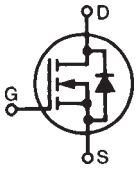
IXYS

X3-Class HiPerFET™ Power MOSFET

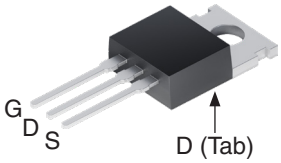
IXFP90N20X3
IXFQ90N20X3
IXFH90N20X3

V_{DSS} = 200V
I_{D25} = 90A
$R_{DS(on)}$ ≤ 12.8mΩ

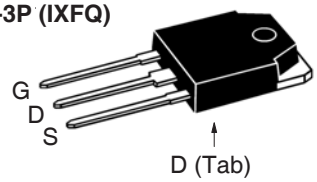
N-Channel Enhancement Mode
Avalanche Rated



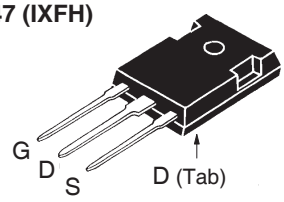
TO-220AB (IXFP)



TO-3P (IXFQ)



TO-247 (IXFH)



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

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	200	V
V_{DGR}	T_J = 25°C to 150°C, R_{GS} = 1MΩ	200	V
V_{GSS}	Continuous	±20	V
V_{GSM}	Transient	±30	V
I_{D25}	T_C = 25°C	90	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	220	A
I_A	T_C = 25°C	45	A
E_{AS}	T_C = 25°C	1.5	J
dv/dt	$I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$	20	V/ns
P_D	T_C = 25°C	390	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
M_d	Mounting Torque	1.13 / 10	Nm/lb.in
Weight	TO-220	3.0	g
	TO-3P	5.5	g
	TO-247	6.0	g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{DSS}	V_{GS} = 0V, I_D = 250μA	200			V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 1.5mA	2.5		4.5	V
I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
I_{DSS}	$V_{DS} = V_{DSS}$, V_{GS} = 0V			5	μA
	T_J = 125°C			300	μA
$R_{DS(on)}$	V_{GS} = 10V, $I_D = 0.5 \bullet I_{D25}$, Note 1		10.5	12.8	mΩ

Features

- International Standard Packages
- Low $R_{DS(ON)}$ and Q_G
- Avalanche Rated
- 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°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max	
g_{fs}	V_{DS} = 10V, I_D = 0.5 • I_{D25}, Note 1	40	67		S
R_{Gi}	Gate Input Resistance		1.4		Ω
C_{iss}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz		5420		pF
C_{oss}			930		pF
C_{rss}			4		pF
	Effective Output Capacitance				
$C_{o(er)}$	Energy related; V_{GS} = 0V, V_{DS} = 0.8 • V_{DSS}		420		pF
$C_{o(tr)}$	Time related; V_{GS} = 0V, V_{DS} = 0.8 • V_{DSS}		1300		pF
$t_{d(on)}$	**Resistive Switching Times**		22		ns
t_r	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		26		ns
$t_{d(off)}$	R_G = 5Ω (External)		62		ns
t_f			13		ns
$Q_{g(on)}$	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		78		nC
Q_{gs}			23		nC
Q_{gd}			22		nC
R_{thJC}				0.32	°C/W
R_{thCS}	TO-220		0.50		°C/W
	TO-247 & TO-3P		0.25		°C/W

Source-Drain Diode

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max	
I_S	V_{GS} = 0V			90	A
I_{SM}	Repetitive, pulse Width Limited by T_{JM}			360	A
V_{SD}	I_F = I_S, V_{GS} = 0V, Note 1			1.4	V
t_{rr}	I_F = 45A, -di/dt = 100A/μs		95		ns
Q_{RM}	V_R = 100V		360		nC
I_{RM}			7.6		A

