

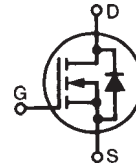
# PolarHV™ Power MOSFET

**IXTQ 22N60P**  
**IXTV 22N60P**  
**IXTV 22N60PS**

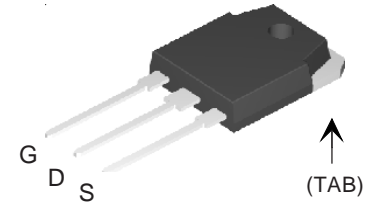
$V_{DSS} = 600 \text{ V}$   
 $I_{D25} = 22 \text{ A}$   
 $R_{DS(on)} \leq 330 \text{ m}\Omega$

N-Channel Enhancement Mode

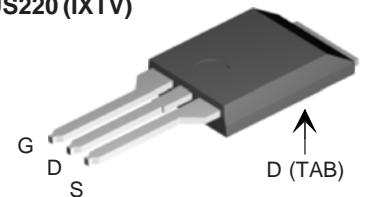
Preliminary Data Sheet



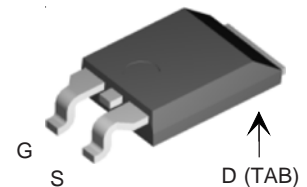
TO-3P (IXTQ)



PLUS220 (IXTV)



PLUS220SMD (IXTV\_S)



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

Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	600	V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$	600	V
$V_{GS}$	Continuous	$\pm 20$	V
$V_{GSM}$	Transient	$\pm 30$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	22	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$	66	A
$I_{AR}$	$T_C = 25^\circ\text{C}$	22	A
$E_{AR}$	$T_C = 25^\circ\text{C}$	40	mJ
$E_{AS}$	$T_C = 25^\circ\text{C}$	1.0	J
$dv/dt$	$I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ , $R_G = 4 \Omega$	10	V/ns
$P_D$	$T_C = 25^\circ\text{C}$	400	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 Plastic body for 10 s	300 250	$^\circ\text{C}$ $^\circ\text{C}$
$M_d$	Mounting torque (TO-3P)	1.13/10	Nm/lb.in.
Weight	TO-3P	6	g
	PLUS220 & PLUS220SMD	5.0	g

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$V_{DSS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	600		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	3.0		5.0 V
$I_{GSS}$	$V_{GS} = \pm 30 \text{ V}_{DC}$ , $V_{DS} = 0$			$\pm 100 \text{ nA}$
$I_{DSS}$	$V_{DS} = V_{DSS}$			25 $\mu\text{A}$
	$V_{GS} = 0 \text{ V}$			250 $\mu\text{A}$
$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$ Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$			330 $\text{m}\Omega$

### Features

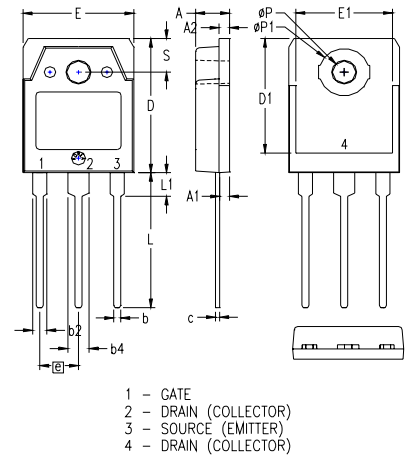
- International standard packages
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
  - easy to drive and to protect

### Advantages

- Easy to mount
- Space savings
- High power density

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
( $T_J = 25^{\circ}\text{C}$ , unless otherwise specified)				
$g_{fs}$	$V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}$ , pulse test	15	21	S
$C_{iss}$ } $C_{oss}$ } $C_{rss}$ }	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		3600	pF
			305	pF
			38	pF
$t_{d(on)}$ } $t_r$ } $t_{d(off)}$ } $t_f$ }	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_{D25}$	$R_G = 4\ \Omega$ (External)	20	ns
			20	ns
			60	ns
			23	ns
$Q_{g(on)}$ } $Q_{gs}$ } $Q_{gd}$ }	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$		105	nC
			25	nC
			55	nC
$R_{thJC}$	(TO-3P)		0.21	KW
$R_{thCK}$		KW		

