

# Standard Power MOSFET

**IXTH 12 N50A**  
**IXTM 12 N50A**

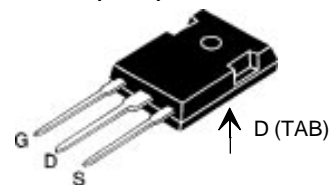
$V_{DSS}$	$I_{D25}$	$R_{DS(on)}$
<b>500 V</b>	<b>12 A</b>	<b>0.4 <math>\Omega</math></b>
<b>500 V</b>	<b>12 A</b>	<b>0.4 <math>\Omega</math></b>

N-Channel Enhancement Mode

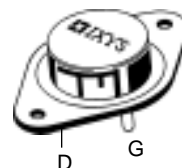


Symbol	Test Conditions	Maximum Ratings
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	500 V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$	500 V
$V_{GS}$	Continuous	$\pm 20$ V
$V_{GSM}$	Transient	$\pm 30$ V
$I_{D25}$	$T_C = 25^\circ\text{C}$	12 A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$	48 A
$P_D$	$T_C = 25^\circ\text{C}$	180 W
$T_J$		-55 ... +150 $^\circ\text{C}$
$T_{JM}$		150 $^\circ\text{C}$
$T_{stg}$		-55 ... +150 $^\circ\text{C}$
$M_d$	Mounting torque	1.13/10 Nm/lb.in.
<b>Weight</b>		TO-204 = 18 g, TO-247 = 6 g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300 $^\circ\text{C}$

TO-247 AD (IXTH)



TO-204 AA (IXTM)



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

## Features

- International standard packages
- Low  $R_{DS(on)}$  HDMOS™ process
- Rugged polysilicon gate cell structure
- Low package inductance (< 5 nH)
  - easy to drive and to protect
- Fast switching times

## Applications

- Switch-mode and resonant-mode power supplies
- Motor controls
- Uninterruptible Power Supplies (UPS)
- DC choppers

## Advantages

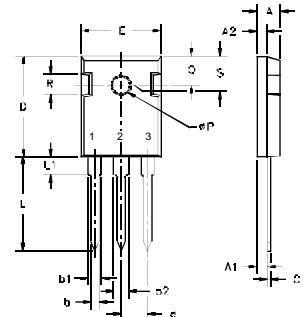
- Easy to mount with 1 screw (TO-247) (isolated mounting screw hole)
- Space savings
- High power density

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_{DSS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	500		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	2		4 V
$I_{GSS}$	$V_{GS} = \pm 20 V_{DC}$ , $V_{DS} = 0$			$\pm 100$ nA
$I_{DSS}$	$V_{DS} = 0.8 \cdot V_{DSS}$ , $T_J = 25^\circ\text{C}$ $V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$			200 $\mu\text{A}$ 1 mA
$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$ Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$			0.40 $\Omega$

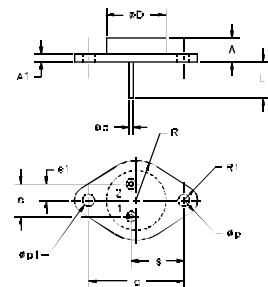
Symbol	Test Conditions	Characteristic Values		
		(T <sub>J</sub> = 25°C, unless otherwise specified)		
		min.	typ.	max.
<b>g<sub>fs</sub></b>	V <sub>DS</sub> = 10 V; I <sub>D</sub> = 0.5 • I <sub>D25</sub> , pulse test	7.5	9	S
<b>C<sub>iss</sub></b>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz		2800	pF
<b>C<sub>oss</sub></b>			300	pF
<b>C<sub>rss</sub></b>			70	pF
<b>t<sub>d(on)</sub></b>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 I <sub>D25</sub> R <sub>G</sub> = 4.7 Ω, (External)		18	30 ns
<b>t<sub>r</sub></b>			27	40 ns
<b>t<sub>d(off)</sub></b>			76	100 ns
<b>t<sub>f</sub></b>			32	60 ns
<b>Q<sub>g(on)</sub></b>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 I <sub>D25</sub>		110	120 nC
<b>Q<sub>gs</sub></b>			15	25 nC
<b>Q<sub>gd</sub></b>			40	50 nC
<b>R<sub>thJC</sub></b>			0.70	K/W
<b>R<sub>thCK</sub></b>		0.25		K/W