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

Fig. 1. Output Characteristics @ T_J = 25°C

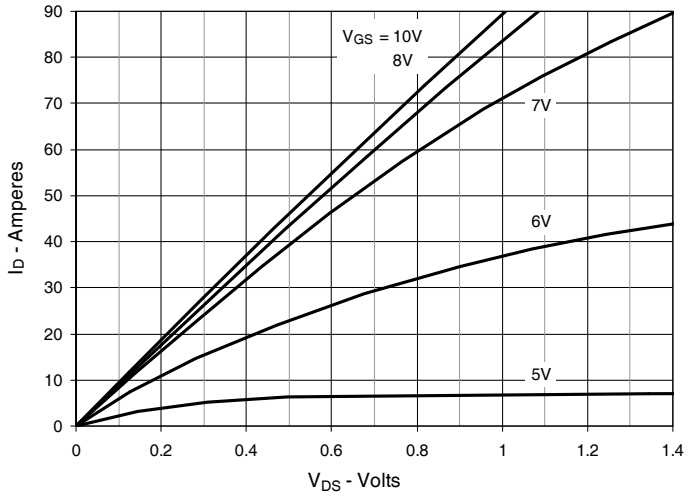


Fig. 2. Extended Output Characteristics @ T_J = 25°C

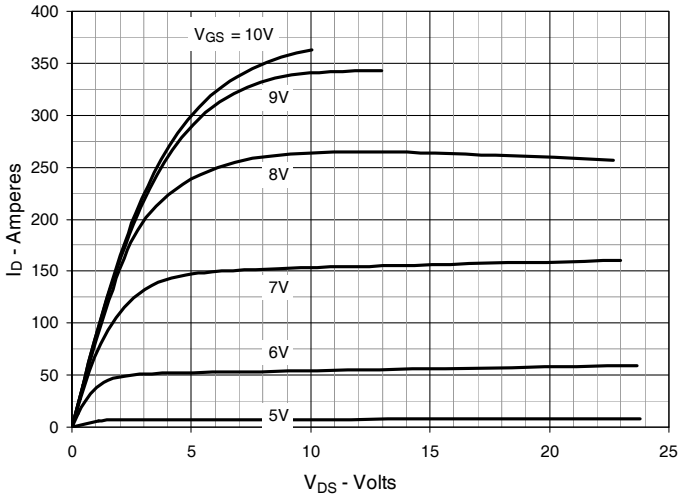


Fig. 3. Output Characteristics @ T_J = 125°C

