

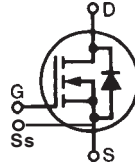
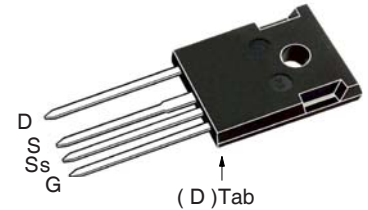
**X2-Class HiPerFET™  
Power MOSFET**
**IXFH60N65X2-4**

$$V_{DSS} = 650V$$

$$I_{D25} = 60A$$

$$R_{DS(on)} \leq 52m\Omega$$

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode


**TO-247-4L**


S = Source    G = Gate  
D = Drain    Ss = Source Sense

Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	650	V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$	650	V
$V_{GSS}$	Continuous	$\pm 30$	V
$V_{GSM}$	Transient	$\pm 40$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$	60	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$	120	A
$I_A$	$T_C = 25^\circ\text{C}$	15	A
$E_{AS}$	$T_C = 25^\circ\text{C}$	2.5	J
$dv/dt$	$I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$	50	V/ns
$P_D$	$T_C = 25^\circ\text{C}$	780	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ\text{C}$
$T_{SOLD}$	1.6 mm (0.062in.) from Case for 10s	260	$^\circ\text{C}$
$M_d$	Mounting Torque	1.13 / 10	Nm/lb.in
<b>Weight</b>		6	g

**Features**

- International Standard Package
- 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 ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSS}$	$V_{GS} = 0V$ , $I_D = 1mA$	650		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 4mA$	3.5		5.0 V
$I_{GSS}$	$V_{GS} = \pm 30V$ , $V_{DS} = 0V$			$\pm 100$ nA
$I_{DSS}$	$V_{DS} = V_{DSS}$ , $V_{GS} = 0V$ $T_J = 125^\circ\text{C}$			25 $\mu\text{A}$ 2.5 mA
$R_{DS(on)}$	$V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1			52 m $\Omega$

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
$g_{fs}$	$V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1	23	38	S
$R_{Gi}$	Gate Input Resistance		0.8	$\Omega$
$C_{iss}$	} $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$		6300	pF
$C_{oss}$			3540	pF
$C_{rss}$			1.7	pF
<b>Effective Output Capacitance</b>				
$C_{o(er)}$	Energy related	} $V_{GS} = 0\text{V}$ $V_{DS} = 0.8 \cdot V_{DSS}$	207	pF
$C_{o(tr)}$	Time related		855	pF
<b>Resistive Switching Times</b>				
$t_{d(on)}$	} $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$ $R_G = 3\Omega$ (External)		30	ns
$t_r$			23	ns
$t_{d(off)}$			63	ns
$t_f$			12	ns
$Q_{g(on)}$	} $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$		108	nC
$Q_{gs}$			40	nC
$Q_{gd}$			34	nC
$R_{thJC}$				0.16 $^\circ\text{C/W}$
$R_{thCS}$		0.21		$^\circ\text{C/W}$

**Source-Drain Diode**

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
$I_S$	$V_{GS} = 0\text{V}$			60 A
$I_{SM}$	Repetitive, pulse Width Limited by $T_{JM}$			240 A
$V_{SD}$	$I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1			1.4 V
$t_{rr}$	} $I_F = 30\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ $V_R = 100\text{V}$		180	ns
$Q_{RM}$			1.4	$\mu\text{C}$
$I_{RM}$			16.0	A

