IXYS

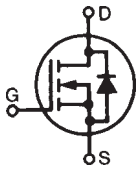
Advance Technical Information

PolarHV™ Power MOSFET

IXTP 1R4N60P
IXTY 1R4N60P
IXTU 1R4N60P

V_{DSS} = 600 V
I_{D25} = 1.4 A
$R_{DS(on)}$ ≤ 9.0 Ω

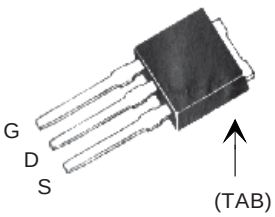
N-Channel Enhancement Mode



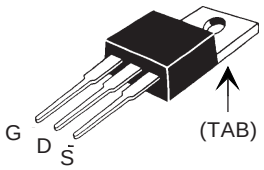
Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 175°C	600	V
V_{DGR}	T_J = 25°C to 175°C; R_{GS} = 1 MΩ	600	V
V_{GS}	Continuous	±30	V
V_{GSM}	Transient	±40	V
I_{D25}	T_C = 25°C	1.4	A
I_{DM}	T_C = 25°C, pulse width limited by T_{JM}	2.1	A
I_{AR}	T_C = 25°C	1.4	A
E_{AR}	T_C = 25°C	5	mJ
E_{AS}	T_C = 25°C	75	mJ
dv/dt	$I_S \le I_{DM}$, di/dt ≤ 100 A/μs, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$, R_G = 20 Ω	10	V/ns
P_D	T_C = 25°C	50	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum tab temperature for soldering TO-252 package for 10s	260	°C
Weight	TO-220	4.0	g
	TO-252	0.35	g
	TO-251	0.4	g

Symbol (T_J = 25°C, unless otherwise specified)	Test Conditions	Characteristic Values Min.	Typ.	Max.	
V_{DSS}	V_{GS} = 0 V, I_D = 25 μA	600			V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 25 μA	3.0		5.5	V
I_{GSS}	V_{GS} = ±30 V_{DC}, V_{DS} = 0			±50	nA
I_{DSS}	$V_{DS} = V_{DSS}$, V_{GS} = 0 V			1	μA
	T_J = 125°C			20	μA
$R_{DS(on)}$	V_{GS} = 10 V, $I_D = 0.5\ I_{D25}$, Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %			9.0	Ω

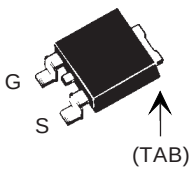
TO-251 AA (IXTU)



TO-220 (IXTP)



TO-252 (IXTY)



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

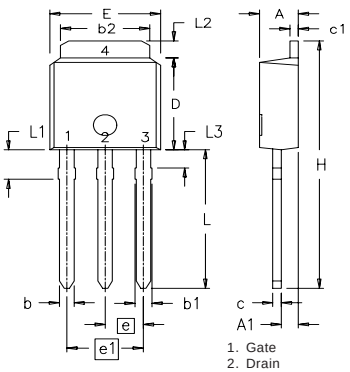
Advantages

- Easy to mount
- Space savings
- High power density

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) Min.	Typ.	Max.	
g_{fs}	V_{DS}= 20 V; I_D = 0.5 I_{D25}, pulse test	0.7	1.1		S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		140		pF
C_{oss}			17		pF
C_{rss}			2.4		pF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 V_{DSS}, I_D =0.5 I_{D25} R_G = 50 Ω (External)		10		ns
t_r			16		ns
$t_{d(off)}$			25		ns
t_f			16		ns
$Q_{g(on)}$	V_{GS}= 10 V, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}		5.2		nC
Q_{gs}			1.34		nC
Q_{gd}			5.2		nC
R_{thJC}				2.5	K/W
R_{thCS}	(TO-220)		0.25		K/W
R_{thCS}	(TO-251)		1.0		K/W

Source-Drain Diode

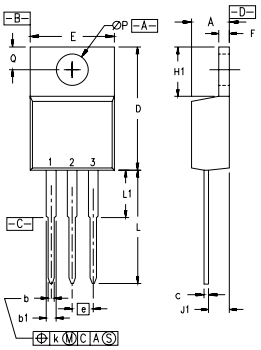
Symbol	Test Conditions (T_J = 25°C, unless otherwise specified)	Min.	typ.	Max.	
I_S	V_{GS} = 0 V			1.4	A
I_{SM}	Repetitive			4	A
V_{SD}	I_F = I_S, V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %			1.5	V
t_{rr}	I_F = 1.5 A, -di/dt = 100 A/µs		500		ns