**Source-Drain Diode**
**Characteristic Values**  
(T<sub>J</sub> = 25°C, unless otherwise specified)

Symbol	Test Conditions	Characteristic Values		
		min.	typ.	max.
<b>I<sub>S</sub></b>	V <sub>GS</sub> = 0 V			12 A
<b>I<sub>SM</sub></b>	Repetitive; pulse width limited by T <sub>JM</sub>			48 A
<b>V<sub>SD</sub></b>	I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V, Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %			1.5 V
<b>t<sub>rr</sub></b>	I <sub>F</sub> = I <sub>S</sub> , -di/dt = 100 A/μs, V <sub>R</sub> = 100 V	600		ns

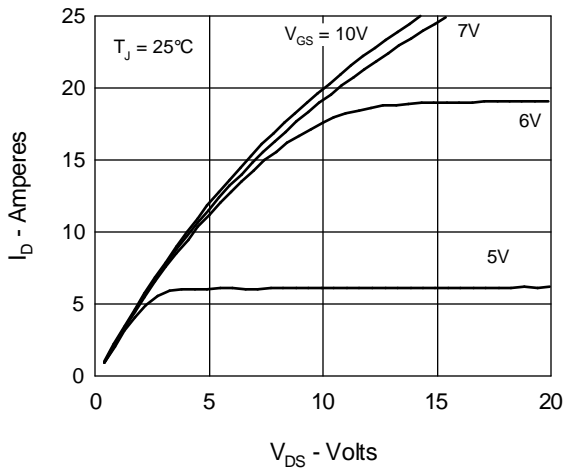
**TO-247 AD (IXTH) Outline**

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

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.7	5.3	.185	.209
A <sub>1</sub>	2.2	2.54	.087	.102
A <sub>2</sub>	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b <sub>1</sub>	1.65	2.13	.065	.084
b <sub>2</sub>	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
∅P	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15	BSC	.242	BSC

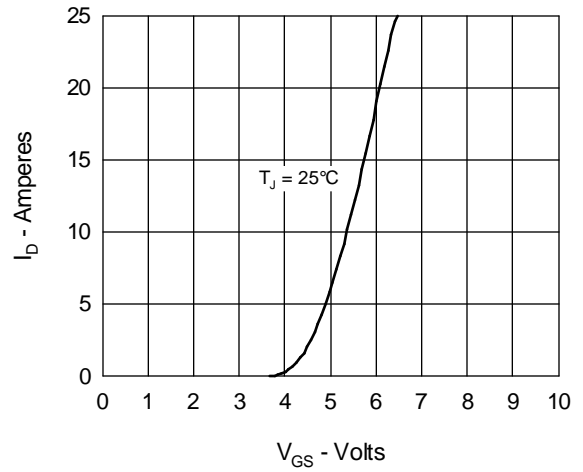
**TO-204AA (IXTM) Outline**

 Pins: 1 - Gate    2 - Source  
 Case - Drain

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	6.4	11.4	.250	.450
A1		3.42		.135
∅b	.97	1.09	.038	.043
∅D		22.22		.875
e	10.67	11.17	.420	.440
e1	5.21	5.71	.205	.225
L	7.93		.312	
∅p	3.84	4.19	.151	.165
∅p1	3.84	4.19	.151	.165
q		30.15 BSC		1.187 BSC
R		13.33		.525
R1		4.77		.188
s	16.64	17.14	.655	.675

