

# High Voltage MOSFET

N-Channel, Depletion Mode

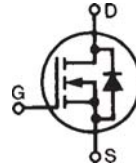
**IXTH 20N50D**  
**IXTT 20N50D**

$$V_{DSS} = 500 \text{ V}$$

$$I_{D25} = 20 \text{ A}$$

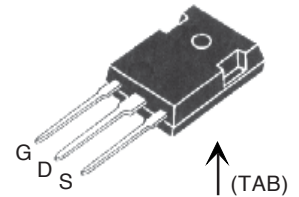
$$R_{DS(on)} = 0.33 \Omega$$

## Preliminary Data Sheet

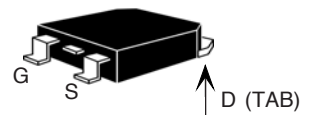


Symbol	Test Conditions	Maximum Ratings	
$V_{DSX}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	500	V
$V_{DGX}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	500	V
$V_{GS}$	Continuous	$\pm 30$	V
$V_{GSM}$	Transient	$\pm 40$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	20	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ ; pulse width limited by $T_{JM}$	50	A
$P_D$	$T_C = 25^\circ\text{C}$	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 (0.063 in) from case for 10 seconds	300	$^\circ\text{C}$
$T_{ISOL}$	Plastic case for 10 seconds	300	$^\circ\text{C}$
$M_d$	Mounting torque	1.13/10	Nm/lb.in.
Weight	TO-247	6	g
	TO-268	4	g

TO-247 (IXFH)



TO-268 (IXTT)



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

## Features

- Normally ON Mode
- International standard packages
- Molding epoxies meet UL94 V-0 flammability classification

## Applications

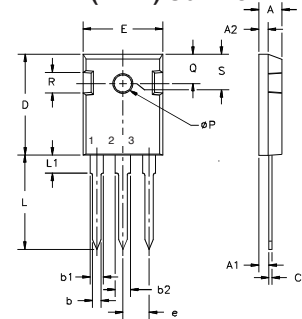
- Level shifting
- Triggers
- Solid State Relays
- Current Regulators
- Active load

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_{DSX}$	$V_{GS} = -10 \text{ V}$ , $I_D = 250 \text{ mA}$	500		V
$V_{GS(off)}$	$V_{DS} = 25 \text{ V}$ , $I_D = 250 \text{ mA}$	-1.5		V
$I_{GSS}$	$V_{GS} = \pm 30 \text{ V}_{DC}$ , $V_{DS} = 0$			$\pm 100 \text{ nA}$
$I_{DSX(off)}$	$V_{DS} = V_{DSS}$ , $V_{GS} = -10 \text{ V}$			25 $\mu\text{A}$ 500 $\mu\text{A}$
$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$ , $I_D = 10 \text{ A}$ Note 1			0.33 $\Omega$
$I_{D(on)}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 25 \text{ V}$ Note 1		1.5	A

Symbol	Test Conditions	Characteristic Values		
		$(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$		
		min.	typ.	max.
$g_{fs}$	$V_{DS} = 30\text{ V}, I_D = 10\text{ A}, \text{ Note 1}$	4.0	7.5	S
$C_{iss}$	$V_{GS} = -10\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		2500	pF
$C_{oss}$			400	pF
$C_{rss}$			100	pF
$t_{d(on)}$	$V_{GS} = 0\text{ V to } -10\text{ V}, V_{DS} = 0.5 \cdot V_{DSX}$ $I_D = 10\text{ A}, R_G = 4.7\ \Omega \text{ (External)},$		35	ns
$t_r$			85	ns
$t_{d(off)}$			110	ns
$t_f$			75	ns
$Q_{g(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSX}, I_D = 0.5 \cdot I_{D25}$		125	nC
$Q_{gs}$			35	nC
$Q_{gd}$			51	nC
$R_{thJC}$			0.31	K/W
$R_{thCK}$			0.25	K/W

