IXYS

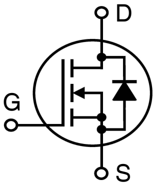
X2-Class
HiperFET™
Power MOSFET

IXFP12N65X2M

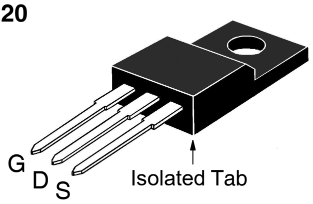
V_{DSS} = 650V
I_{D25} = 12A
$R_{DS(on)}$ ≤ 310mΩ

(Electrically Isolated Tab)

N-Channel Enhancement Mode



OVERMOLDED
TO-220



G = Gate D = Drain
S = Source

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	650	V
V_{DGR}	T_J = 25°C to 150°C, R_{GS} = 1MΩ	650	V
V_{GSS}	Continuous	±30	V
V_{GSM}	Transient	±40	V
I_{D25}	T_C = 25°C, Limited by T_{JM}	12	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	24	A
I_A	T_C = 25°C	6	A
E_{AS}	T_C = 25°C	300	mJ
dv/dt	$I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le$ 150°C	50	V/ns
P_D	T_C = 25°C	40	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
V_{ISOL}	50/60 Hz, 1 Minute	2500	V~
M_d	Mounting Torque	1.13 / 10	Nm/lb.in
Weight		2.5	g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{DSS}	V_{GS} = 0V, I_D = 250µA	650			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250µA	3.0		5.0	V
I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V			±100	nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0V			10	µA
	T_J = 125°C			500	µA
$R_{DS(on)}$	V_{GS} = 10V, I_D = 6A, Note 1			310	mΩ

Features

- International Standard Package
- Plastic Overmolded Tab
- High Voltage Package
- Low $R_{DS(ON)}$ and Q_G
- Avalanche Rated
- 2500V~ Electrical Isolation
- Low Package Inductance

Advantages

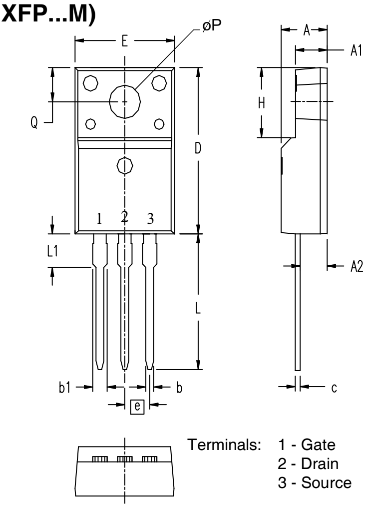
- High Power Density
- Easy to Mount
- Space Savings

Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

Symbol	Test Conditions	Characteristic Values			
(T_J = 25°C, Unless Otherwise Specified)		Min.	Typ.	Max	
g_{fs}	V_{DS} = 10V, I_D = 6A, Note 1	4.8	8.0		S
R_{Gi}	Gate Input Resistance		4.0		Ω
C_{iss}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz		1134		pF
C_{oss}			712		pF
C_{rss}			1		pF
	Effective Output Capacitance				
$C_{o(er)}$	Energy related; V_{GS} = 0V		42		pF
$C_{o(tr)}$	Time related; V_{DS} = 0.8 • V_{DSS}		132		pF
$t_{d(on)}$	**Resistive Switching Times**		27		ns
t_r	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 6A		26		ns
$t_{d(off)}$	R_G = 20Ω (External)		45		ns
t_f			12		ns
$Q_{g(on)}$	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 6A		18.5		nC
Q_{gs}			6.7		nC
Q_{gd}			5.0		nC
R_{thJC}				3.10	°C/W
R_{thCS}			0.50		°C/W

OVERMOLDED TO-220 (IXFP...M)



Terminals: 1 - Gate
2 - Drain
3 - Source

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.177	.193	4.50	4.90
A1	.092	.108	2.34	2.74
A2	.101	.117	2.56	2.96
b	.028	.035	0.70	0.90
b1	.050	.058	1.27	1.47
c	.018	.024	0.45	0.60
D	.617	.633	15.67	16.07
E	.392	.408	9.96	10.36
e	.100 BSC		2.54 BSC	
H	.255	.271	6.48	6.88
L	.499	.523	12.68	13.28
L1	.119	.135	3.03	3.43
ØP	.121	.129	3.08	3.28
Q	.126	.134	3.20	3.40

