

# X2-Class Power MOSFET

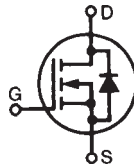
## IXTP12N70X2M

$$V_{DSS} = 700V$$

$$I_{D25} = 12A$$

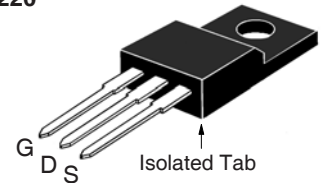
$$R_{DS(on)} \leq 300m\Omega$$

(Electrically Isolated Tab)



N-Channel Enhancement Mode

OVERMOLDED  
TO-220



G = Gate      D = Drain  
S = Source

Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ C$ to $150^\circ C$	700	V
$V_{DGR}$	$T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$	700	V
$V_{GSS}$	Continuous	$\pm 30$	V
$V_{GSM}$	Transient	$\pm 40$	V
$I_{D25}$	$T_C = 25^\circ C$ , Limited by $T_{JM}$	12	A
$I_{DM}$	$T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$	24	A
$I_A$	$T_C = 25^\circ C$	6	A
$E_{AS}$	$T_C = 25^\circ C$	300	mJ
dv/dt	$I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$	50	V/ns
$P_D$	$T_C = 25^\circ C$	40	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6 mm (0.062in.) from Case for 10s	260	$^\circ C$
$V_{ISOL}$	50/60 Hz, 1 Minute	2500	V~
$M_d$	Mounting Torque	1.13 / 10	Nm/lb.in
Weight		2.5	g

### 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 ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSS}$	$V_{GS} = 0V$ , $I_D = 250\mu A$	700		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\mu A$	2.5		4.5 V
$I_{GSS}$	$V_{GS} = \pm 30V$ , $V_{DS} = 0V$			$\pm 100$ nA
$I_{DSS}$	$V_{DS} = V_{DSS}$ , $V_{GS} = 0V$ $T_J = 125^\circ C$			5 $\mu A$ 50 $\mu A$
$R_{DS(on)}$	$V_{GS} = 10V$ , $I_D = 6A$ , Note 1			300 m $\Omega$

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
$g_{fs}$	$V_{DS} = 10\text{V}$ , $I_D = 6\text{A}$ , Note 1	7	12	S
$R_{Gi}$	Gate Input Resistance		3.7	$\Omega$
$C_{iss}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$		960	pF
$C_{oss}$			920	pF
$C_{rss}$			2	pF
<b>Effective Output Capacitance</b>				
$C_{o(er)}$	Energy related	$V_{GS} = 0\text{V}$ $V_{DS} = 0.8 \cdot V_{DSS}$	58	pF
$C_{o(tr)}$	Time related		200	pF
<b>Resistive Switching Times</b>				
$t_{d(on)}$	$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 6\text{A}$ $R_G = 30\Omega$ (External)		24	ns
$t_r$			30	ns
$t_{d(off)}$			78	ns
$t_f$			27	ns
$Q_{g(on)}$	$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 6\text{A}$		19	nC
$Q_{gs}$			5	nC
$Q_{gd}$			8	nC
$R_{thJC}$				3.10 $^\circ\text{C/W}$
$R_{thCS}$		0.50		$^\circ\text{C/W}$

### Source-Drain Diode

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
$I_S$	$V_{GS} = 0\text{V}$			12 A
$I_{SM}$	Repetitive, pulse Width Limited by $T_{JM}$			48 A
$V_{SD}$	$I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1			1.4 V
$t_{rr}$	$I_F = 6\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ $V_R = 100\text{V}$		270	ns
$Q_{RM}$			2.8	$\mu\text{C}$
$I_{RM}$			21	A

Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

### PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

### OVERMOLDED TO-220 (IXTP...M)

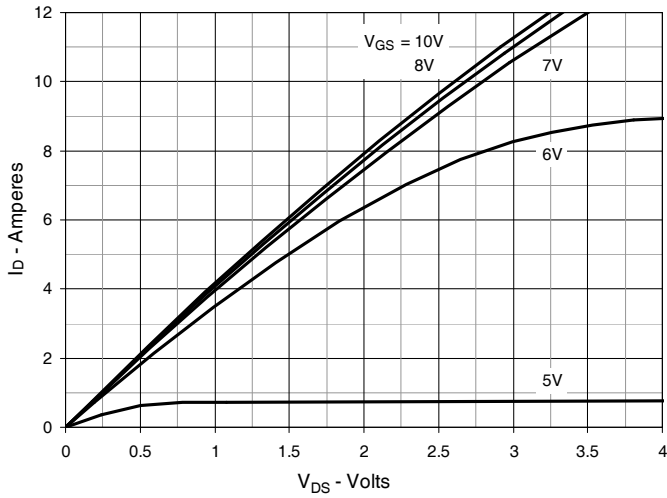


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.177	.193	4.50	4.90
A1	.092	.108	2.34	2.74
A2	.101	.117	2.56	2.96
b	.028	.035	0.70	0.90
b1	.050	.058	1.27	1.47
c	.018	.024	0.45	0.60
D	.617	.633	15.67	16.07
E	.392	.408	9.96	10.36
e	.100 BSC		2.54 BSC	
H	.255	.271	6.48	6.88
L	.499	.523	12.68	13.28
L1	.119	.135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

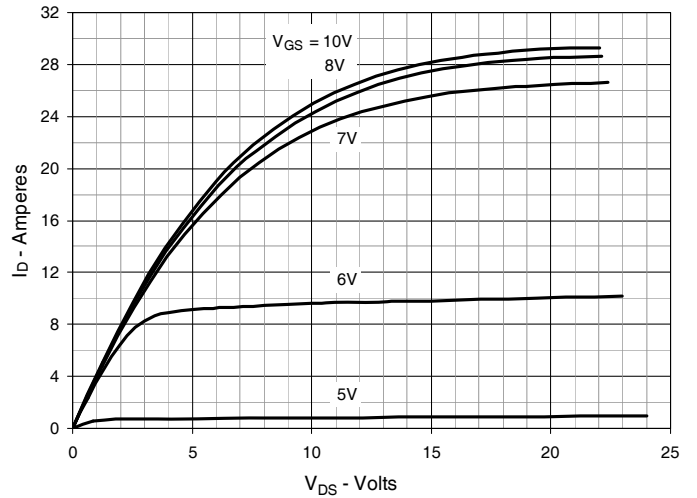
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065B1	6,683,344	6,727,585	7,005,734B2	7,157,338B2
	4,860,072	5,017,508	5,063,307	5,381,025	6,259,123B1	6,534,343	6,710,405B2	6,759,692	7,063,975B2	
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728B1	6,583,505	6,710,463	6,771,478B2	7,071,537	

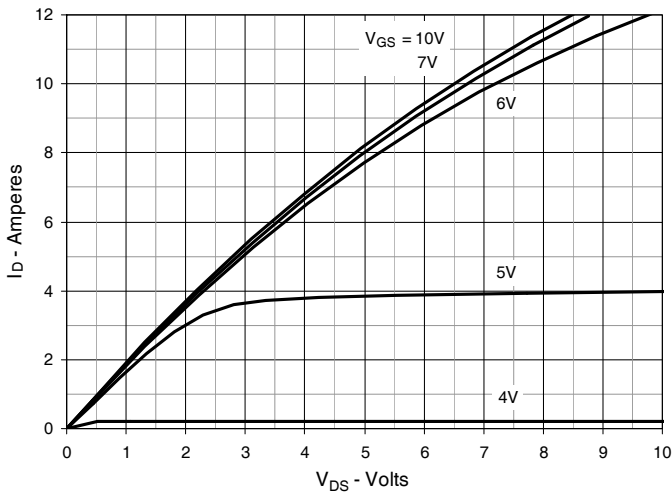
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