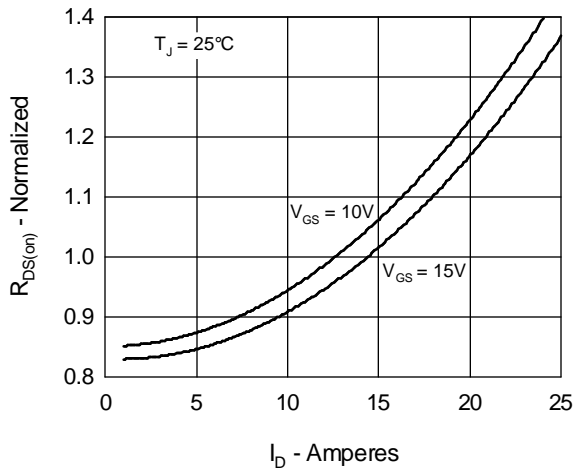
**Fig. 1 Output Characteristics**



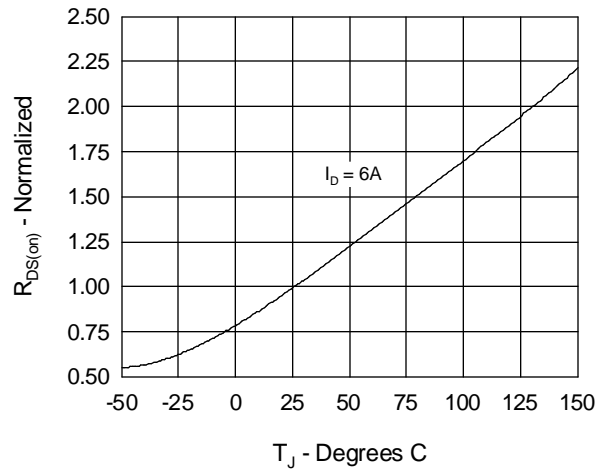
**Fig. 2 Input Admittance**



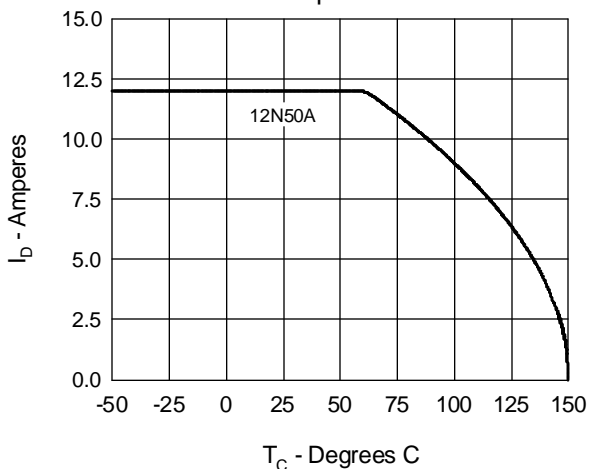
**Fig. 3  $R_{DS(on)}$  vs. Drain Current**



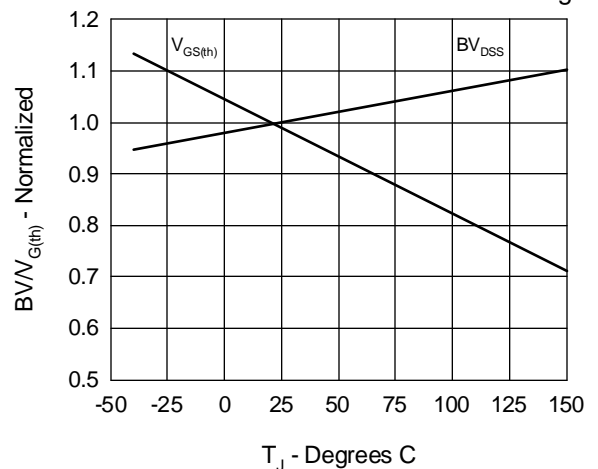
**Fig. 4 Temperature Dependence of Drain to Source Resistance**