Source-Drain Diode

Symbol	Test Conditions	Characteristic Values			
(T_J = 25°C, Unless Otherwise Specified)		Min.	Typ.	Max	
I_S	V_{GS} = 0V			12	A
I_{SM}	Repetitive, Pulse Width Limited by T_{JM}			48	A
V_{SD}	I_F = I_S, V_{GS} = 0V, Note 1			1.4	V
t_{rr}	I_F = 6A, -di/dt = 100A/μs		155		ns
Q_{RM}	V_R = 100V		1		μC
I_{RM}			13		A

Note 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

Fig. 1. Output Characteristics @ $T_J = 25^oC$

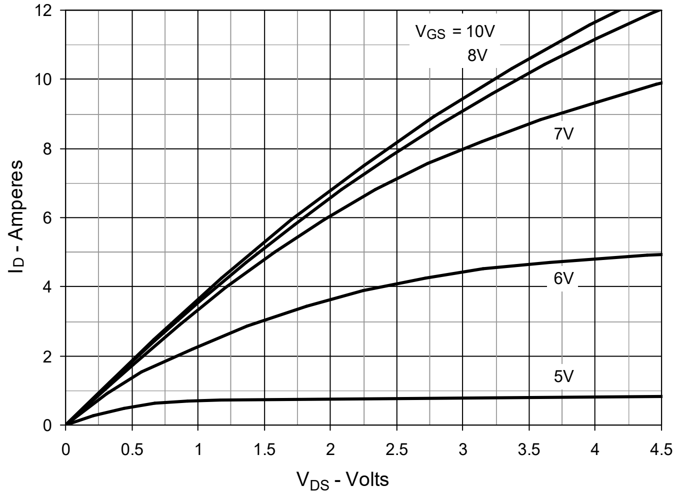


Fig. 2. Extended Output Characteristics @ $T_J = 25^oC$

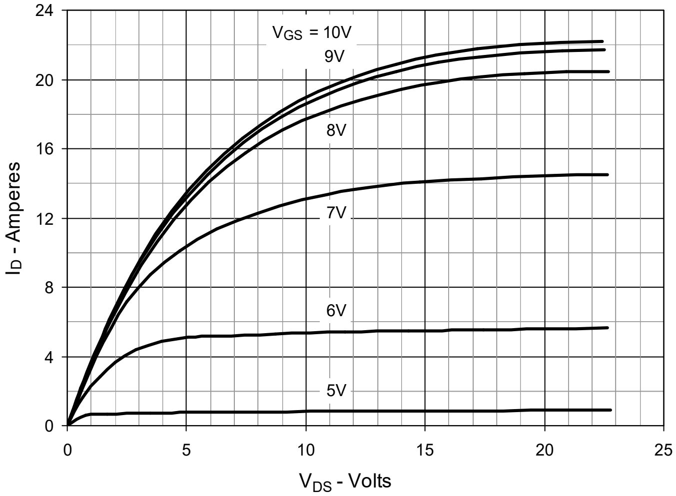


Fig. 3. Output Characteristics @ $T_J = 125^oC$

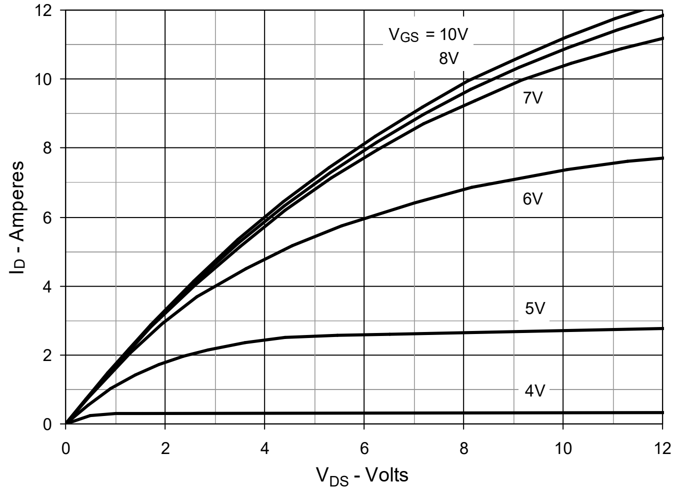


Fig. 4. $R_{DS(on)}$ Normalized to I_D = 6A Value vs. Junction Temperature

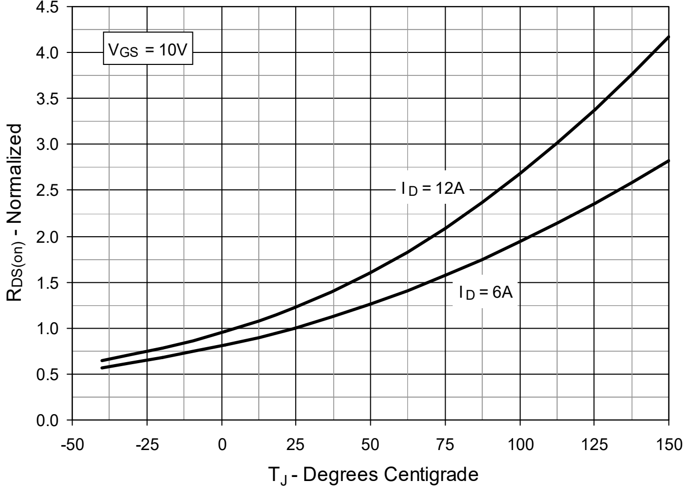


Fig. 5. $R_{DS(on)}$ Normalized to I_D = 6A Value vs. Drain Current