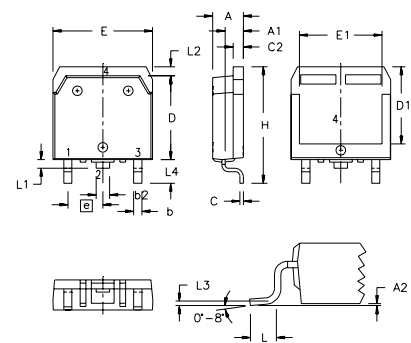
Symbol	Test Conditions	Characteristic Values		
		$(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$		
		min.	typ.	max.
$V_{SD}$	$I_F = I_{D25}, V_{GS} = -10\text{ V}, \text{ Note 1}$	0.85	1.5	V
$t_{rr}$	$I_F = 20\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$ $V_{GS} = -10\text{ V}$		510	ns

Note 1: Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $d \leq 2\%$

**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-268 (IXTTH) Outline**


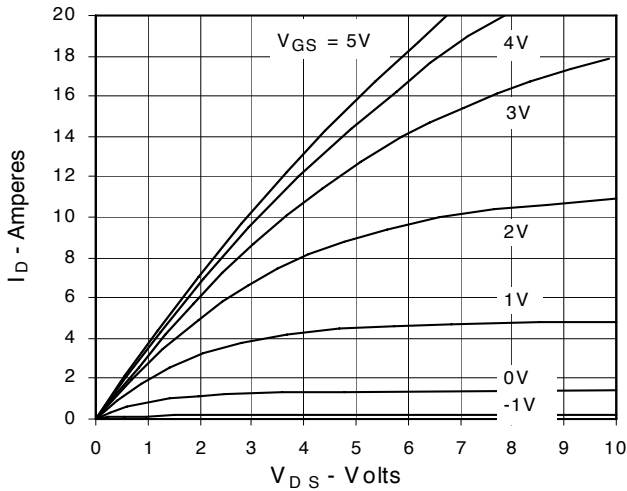
Terminals:  
 1 - Gate 2 - Drain  
 3 - Source Tab - Drain

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215	BSC	5.45	BSC
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L1	.047	.055	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010	BSC	0.25	BSC
L4	.150	.161	3.80	4.10

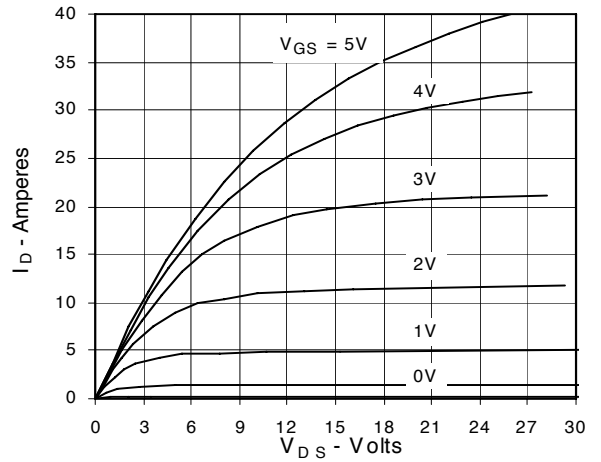
IXYS reserves the right to change limits, test conditions, and dimensions.

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	6,404,065 B1	6,683,344	6,727,585
	4,850,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	

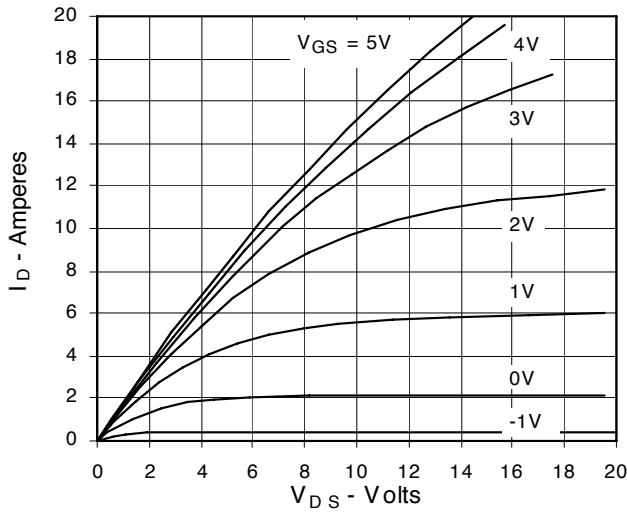
**Fig. 1. Output Characteristics**  
**@ 25°C**