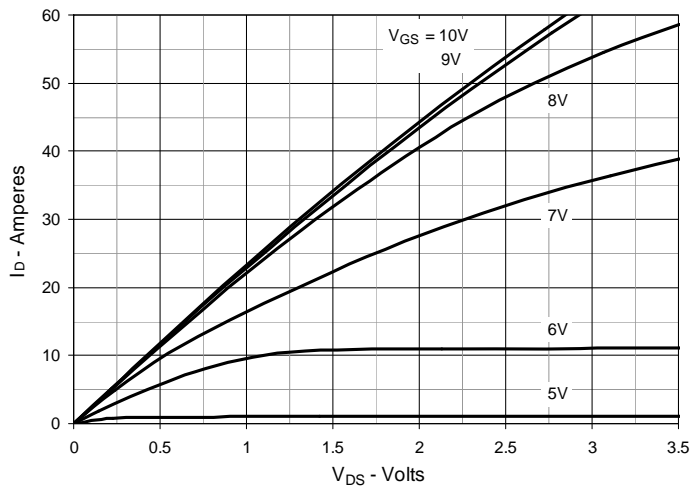
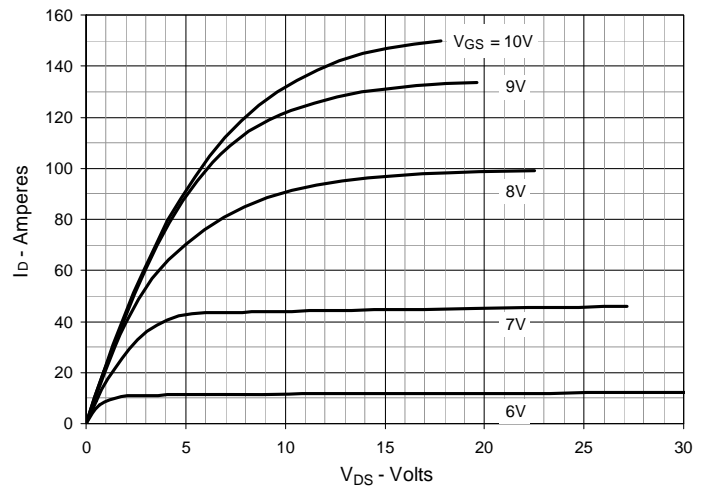
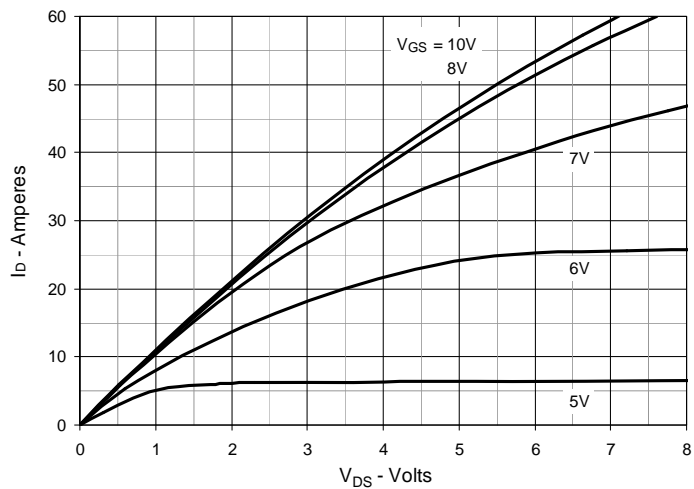
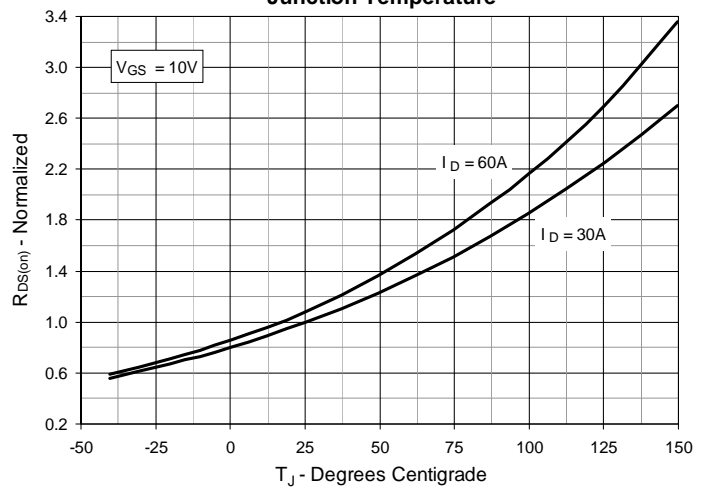