### TO-3P (IXTQ) Outline

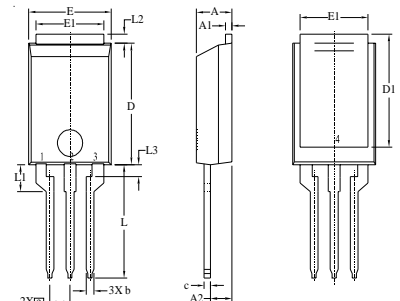


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.193	4.70	4.90
A1	.051	.059	1.30	1.50
A2	.057	.065	1.45	1.65
b	.035	.045	0.90	1.15
b2	.075	.087	1.90	2.20
b4	.114	.126	2.90	3.20
c	.022	.031	0.55	0.80
D	.780	.791	19.80	20.10
D1	.665	.677	16.90	17.20
E	.610	.622	15.50	15.80
E1	.531	.539	13.50	13.70
e	.215 BSC		5.45 BSC	
L	.779	.795	19.80	20.20
L1	.134	.142	3.40	3.60
L2	.126	.134	3.20	3.40
ØP1	.272	.280	6.90	7.10
S	.193	.201	4.90	5.10

All metal area are tin plated.

Symbol	Test Conditions	Characteristic Values		
		min.	typ.	max.
( $T_J = 25^{\circ}\text{C}$ , unless otherwise specified)				
$I_S$	$V_{GS} = 0\text{ V}$			22 A
$I_{SM}$	Repetitive			66 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
$t_{rr}$ } $Q_{RM}$ }	$I_F = 22\text{ A}$ $-di/dt = 100\text{ A}/\mu\text{s}$ $V_R = 100\text{ V}$		410	ns
			4.0	$\mu\text{C}$

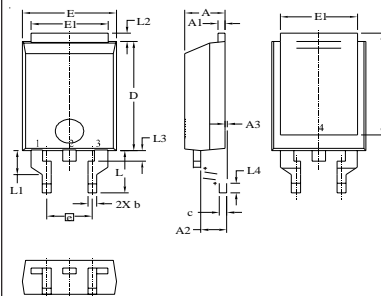
### PLUS220 (IXTV) Outline



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

SYM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX
A	.169	.185	4.30	4.70
A1	.028	.035	0.70	0.90
A2	.098	.118	2.50	3.00
b	.035	.047	0.90	1.20
c	.028	.035	0.70	0.90
D	.551	.591	14.00	15.00
D1	.512	.539	13.00	13.70
E	.394	.433	10.00	11.00
E1	.331	.346	8.40	8.80
e	.100 BSC		2.54 BSC	
L	.512	.551	13.00	14.00
L1	.118	.138	3.00	3.50
L2	.035	.051	0.90	1.30
L3	.047	.059	1.20	1.50

### PLUS220SMD



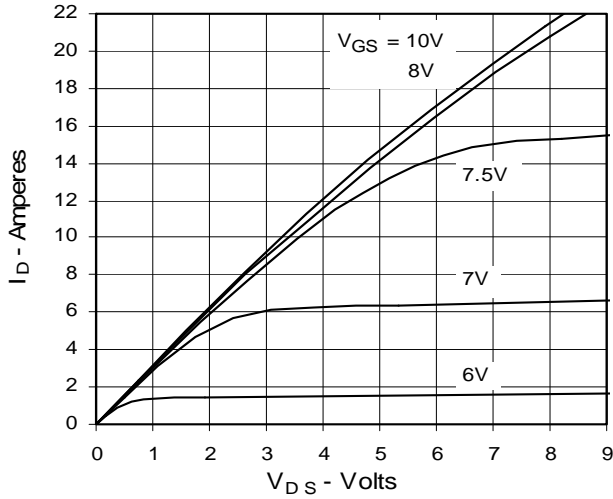
Terminals: 1 - Gate 2 - Drain  
3 - Source TAB - Drain

