

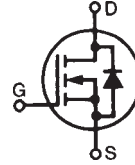
# PolarHT™ Power MOSFET

**IXTQ 50N20P**  
**IXTA 50N20P**  
**IXTP 50N20P**

$V_{DSS} = 200 \text{ V}$   
 $I_{D25} = 50 \text{ A}$   
 $R_{DS(on)} = 60 \text{ m}\Omega$

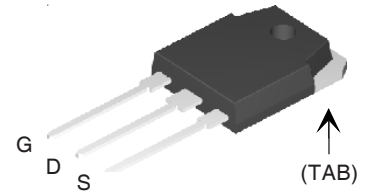
N-Channel Enhancement Mode

Preliminary Data Sheet

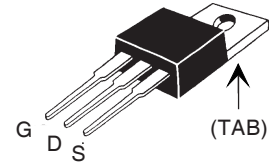


Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$	200	V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$	200	V
$V_{GSM}$		$\pm 20$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	50	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$	120	A
$I_{AR}$	$T_C = 25^\circ\text{C}$	50	A
$E_{AR}$	$T_C = 25^\circ\text{C}$	30	mJ
$E_{AS}$	$T_C = 25^\circ\text{C}$	1.0	J
$dv/dt$	$I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ , $R_G = 10 \Omega$	10	V/ns
$P_D$	$T_C = 25^\circ\text{C}$	360	W
$T_J$		-55 ... +175	$^\circ\text{C}$
$T_{JM}$		175	$^\circ\text{C}$
$T_{stg}$		-55 ... +125	$^\circ\text{C}$
$T_L$	1.6 mm (0.062 in.) from case for 10 s Maximum tab temperature for soldering TO-263 package for 10s	300 260	$^\circ\text{C}$ $^\circ\text{C}$
$M_d$	Mounting torque (TO-3P / TO-220)	1.13/10	Nm/lb.in.
Weight	TO-3P	5.5	g
	TO-220	4	g
	TO-263	3	g

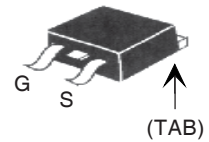
TO-3P (IXTQ)



TO-220 (IXTP)



TO-263 (IXTA)



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

### 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

**PolarHT™ DMOS transistors utilize proprietary designs and process. US patent is pending.**

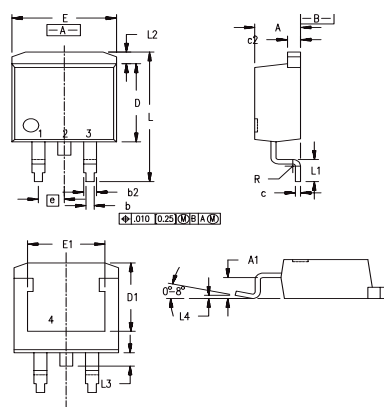
Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{DSS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	200		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	2.5		5.0 V
$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$			$\pm 100 \text{ nA}$
$I_{DSS}$	$V_{DS} = V_{DSS}$ $V_{GS} = 0 \text{ V}$ $T_J = 150^\circ\text{C}$			25 $\mu\text{A}$
				250 $\mu\text{A}$
$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$ , $I_D = I_T$ Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2\%$	50		60 $\text{m}\Omega$

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		Min.	Typ.	Max.
$g_{fs}$	$V_{DS} = 10\text{ V}; I_D = 50\text{ A}$ pulse test	12	23	S
$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		2250	pF
$C_{oss}$		500	pF	
$C_{rss}$		125	pF	
$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_T$ $R_G = 10\ \Omega$ (External)		26	ns
$t_r$		35	ns	
$t_{d(off)}$		70	ns	
$t_f$		30	ns	
$Q_{g(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_T$		70	nC
$Q_{gs}$		17	nC	
$Q_{gd}$		37	nC	
$R_{thJC}$				0.42 K/W
$R_{thCK}$	(TO-3P)	0.21		K/W
	(TO-220)	0.25		K/W