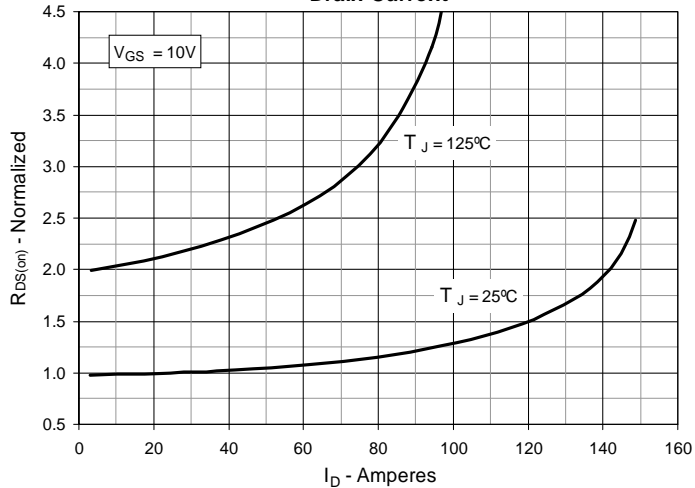
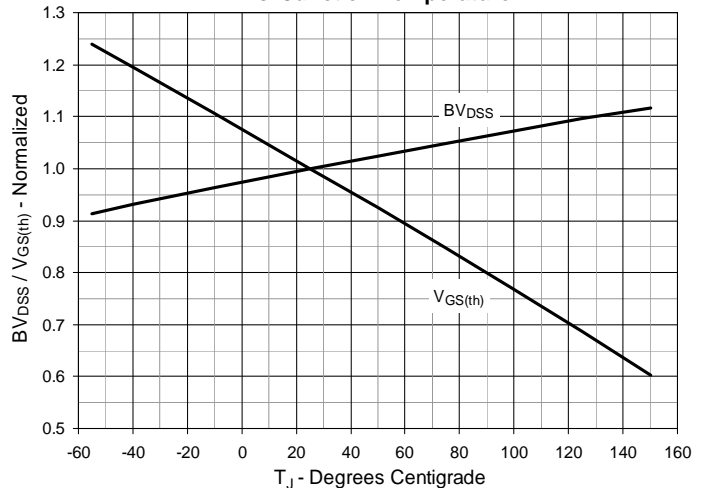
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