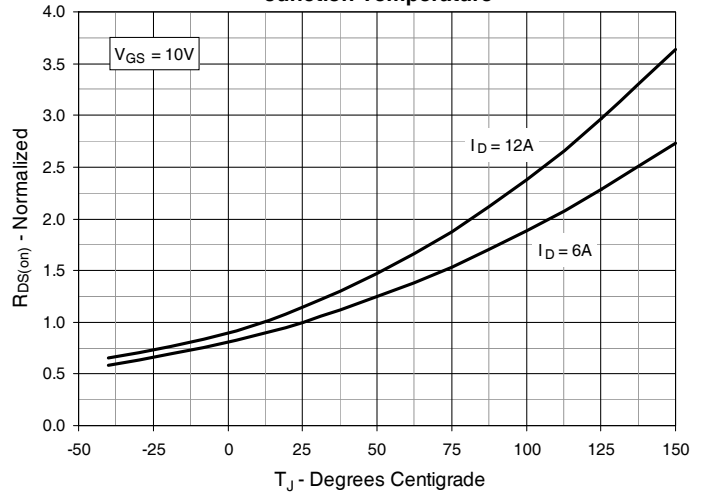
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



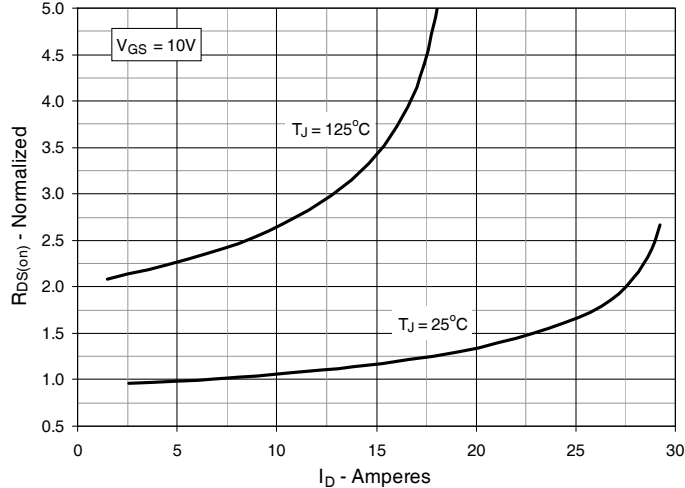
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



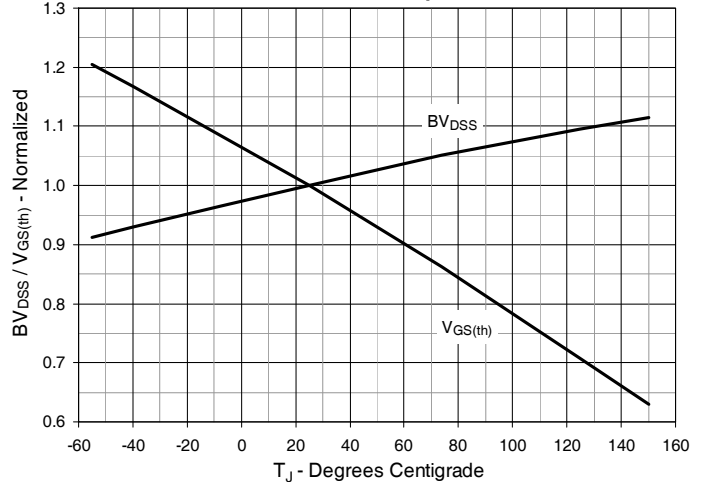
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 6A$  Value vs. Junction Temperature**