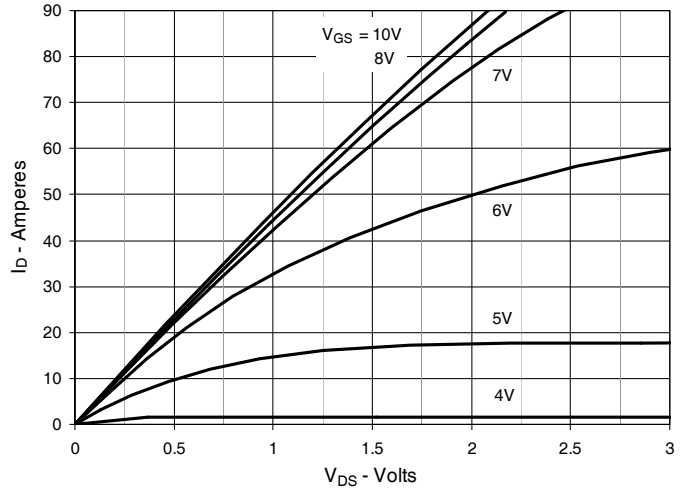


Fig. 4. $R_{DS(on)}$ Normalized to I_D = 45A Value vs. Junction Temperature

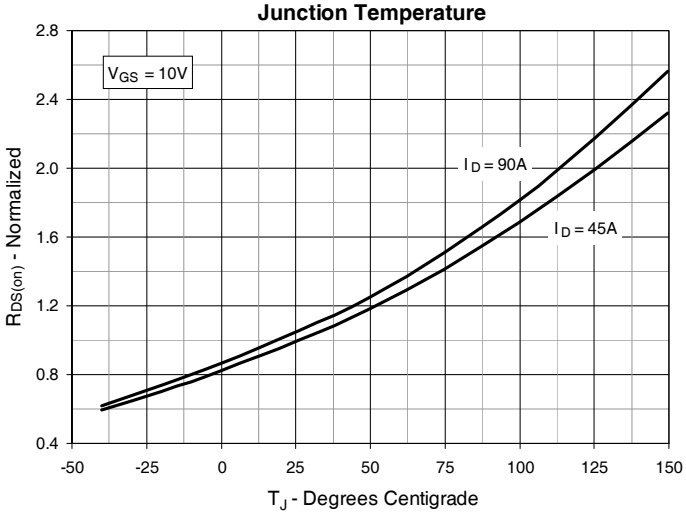


Fig. 5. $R_{DS(on)}$ Normalized to I_D = 45A Value vs. Drain Current

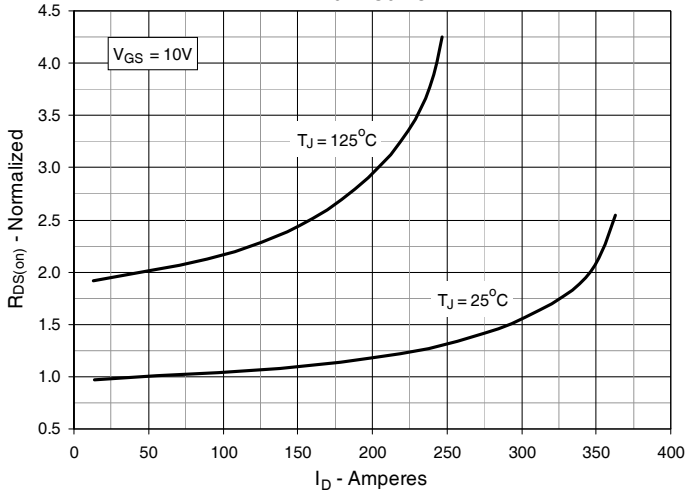


Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature

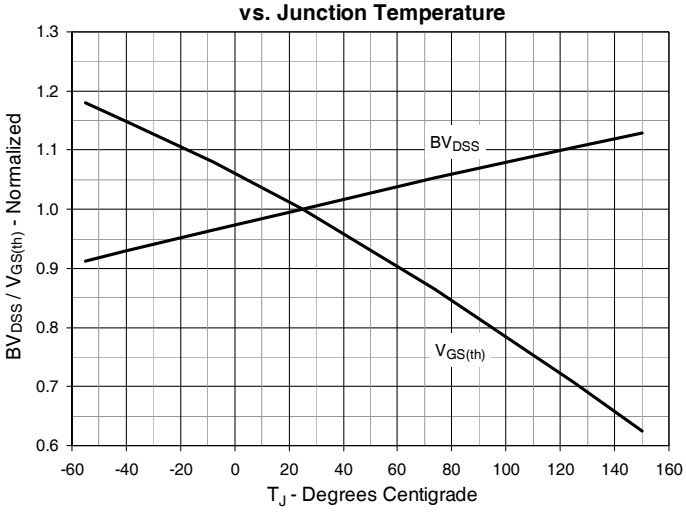


Fig. 7. Maximum Drain Current vs. Case Temperature

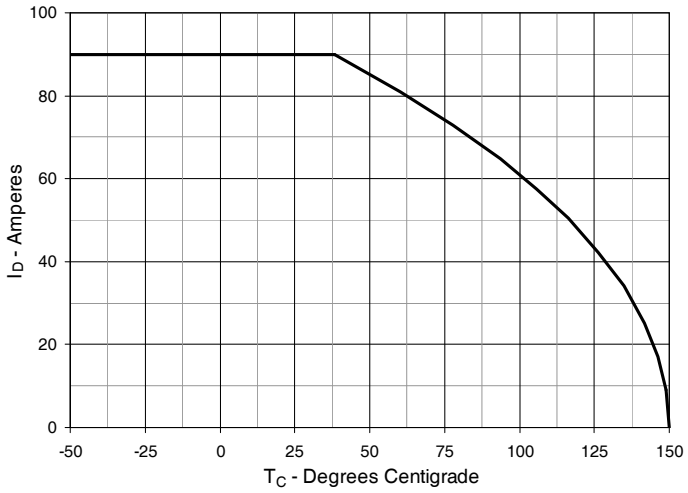


Fig. 8. Input Admittance

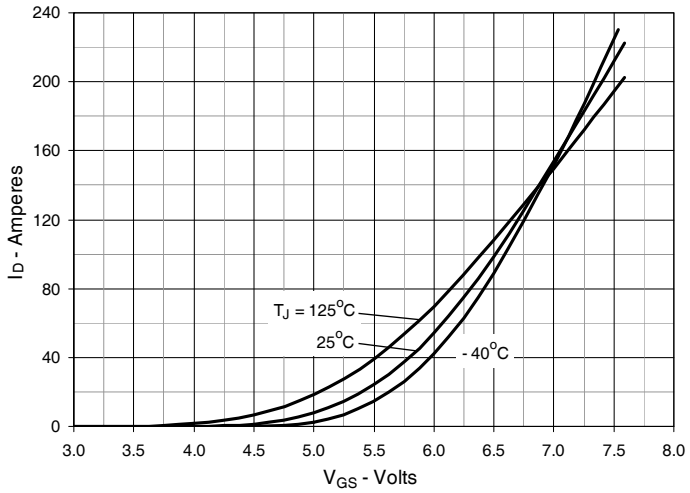