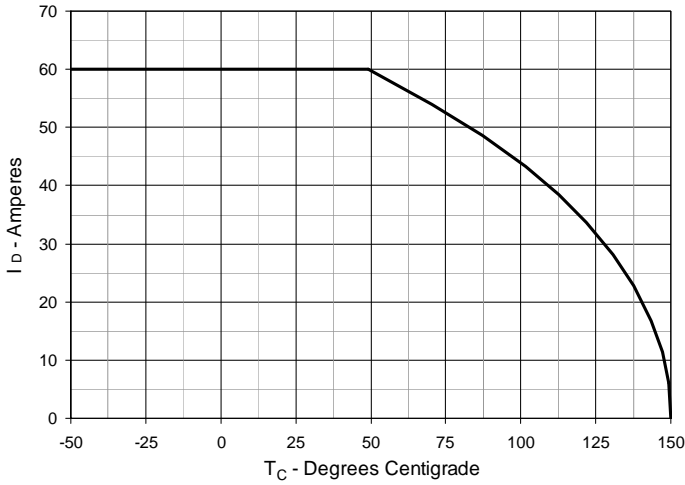
**ADVANCE TECHNICAL INFORMATION**

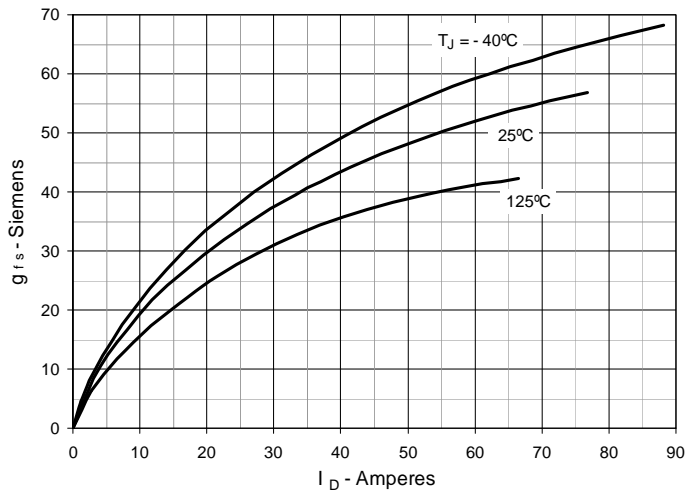
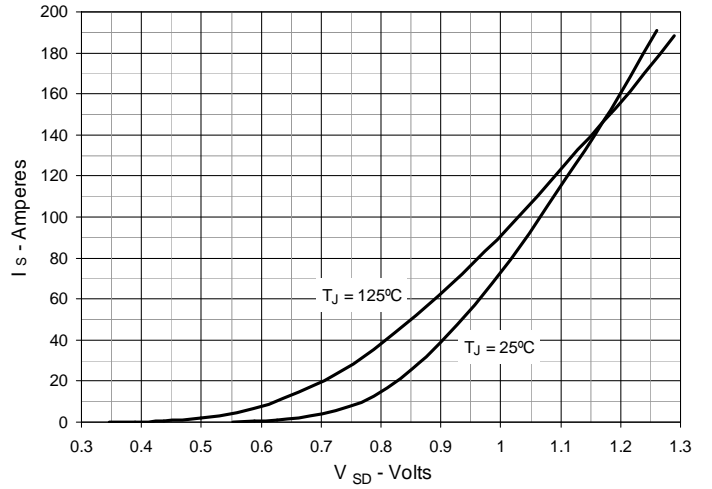
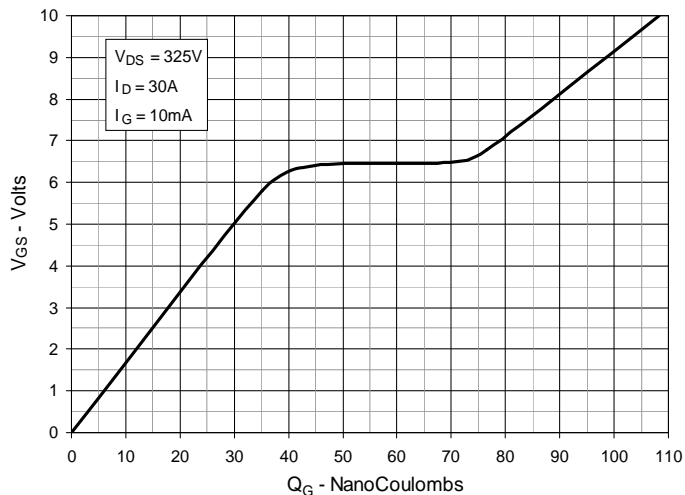
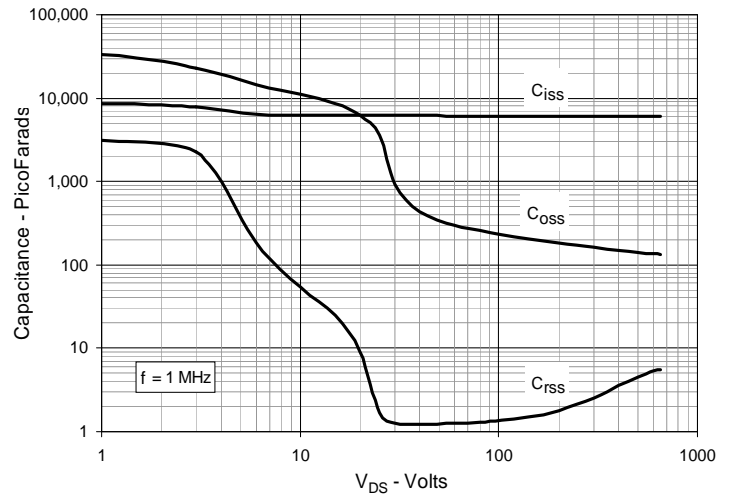
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