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		Min.	typ.	Max.
$I_S$	$V_{GS} = 0\text{ V}$			50 A
$I_{SM}$	Repetitive			120 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
$t_{rr}$	$I_F = 25\text{ A}$ $-di/dt = 100\text{ A}/\mu\text{s}$		180	ns
$Q_{RM}$	$V_R = 100\text{ V}$		2.0	$\mu\text{C}$

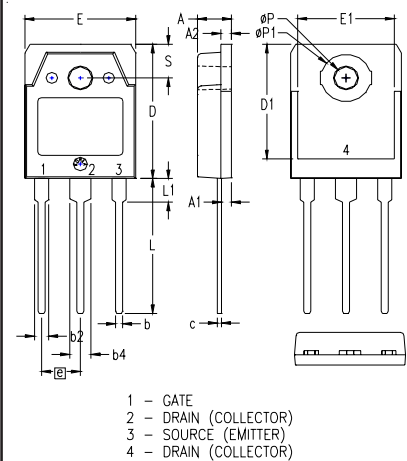
Notes: Test current  $I_T = 50\text{ A}$ .

### TO-263 (IXTP) Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.06	4.83	.160	.190
A1	2.03	2.79	.080	.110
b	0.51	0.99	.020	.039
b2	1.14	1.40	.045	.055
c	0.46	0.74	.018	.029
c2	1.14	1.40	.045	.055
D	8.64	9.65	.340	.380
D1	7.11	8.13	.280	.320
E	9.65	10.29	.380	.405
E1	6.86	8.13	.270	.320
e	2.54	BSC	.100	BSC
L	14.61	15.88	.575	.625
L1	2.29	2.79	.090	.110
L2	1.02	1.40	.040	.055
L3	1.27	1.78	.050	.070
L4	0	0.38	0	.015
R	0.46	0.74	.018	.029

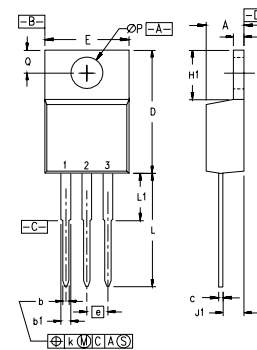
### TO-3P (IXTQ) Outline



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
$\phi P$	.126	.134	3.20	3.40
$\phi P1$	.272	.280	6.90	7.10
S	.193	.201	4.90	5.10

All metal area are tin plated.

### TO-220 (IXTA) Outline



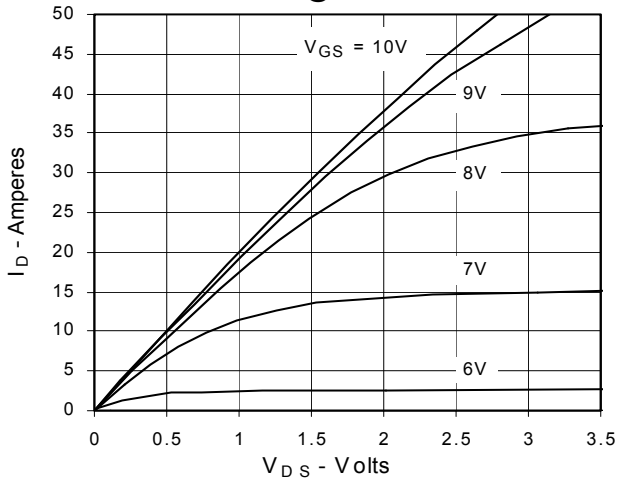
Pins: 1 - Gate 2 - Drain

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
$\phi P$	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