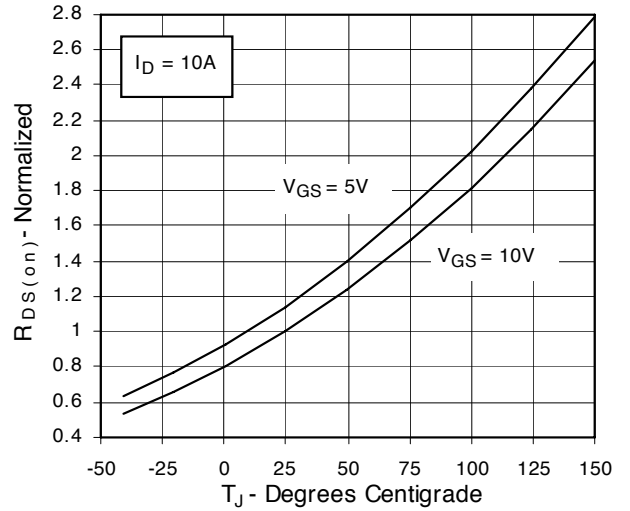
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



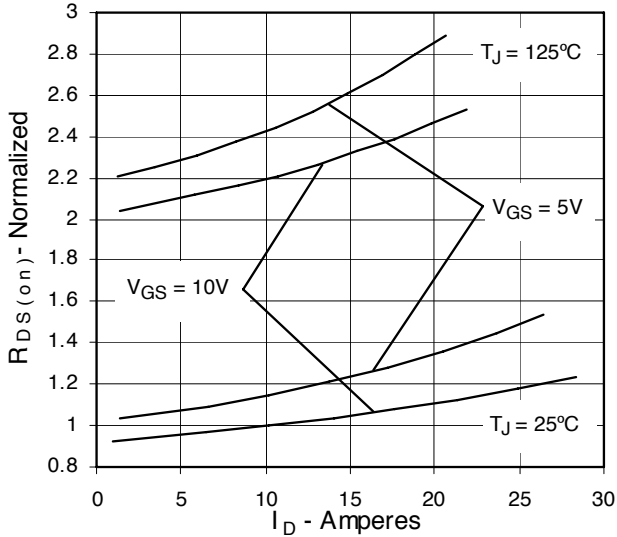
**Fig. 3. Output Characteristics**  
**@ 125°C**



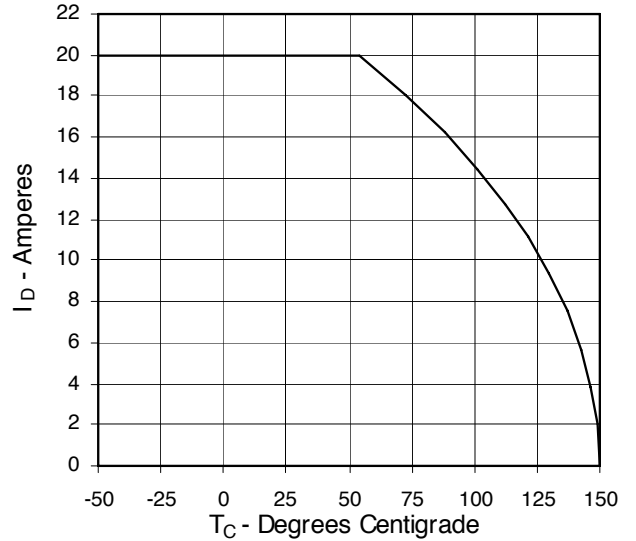
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs. Junction Temperature**



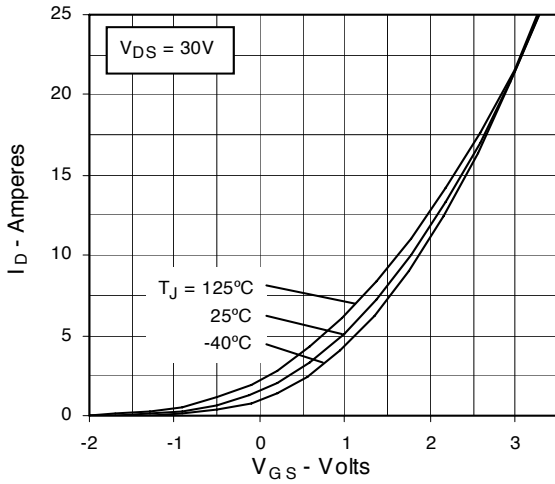
**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs.  $I_D$**