**Fig. 5 Drain Current vs. Case Temperature**



**Fig. 6 Temperature Dependence of Breakdown and Threshold Voltage**



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

Fig.7 Gate Charge Characteristic Curve

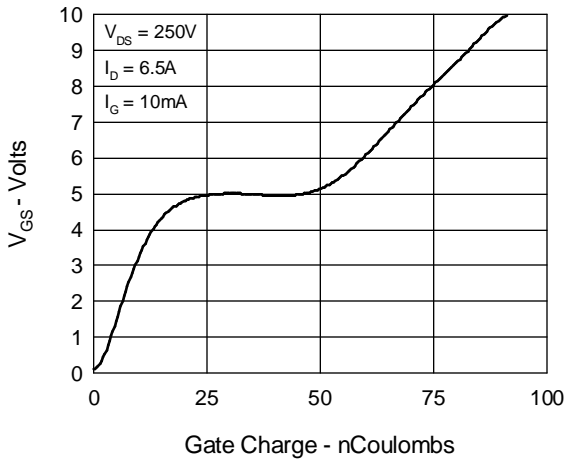


Fig.8 Forward Bias Safe Operating Area

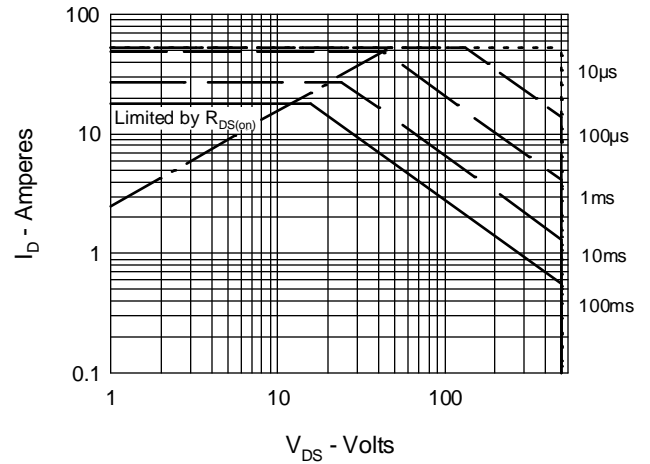


Fig.9 Capacitance Curves

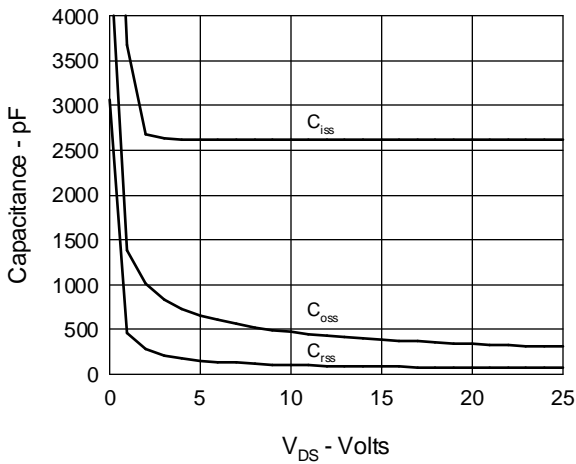


Fig.10 Source Current vs. Source to Drain Voltage

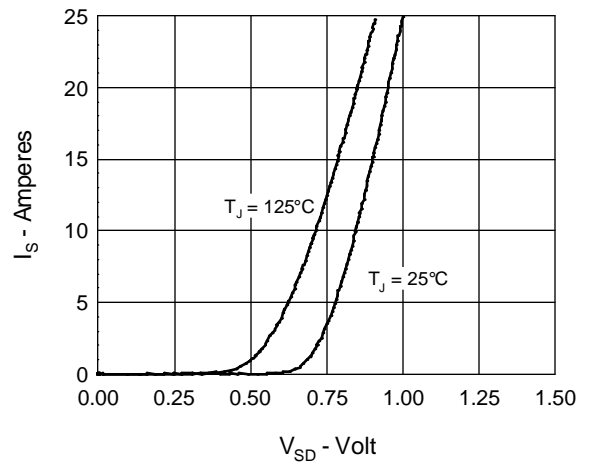


Fig.11 Transient Thermal Impedance