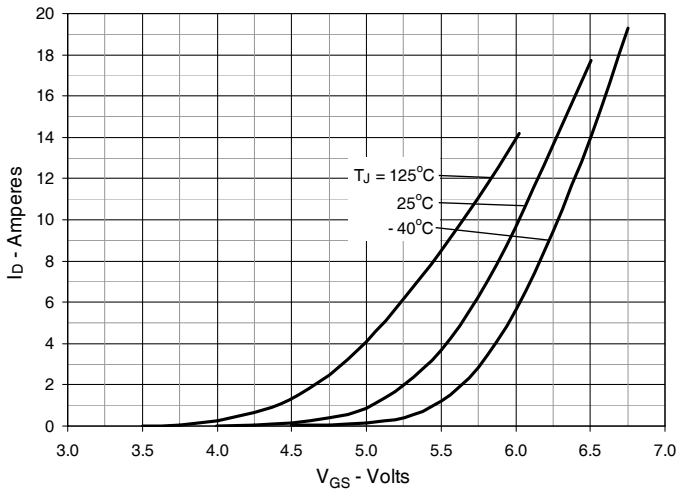
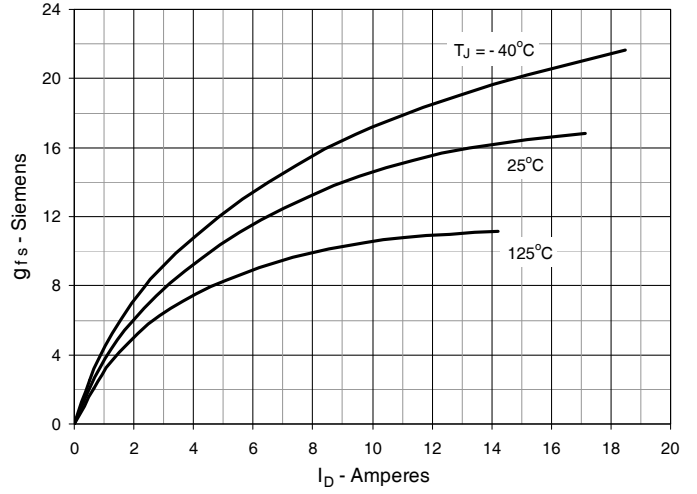
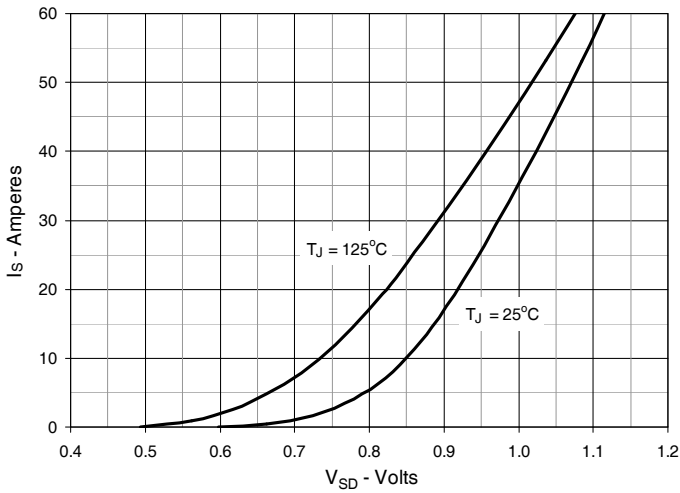
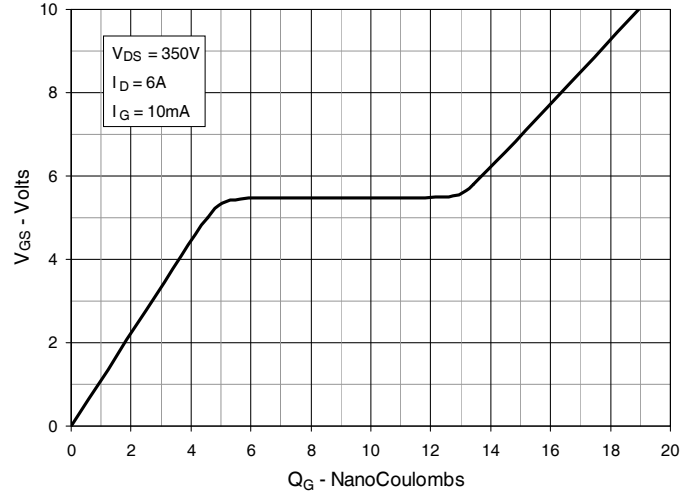
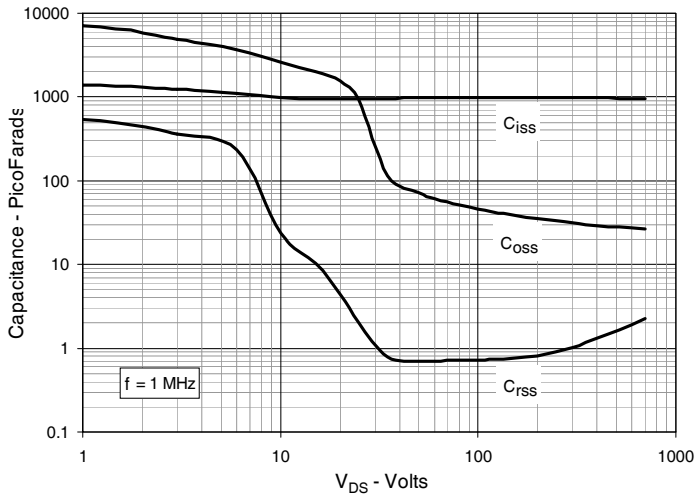
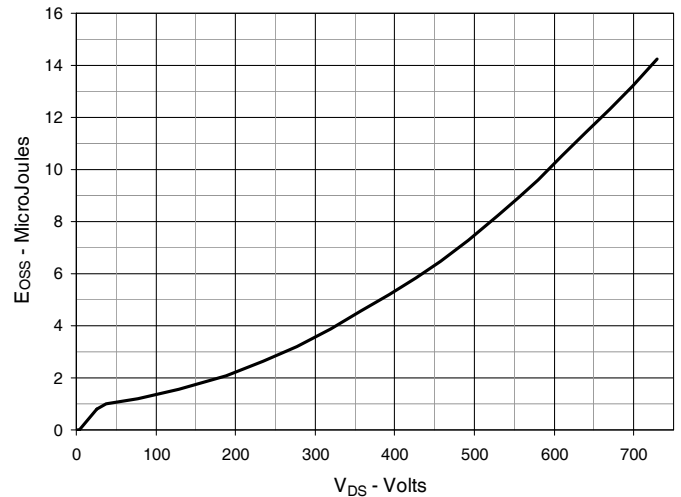