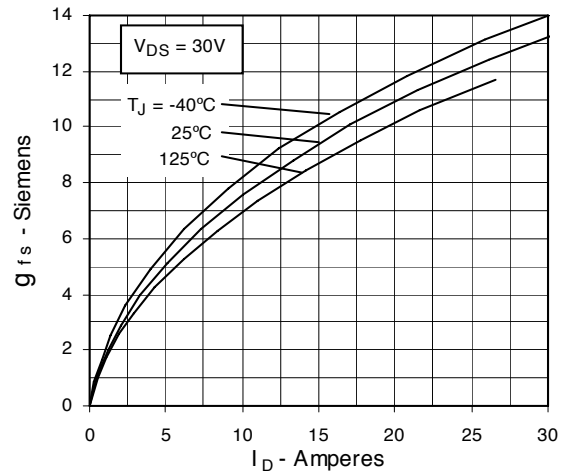
**Fig. 6. Drain Current vs. Case Temperature**



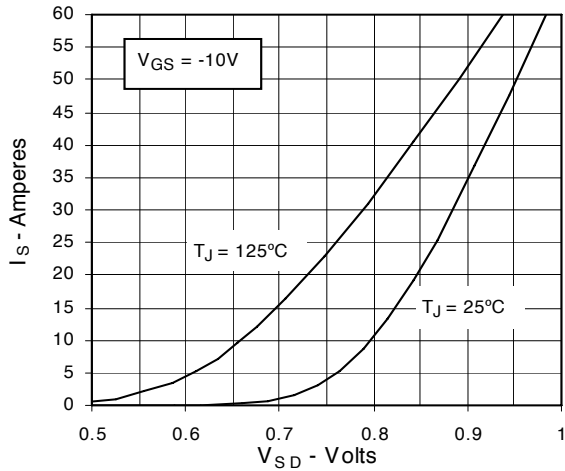
**Fig. 7. Input Admittance**



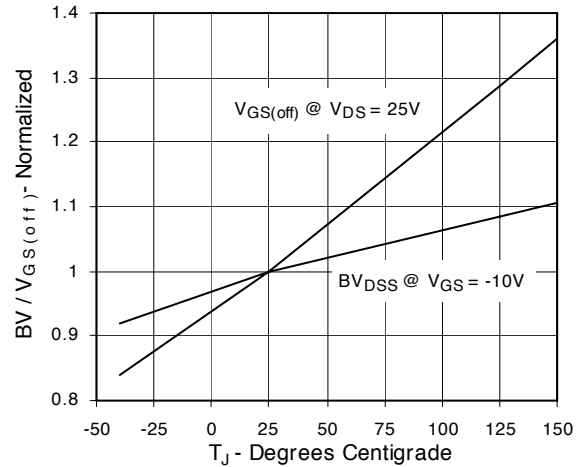
**Fig. 8. Transconductance**



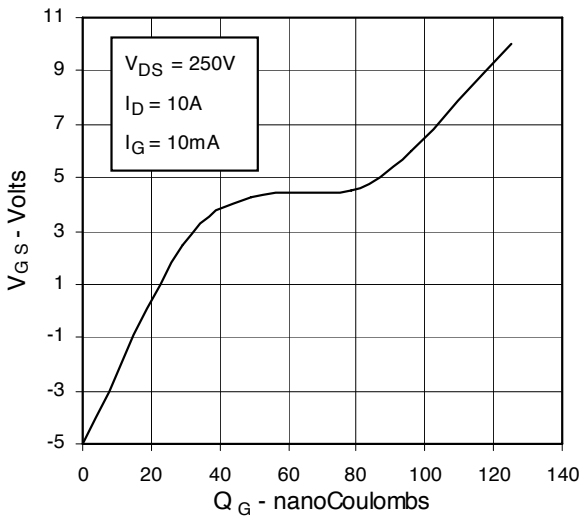
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



