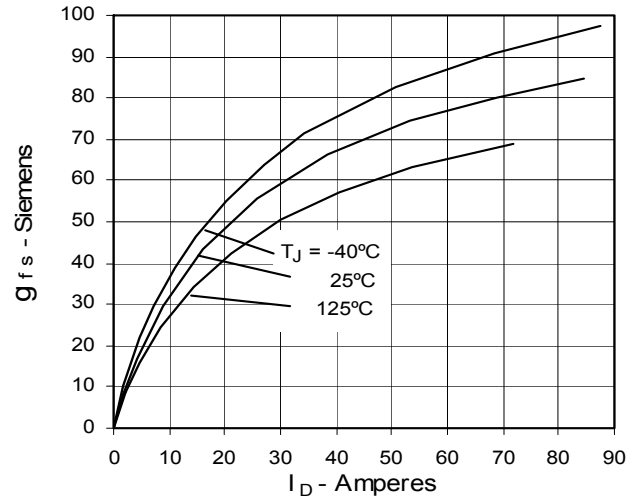
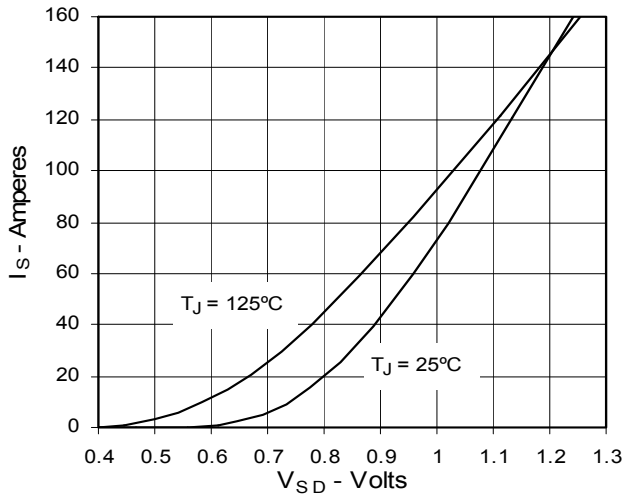
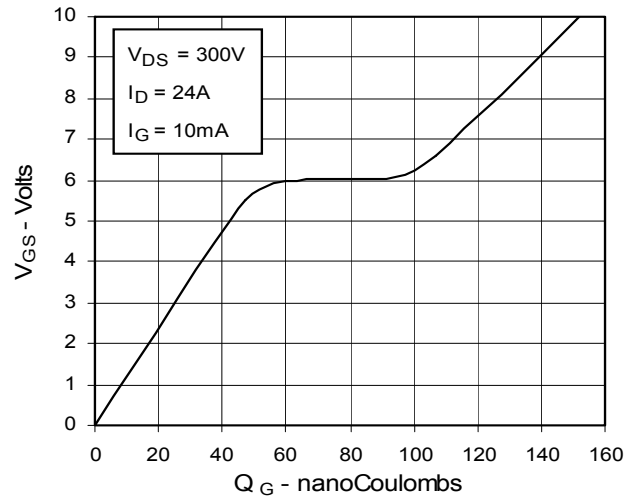
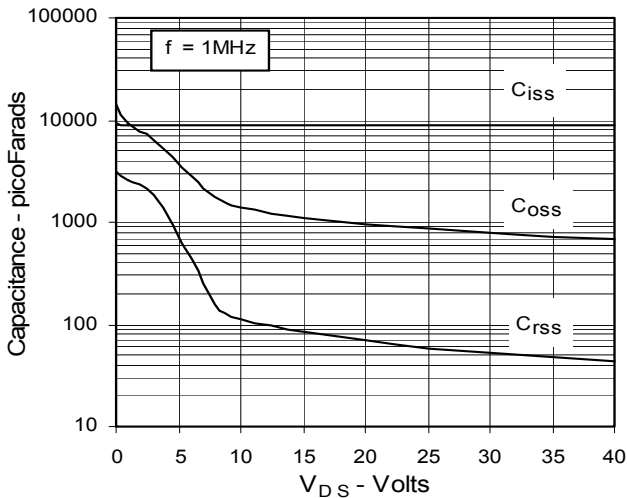
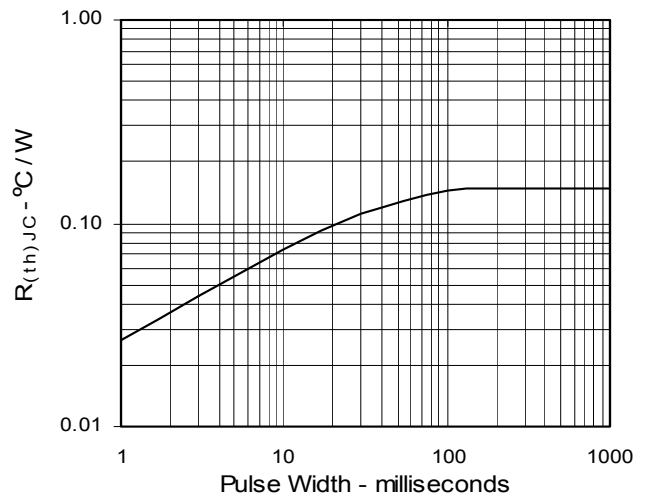
- Terminals: 1 - Gate
- 2 - Drain (Collector)
- 3 - Source (Emitter)
- 4 - Drain (Collector)

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	.190	.205
A <sub>1</sub>	2.29	2.54	.090	.100
A <sub>2</sub>	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b <sub>1</sub>	1.91	2.13	.075	.084
b <sub>2</sub>	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	0.244
R	4.32	4.83	.170	.190

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

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 4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6,771,478 B2

**Fig. 1. Output Characteristics  
@ 25°C**

**Fig. 2. Extended Output Characteristics  
@ 25°C**

**Fig. 3. Output Characteristics  
@ 125°C**

**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$   
Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  
0.5  $I_{D25}$  Value vs.  $I_D$** 

**Fig. 6. Drain Current vs. Case  
Temperature**


**Fig. 7. Input Admittance**

**Fig. 8. Transconductance**

**Fig. 9. Source Current vs. Source-To-Drain Voltage**

**Fig. 10. Gate Charge**

**Fig. 11. Capacitance**

**Fig. 13. Maximum Transient Thermal Resistance**




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