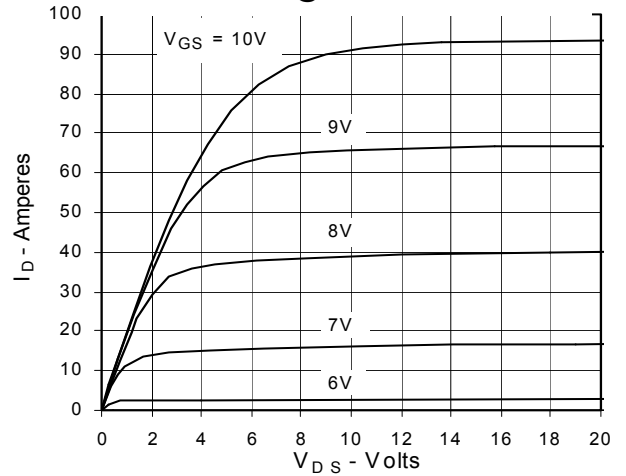
IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,850,072	4,931,844	5,034,796	5,063,307	5,237,481	5,381,025	6,404,065B1	6,162,665	6,534,343	6,583,505
	4,835,592	4,881,106	5,017,508	5,049,961	5,187,117	5,486,715	6,306,728B1	6,259,123B1	6,306,728B1	6,683,344

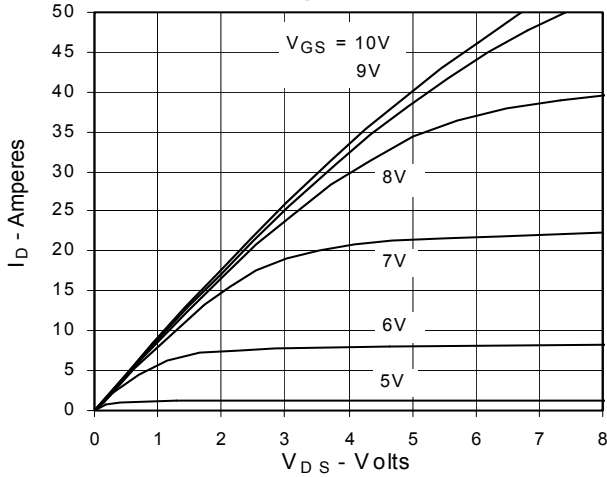
**Fig. 1. Output Characteristics @ 25°C**



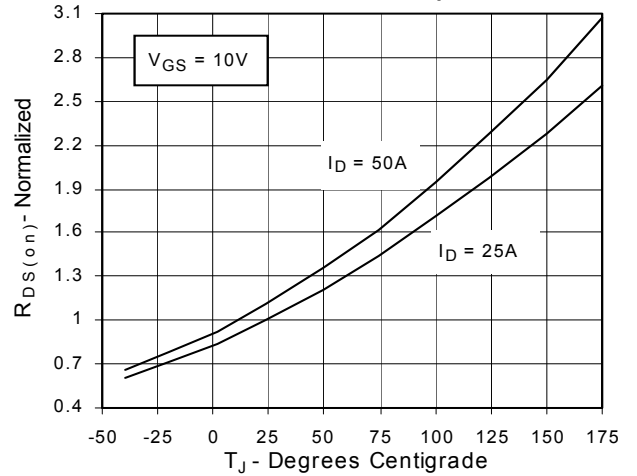
**Fig. 2. Extended Output Characteristics @ 25°C**



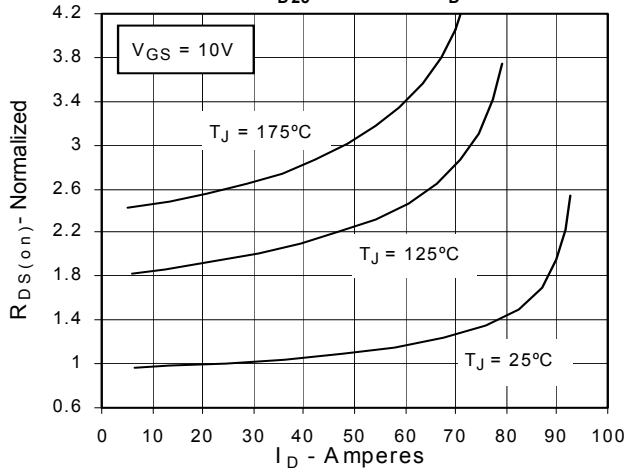
**Fig. 3. Output Characteristics @ 150°C**