SYM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX
A	.169	.185	4.30	4.70
A1	.028	.035	0.70	0.90
A2	.098	.118	2.50	3.00
A3	.000	.010	0.00	0.25
b	.035	.047	0.90	1.20
c	.028	.035	0.70	0.90
D	.551	.591	14.00	15.00
D1	.512	.539	13.00	13.70
E	.394	.433	10.00	11.00
E1	.331	.346	8.40	8.80
e	.200BSC		5.08 BSC	
L	.209	.228	5.30	5.80
L1	.118	.138	3.00	3.50
L2	.035	.051	0.90	1.30
L3	.047	.059	1.20	1.50
L4	.039	.059	1.00	1.50

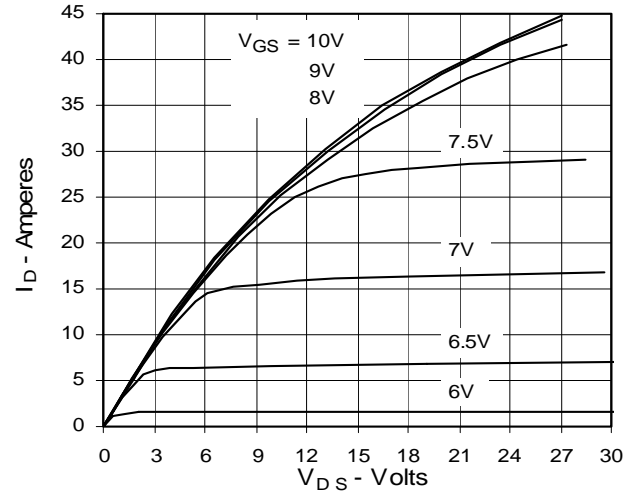
IXYS reserves the right to change limits, test conditions, and dimensions.

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
	4,850,072	5,017,508	5,063,307	5,381,025	6,259,123B1	6,534,343	6,710,405B2	6,759,692
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	

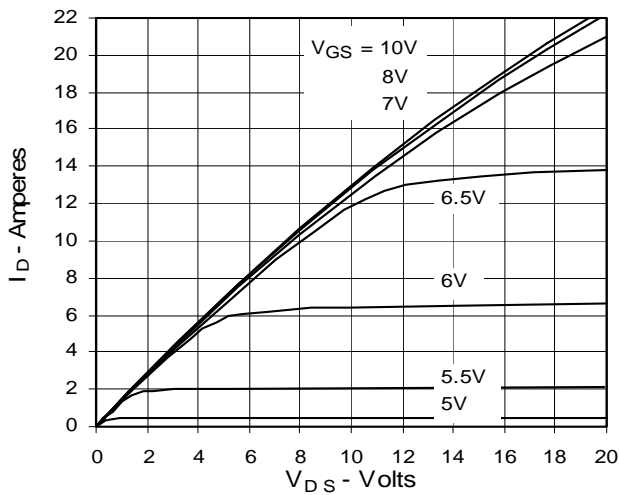
**Fig. 1. Output Characteristics**  
@ 25°C



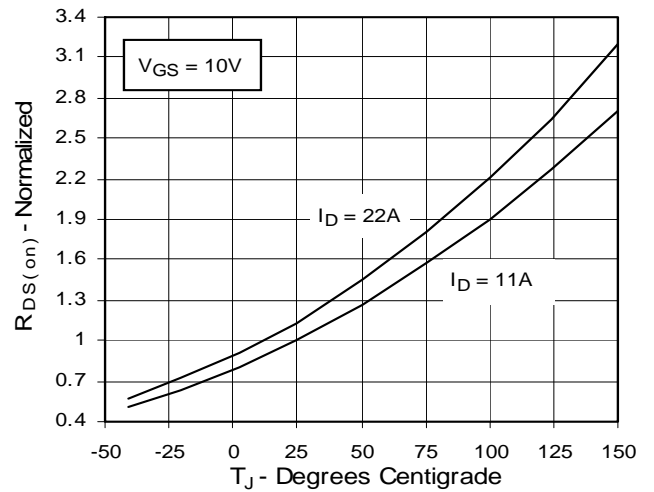
**Fig. 2. Extended Output Characteristics**  
@ 25°C