1. Gate
2. Drain
3. Source
4. Drain

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	2.19	2.38	.086	.094
A1	0.89	1.14	0.35	.045
b	0.64	0.89	.025	.035
b1	0.76	1.14	.030	.045
b2	5.21	5.46	.205	.215
c	0.46	0.58	.018	.023
c1	0.46	0.58	.018	.023
D	5.97	6.22	.235	.245
E	6.35	6.73	.250	.265
e	2.28	BSC	.090	BSC
e1	4.57	BSC	.180	BSC
H	17.02	17.78	.670	.700
L	8.89	9.65	.350	.380
L1	1.91	2.28	.075	.090
L2	0.89	1.27	.035	.050

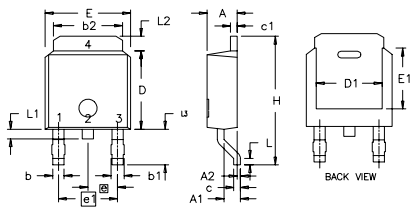
TO-220 (IXTP) Outline



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

SYM	INCHES MIN	MAX	MILLIMETERS 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
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

TO-252 AA (IXTY) Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	2.19	2.38	0.086	0.094
A1	0.89	1.14	0.035	0.045
A2	0	0.13	0	0.005
b	0.64	0.89	0.025	0.035
b1	0.76	1.14	0.030	0.045
b2	5.21	5.46	0.205	0.215
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
D1	4.32	5.21	0.170	0.205
E	6.35	6.73	0.250	0.265
E1	4.32	5.21	0.170	0.205
e	2.28 BSC		0.090 BSC	
e1	4.57 BSC		0.180 BSC	
H	9.40	10.42	0.370	0.410
L	0.51	1.02	0.020	0.040
L1	0.64	1.02	0.025	0.040
L2	0.89	1.27	0.035	0.050
L3	2.54	2.92	0.100	0.115