Fig. 9. Transconductance

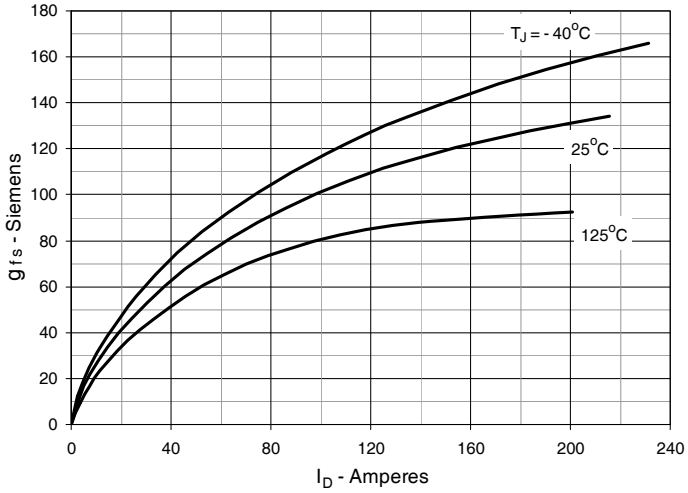


Fig. 10. Forward Voltage Drop of Intrinsic Diode

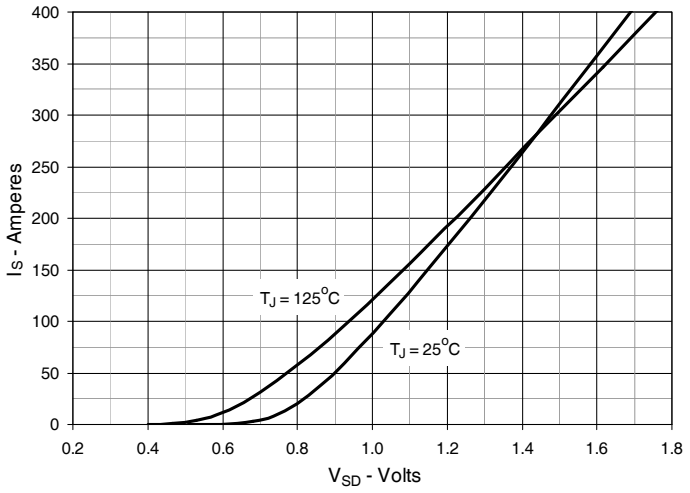


Fig. 11. Gate Charge

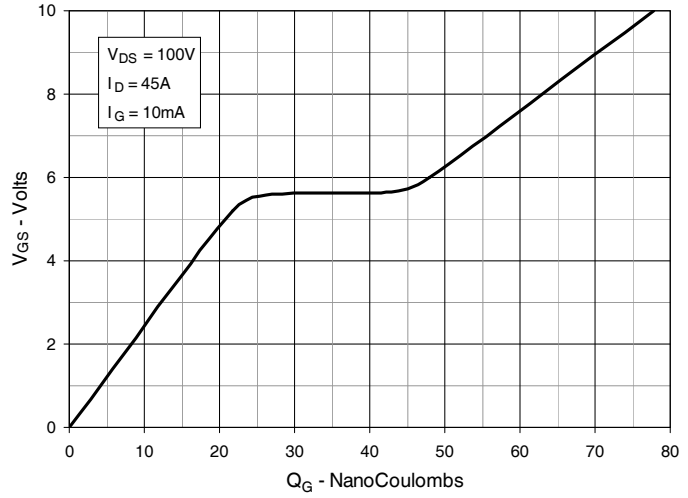


Fig. 12. Capacitance

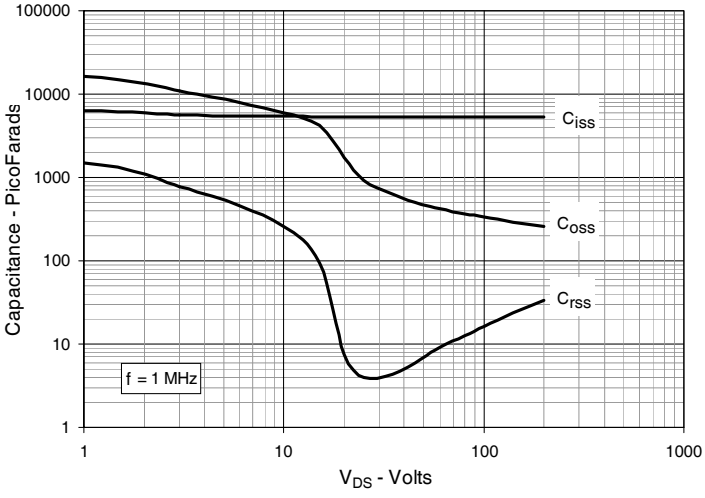