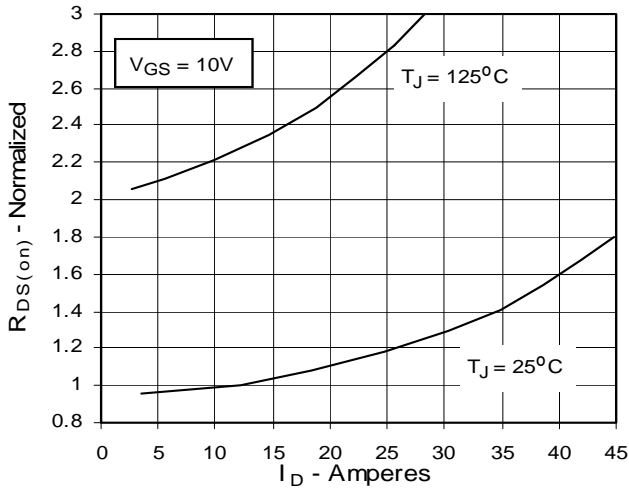
**Fig. 3. Output Characteristics**  
@ 125°C



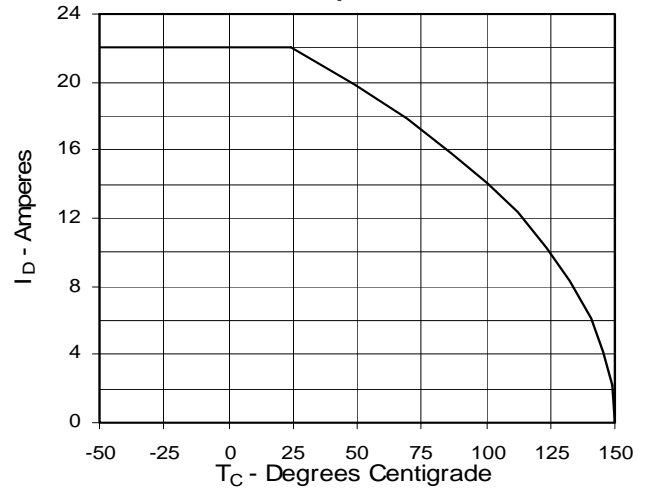
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs. Junction Temperature**



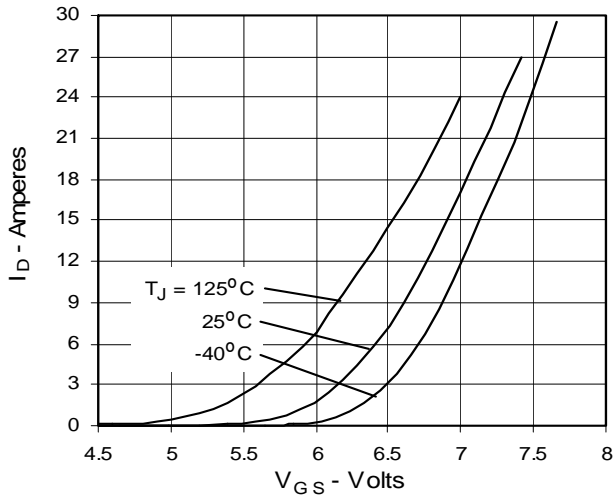
**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs.  $I_D$**



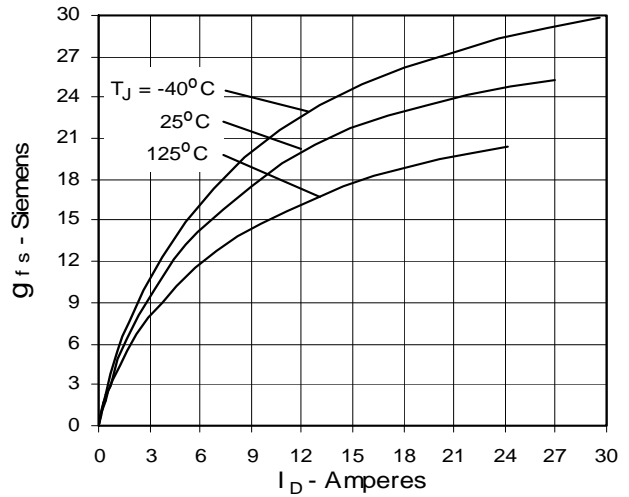
**Fig. 6. Drain Current vs. Case Temperature**