Fig. 1. Output Characteristics @ 25°C

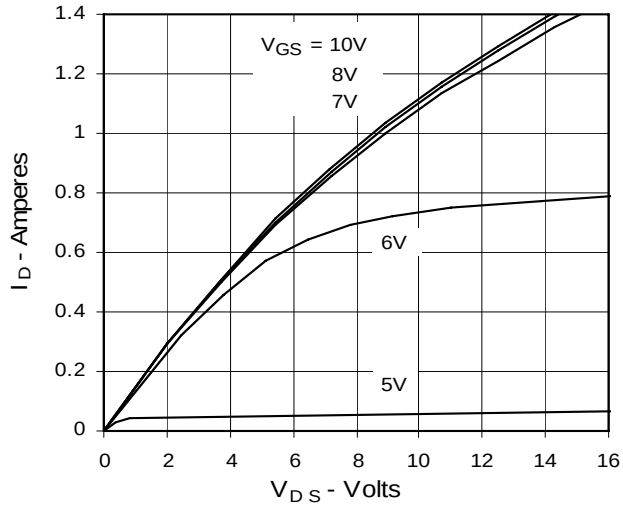


Fig. 2. Extended Output Characteristics @ 25°C

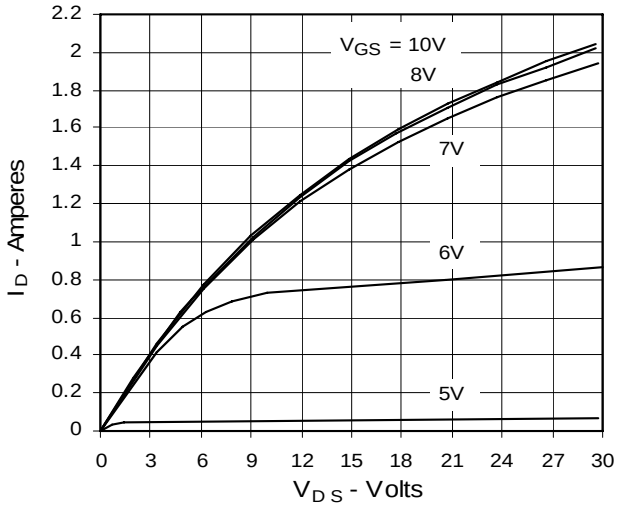


Fig. 3. Output Characteristics @ 125°C

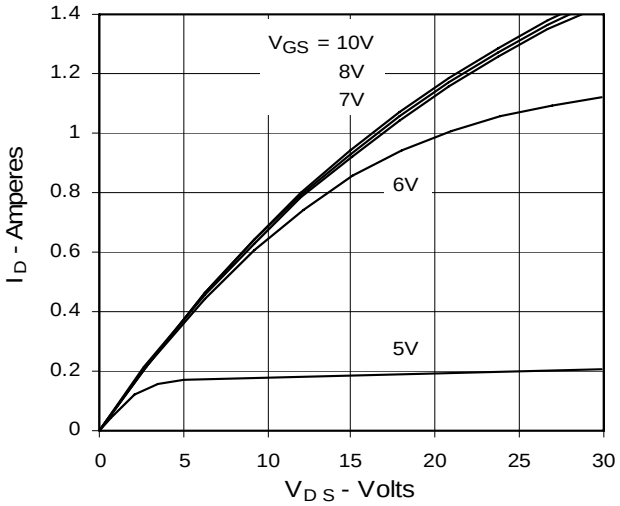


Fig. 4. $R_{DS(on)}$ Normalized to 0.5 I_{D25} Value vs. Junction Temperature

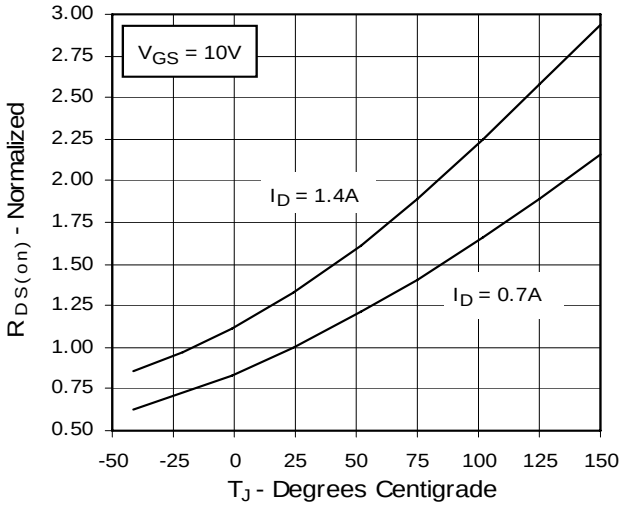


Fig. 5. $R_{DS(on)}$ Normalized to 0.5 I_{D25} Value vs. I_D

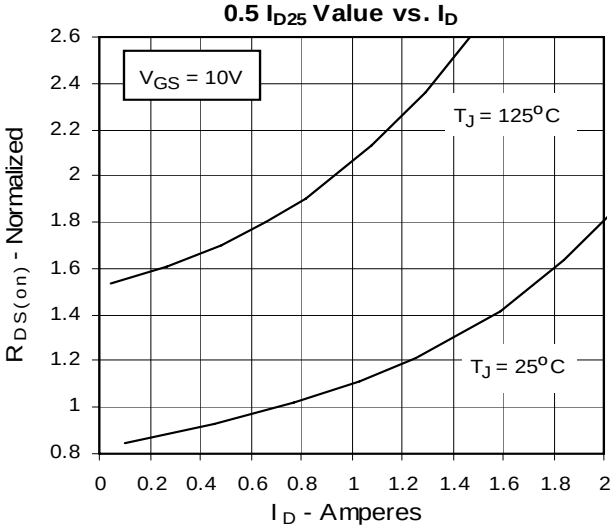