Fig. 13. Output Capacitance Stored Energy

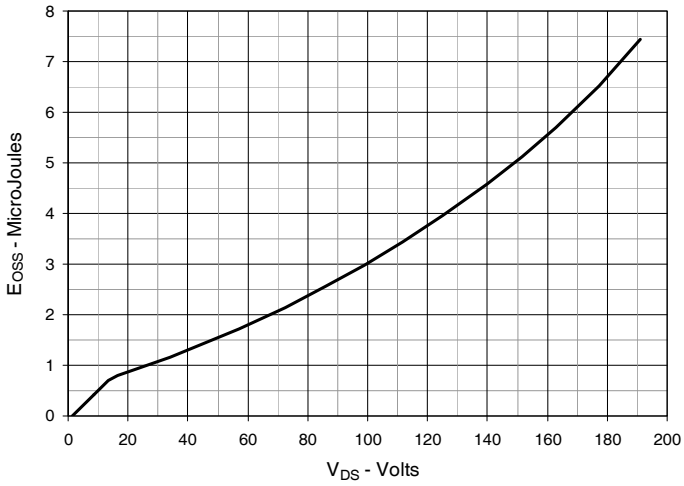


Fig. 14. Forward-Bias Safe Operating Area

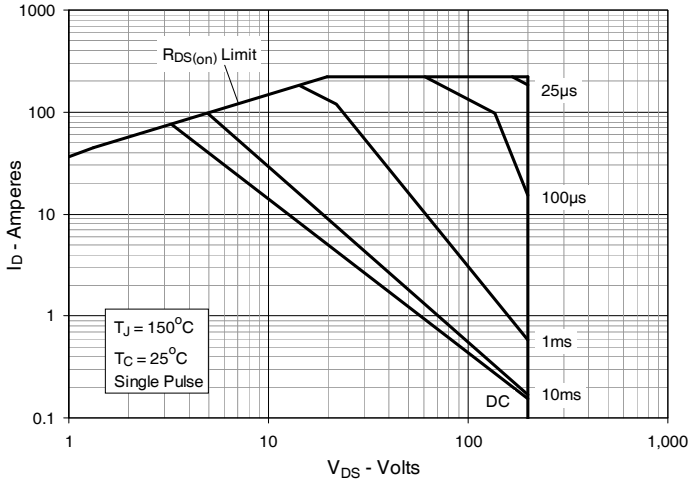
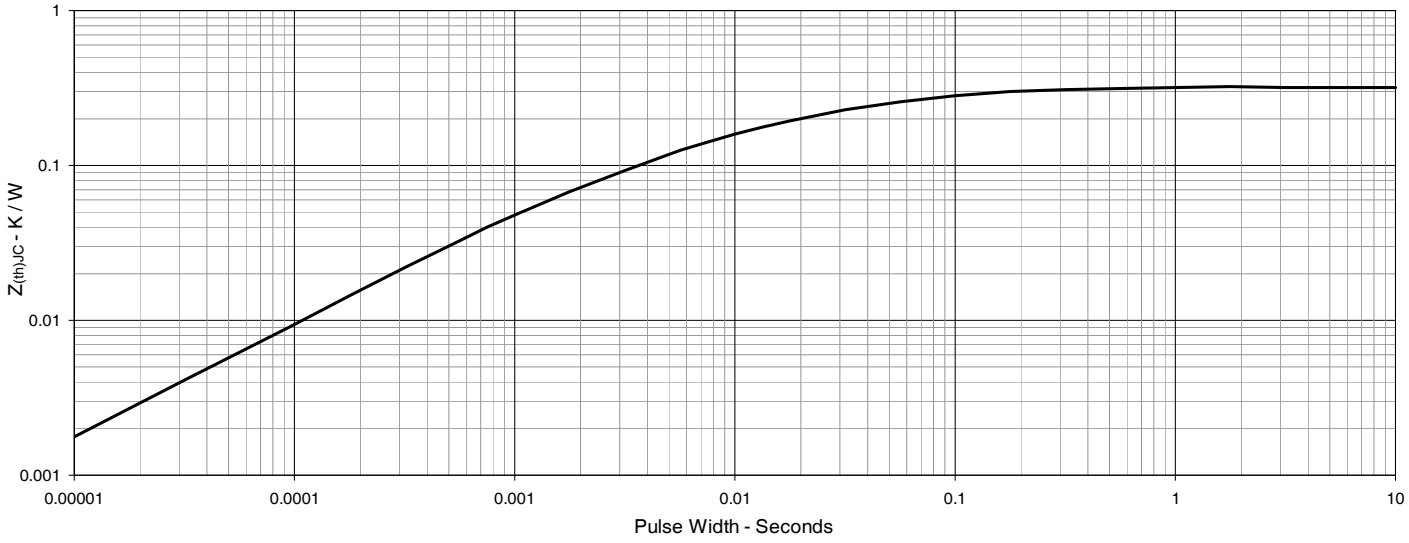
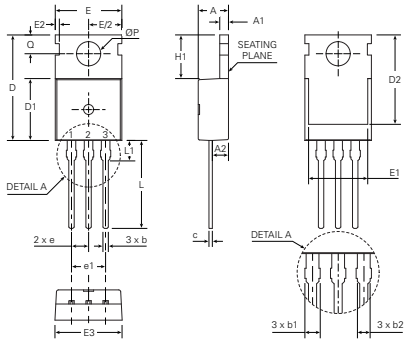