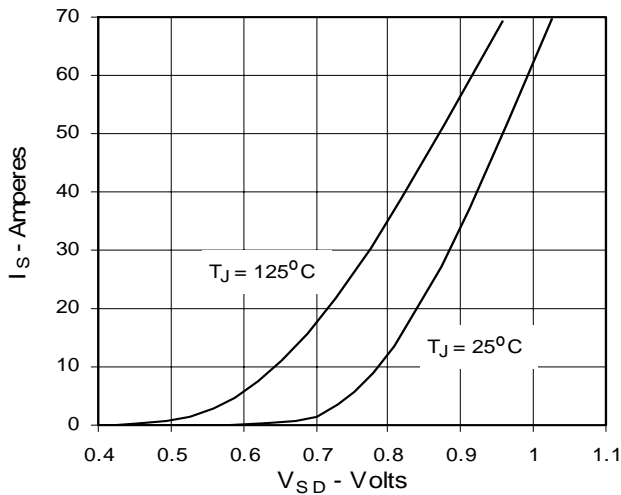
**Fig. 7. Input Admittance**



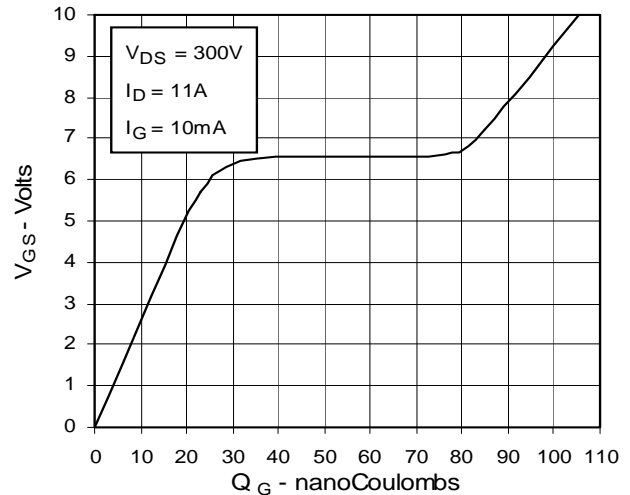
**Fig. 8. Transconductance**



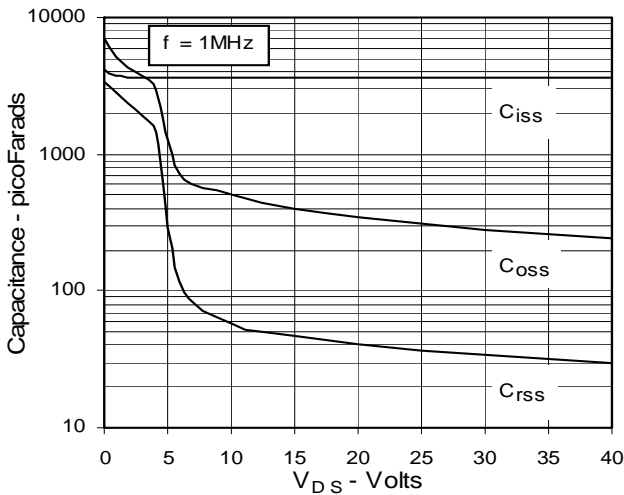
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



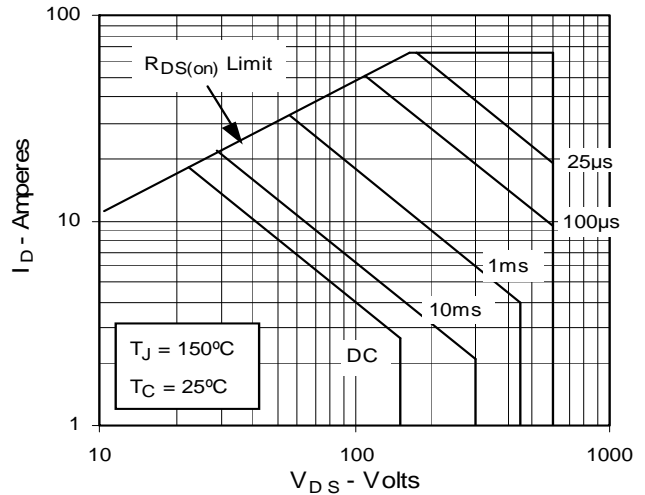
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Forward-Bias Safe Operating Area**



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