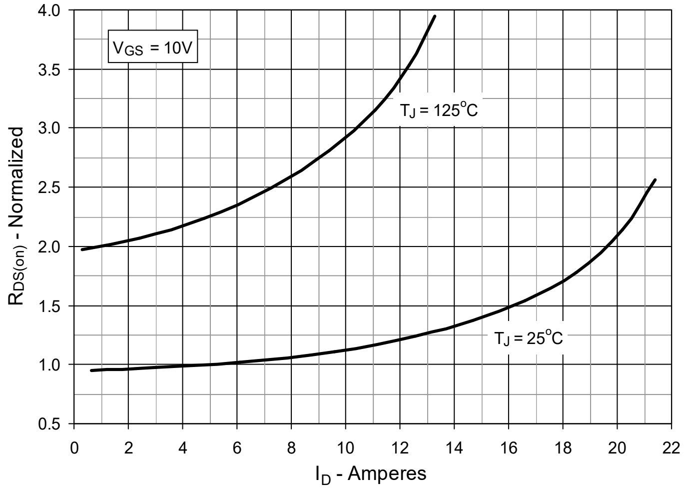


Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature

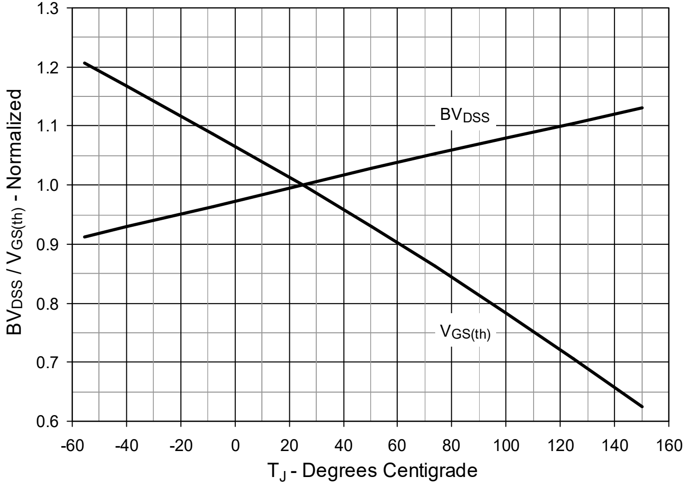


Fig. 7. Input Admittance

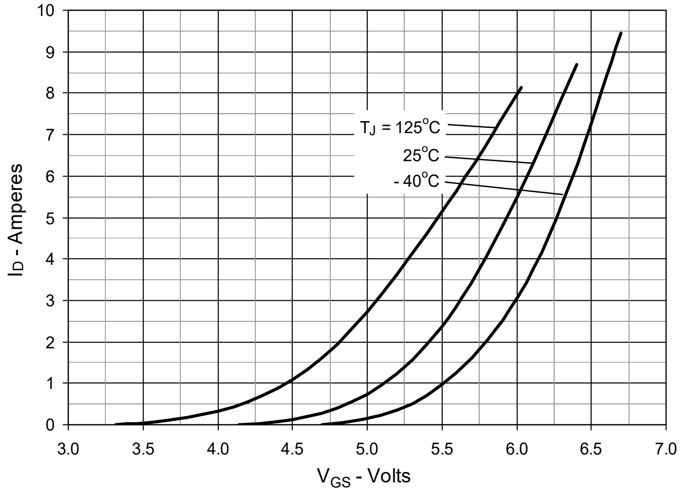


Fig. 8. Transconductance

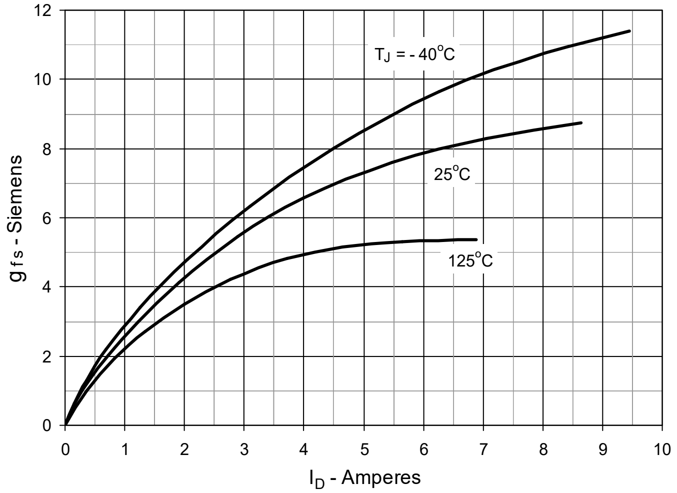


Fig. 9. Forward Voltage Drop of Intrinsic Diode

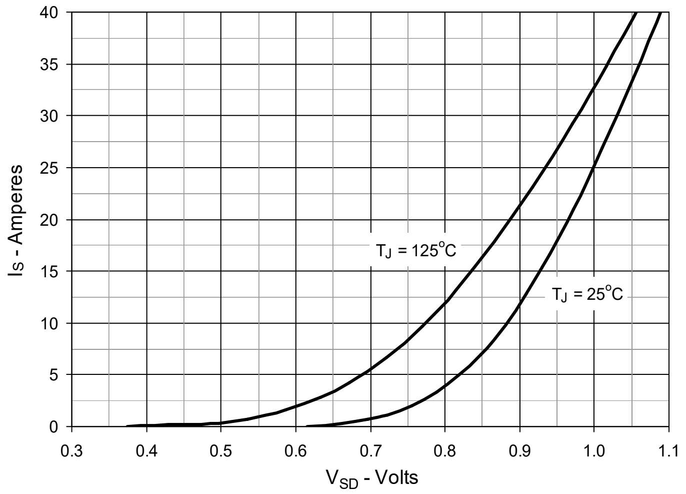


Fig. 10. Gate Charge