Fig. 15. Maximum Transient Thermal Impedance



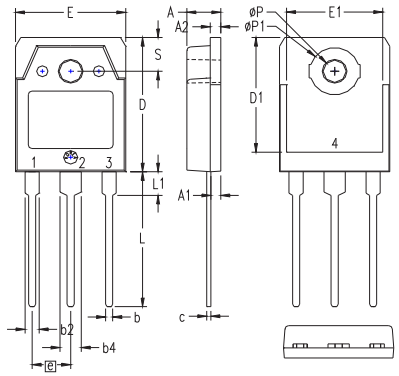
TO-220 Outline



Pins: 1 - Gate 2 - Drain
3 - Source

Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max
A	0.169	0.177	0.185	4.30	4.50	4.70
A1	0.049	0.051	0.055	1.25	1.30	1.40
A2	0.087	0.094	0.102	2.20	2.40	2.60
b	0.028	0.031	0.035	0.70	0.80	0.90
b1	0.056	0.060	0.064	1.42	1.52	1.62
b2	0.046	0.050	0.054	1.17	1.27	1.37
c	0.018	0.020	0.024	0.45	0.50	0.60
D	0.610	0.618	0.626	15.50	15.70	15.90
D1	0.354	0.362	0.370	9.00	9.20	9.40
D2	0.516	0.524	0.531	13.10	13.30	13.50
E	0.382	0.390	0.400	9.70	9.90	10.10
E1		0.346			8.80	
E2		0.024			0.60	
E3	0.386	0.394	0.402	9.80	10.00	10.20
e		0.100			2.54 BSC	
e1		0.200			5.08 BSC	
H1	0.248	0.256	0.264	6.30	6.50	6.70
L	0.507	0.515	0.523	12.88	13.08	13.28
L1		0.118			3.00	
ØP	0.134	0.142	0.150	3.40	3.60	3.80
Q	0.106	0.110	0.114	2.70	2.80	2.90

TO-3P Outline

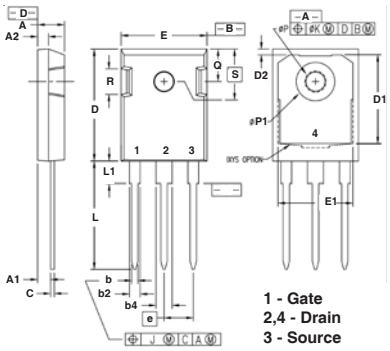


Pins: 1 - Gate 2 - Drain
3 - Source 4 - Drain

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
øP	.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.

TO-247 Outline



Dim.	Millimeter		Inches	
	min	max	min	max
A	4.70	5.30	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
b4	2.59	3.43	0.102	0.135
c	0.38	0.89	0.015	0.035
D	20.79	21.45	0.819	0.845
D1	13.07	-	0.515	-
D2	0.51	1.35	0.020	0.053
E	15.48	16.24	0.610	0.640
E1	13.45	-	0.53	-
E2	4.31	5.48	0.170	0.216
e	5.45 BSC		0.215 BSC	
L	19.80	20.30	0.078	0.800
L1	-	4.49	-	0.177
Ø P	3.55	3.65	0.140	0.144
Ø P1	-	7.39	-	0.290
Q	5.38	6.19	0.212	0.244
S	6.14 BSC		0.242 BSC	