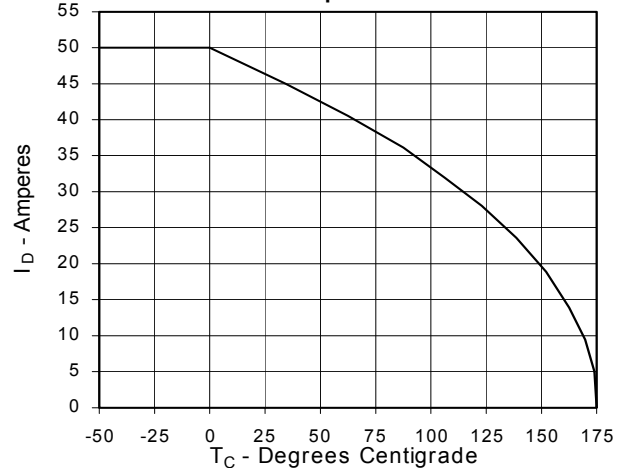
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs. Junction Temperature**



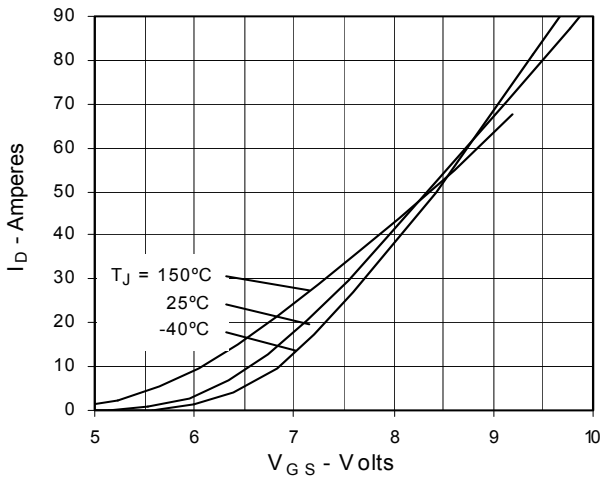
**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs.  $I_D$**



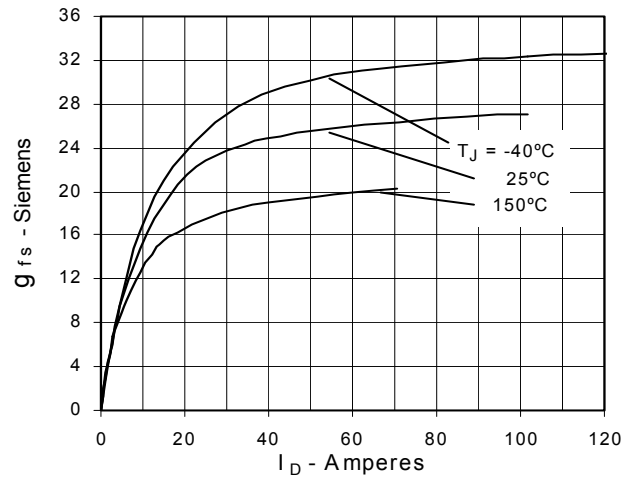
**Fig. 6. Drain Current vs. Case Temperature**