**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 6A$  Value vs. Drain Current**

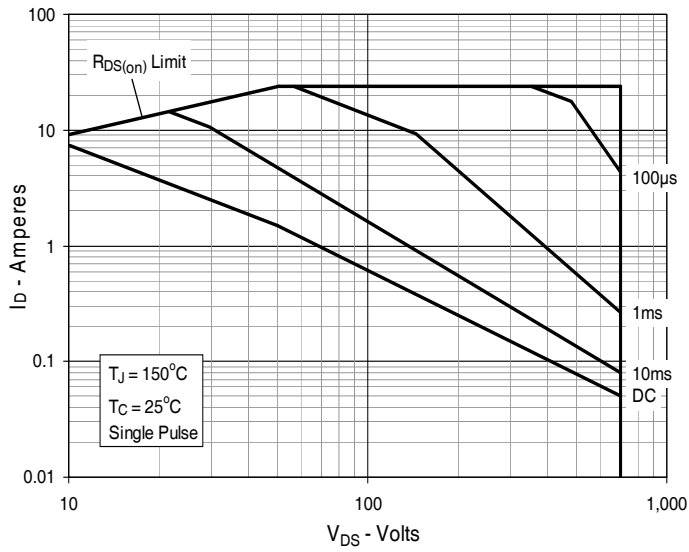


**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**

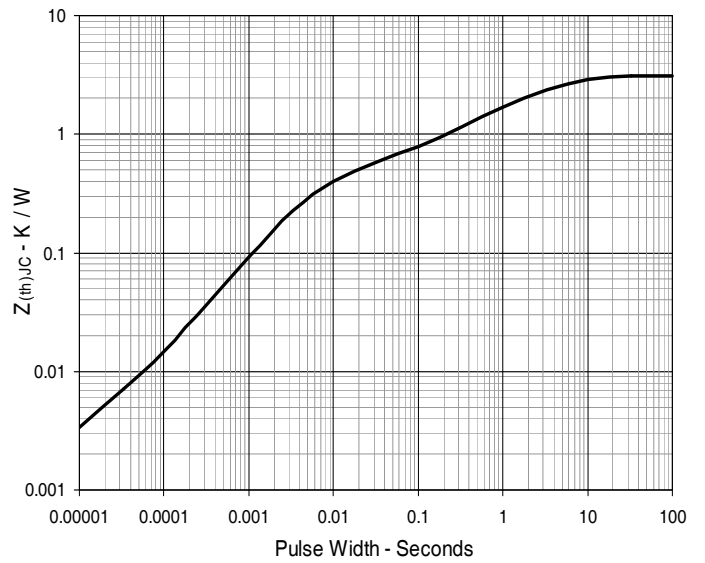


**Fig. 7. Input Admittance**

**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**





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).