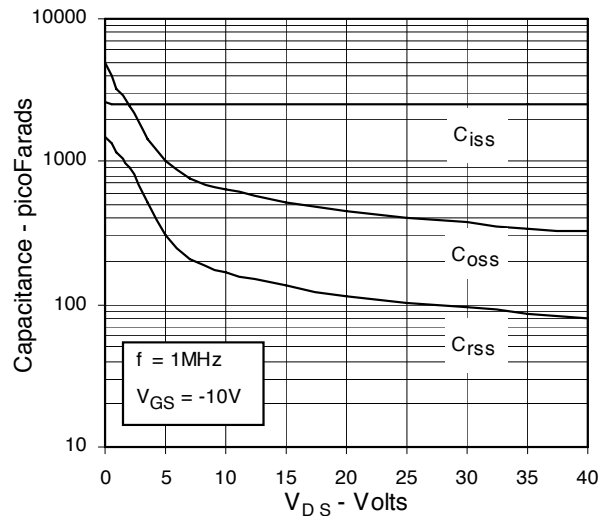
**Fig. 10. Dependence of Breakdown and Threshold Voltages on Temperature**



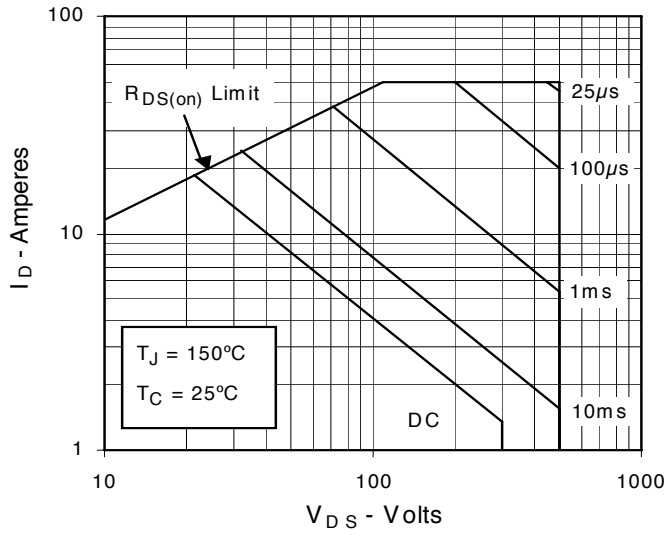
**Fig. 11. Gate Charge**



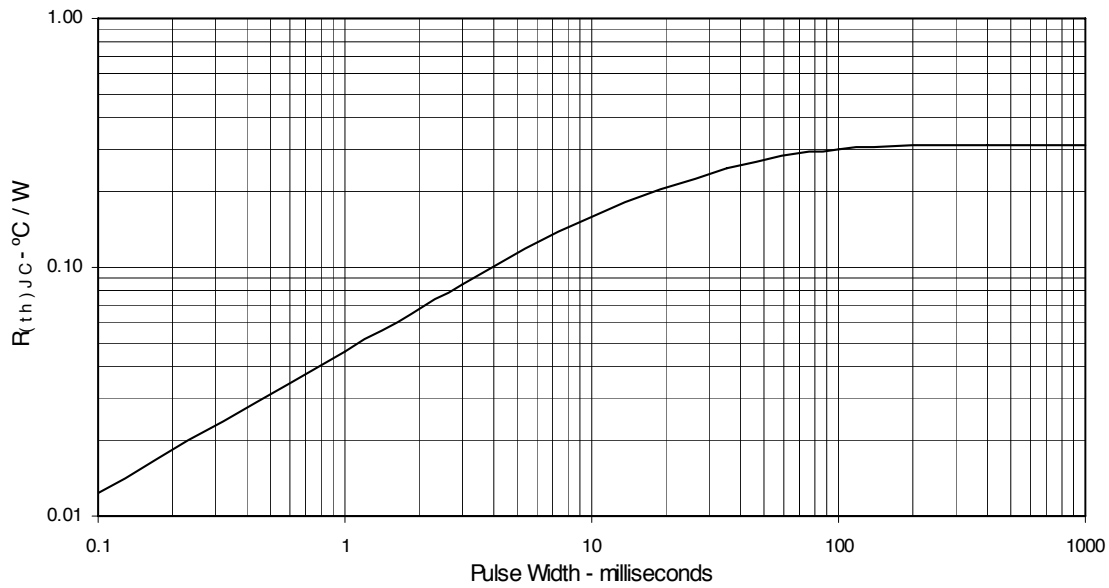
**Fig. 12. Capacitance**



**Fig. 13. Forward-Bias Safe Operating Area**



**Fig. 14. Maximum Transient Thermal Resistance**



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