Fig. 6. Drain Current vs. Case Temperature

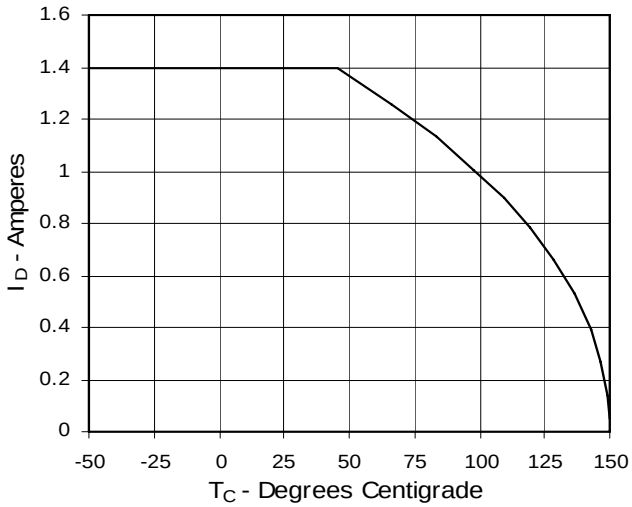


Fig. 7. Input Admittance

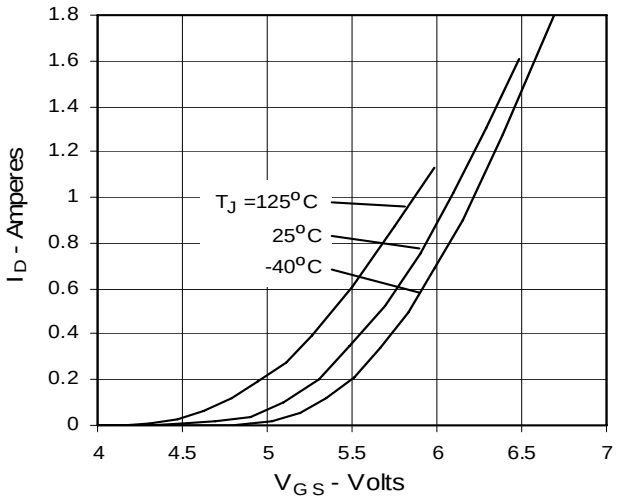


Fig. 8. Transconductance

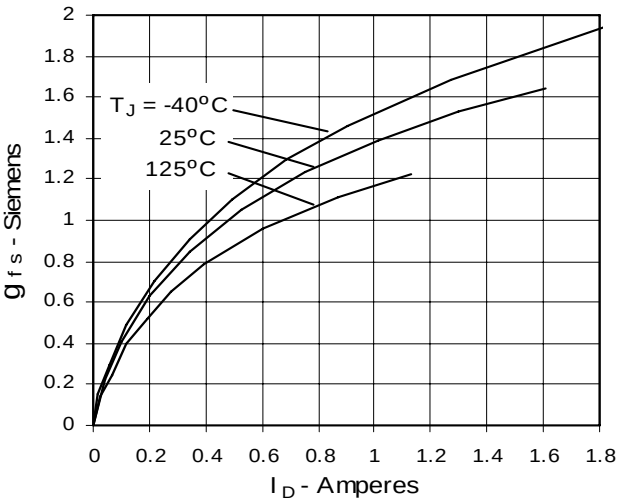


Fig. 9. Source Current vs. Source-To-Drain Voltage

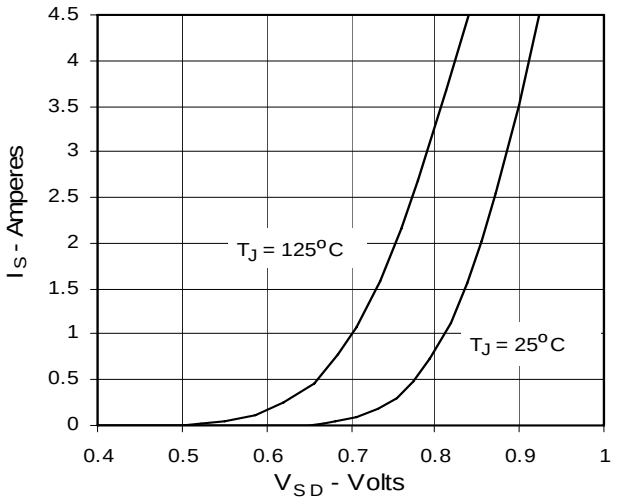


Fig. 10. Gate Charge

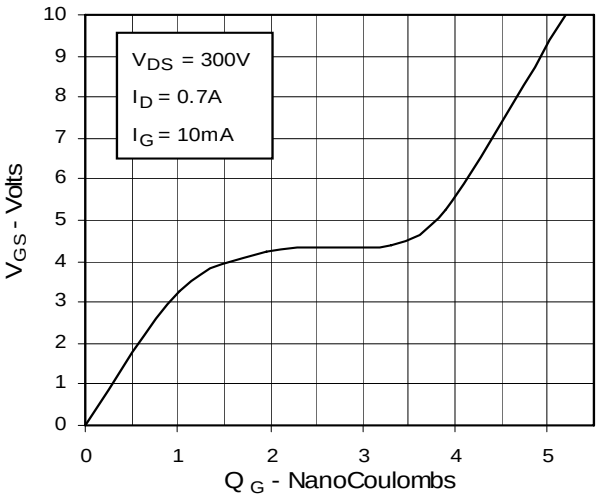


Fig. 11. Capacitance

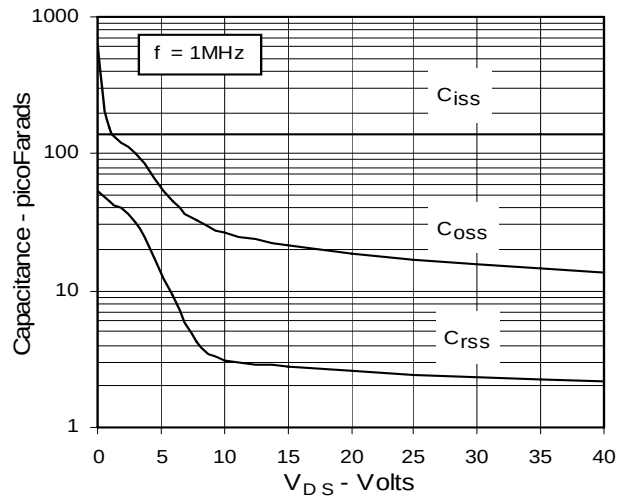


Fig. 12. Maximum Transient Thermal Resistance