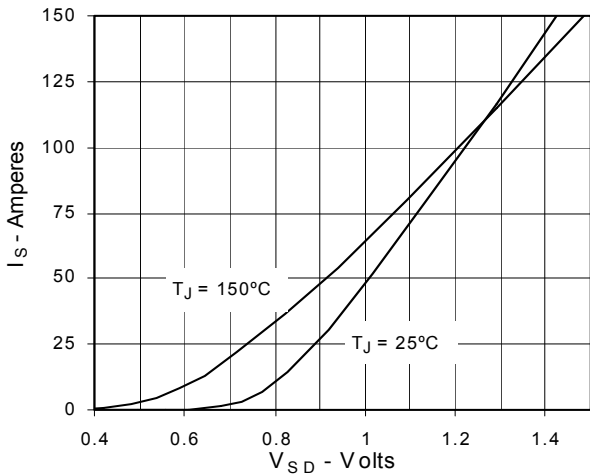
**Fig. 7. Input Admittance**



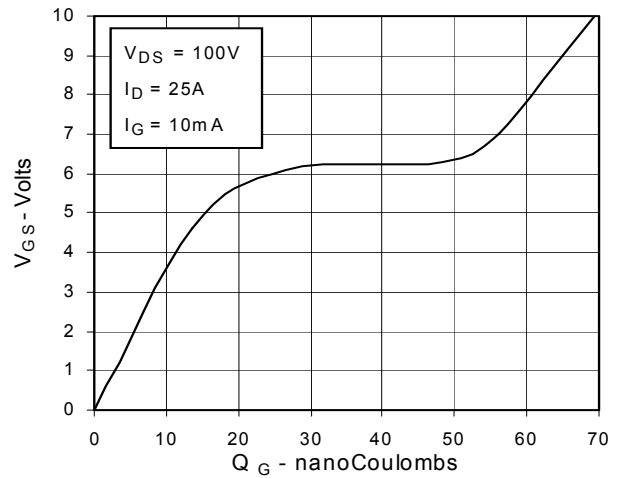
**Fig. 8. Transconductance**



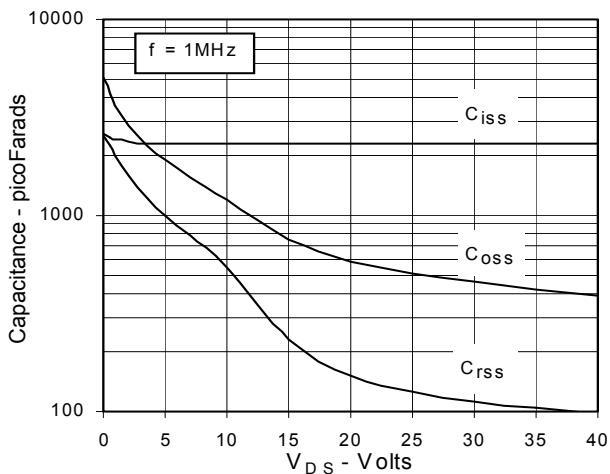
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



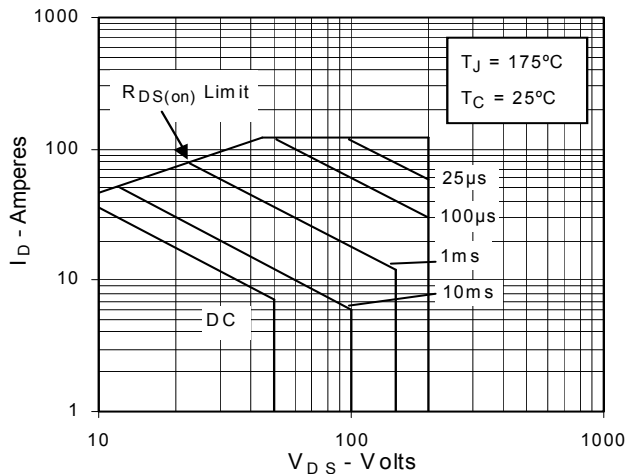
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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



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4,835,592	4,881,106	5,017,508	5,049,961	5,187,117	5,486,715	6,306,728B1	6,259,123B1	6,306,728B1	6,683,344

Fig. 13. Maximum Transient Thermal Resistance