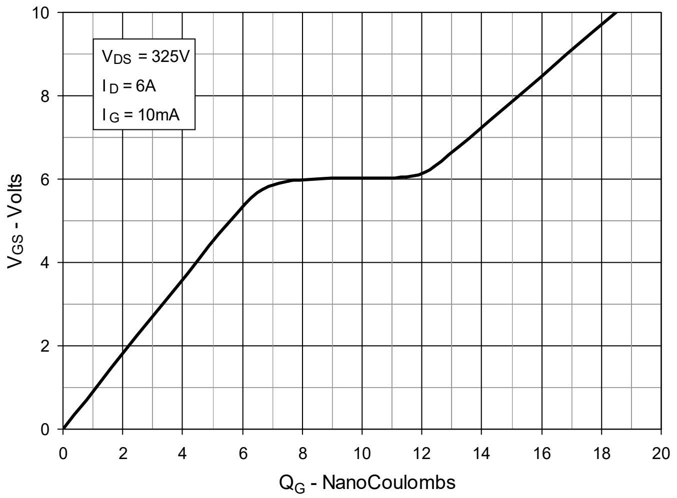


Fig. 11. Capacitance

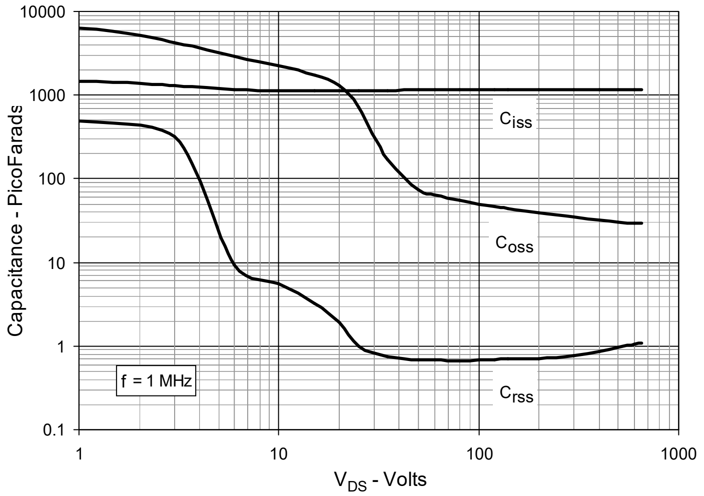
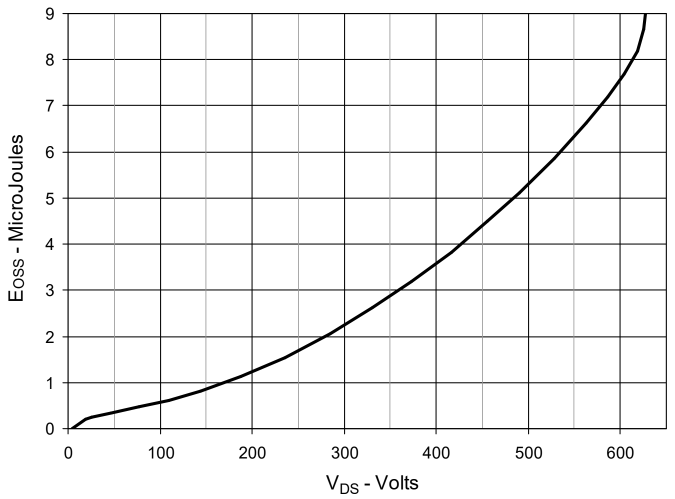


Fig. 12. Output Capacitance Stored Energy



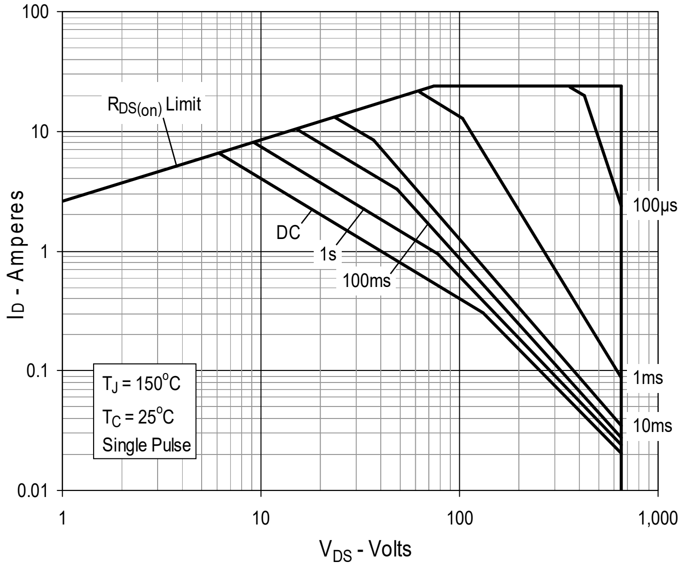


Fig. 13. Forward-Bias Safe Operating Area

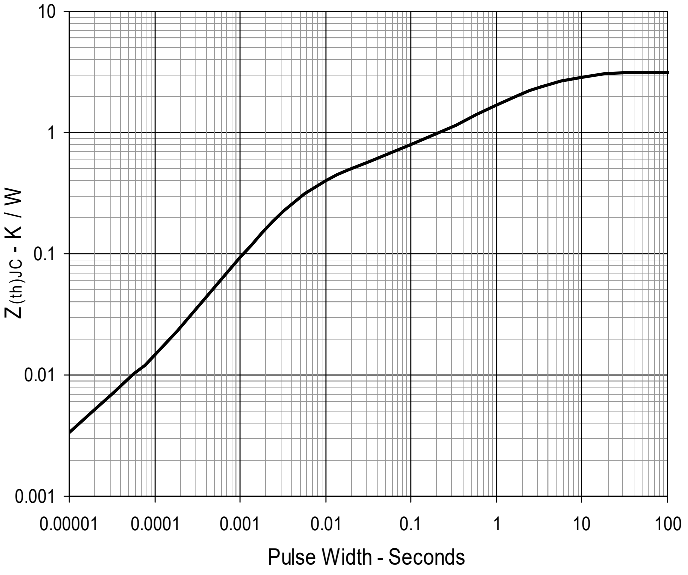


Fig. 14. Maximum Transient Thermal Impedance

IXYS REF: F_12N65X2(X3-S602) 9-09-16

IXYS
A Littelfuse Technology