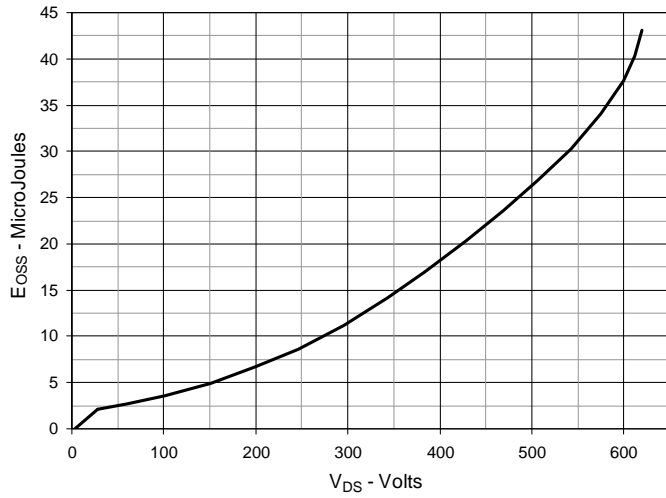
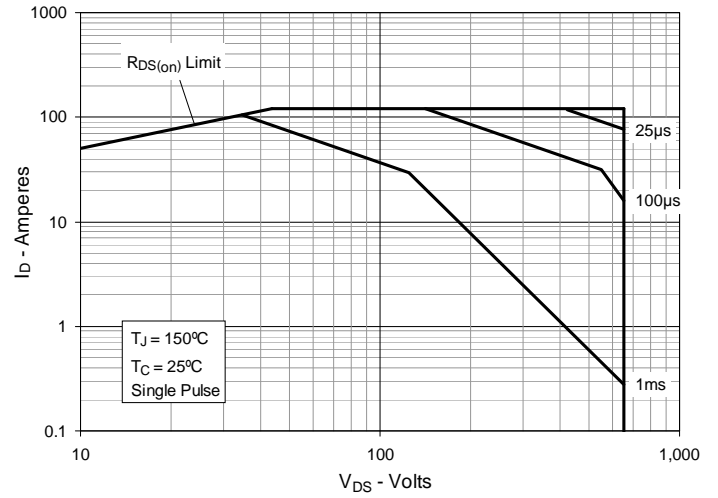
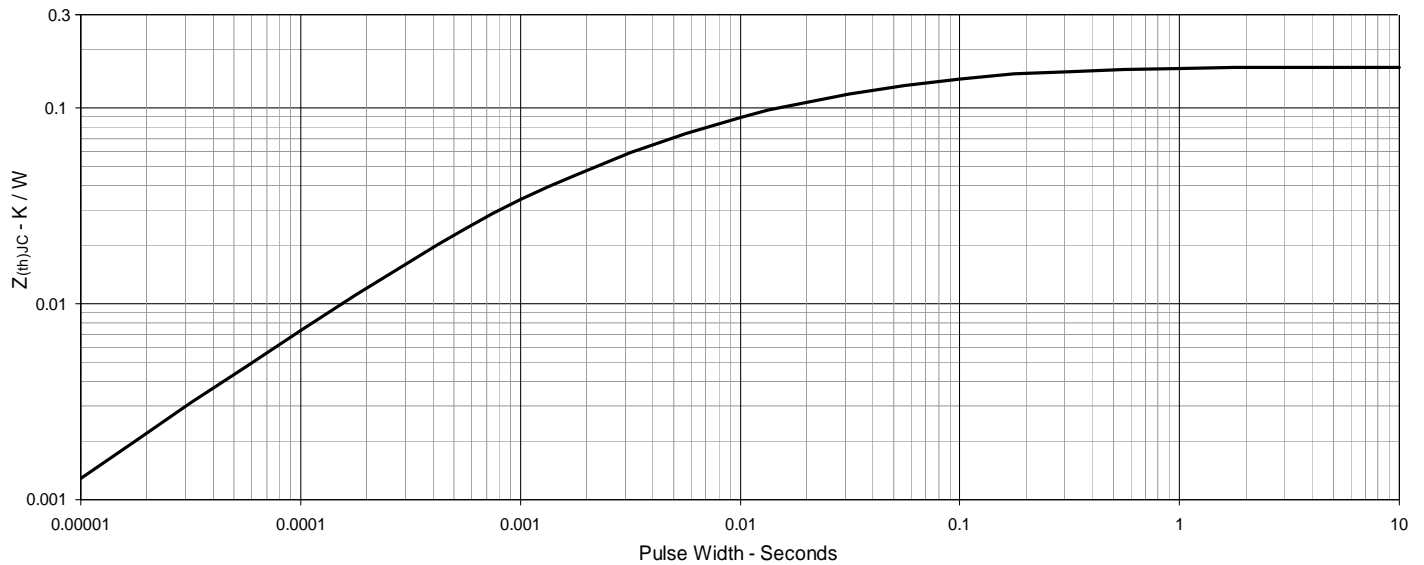
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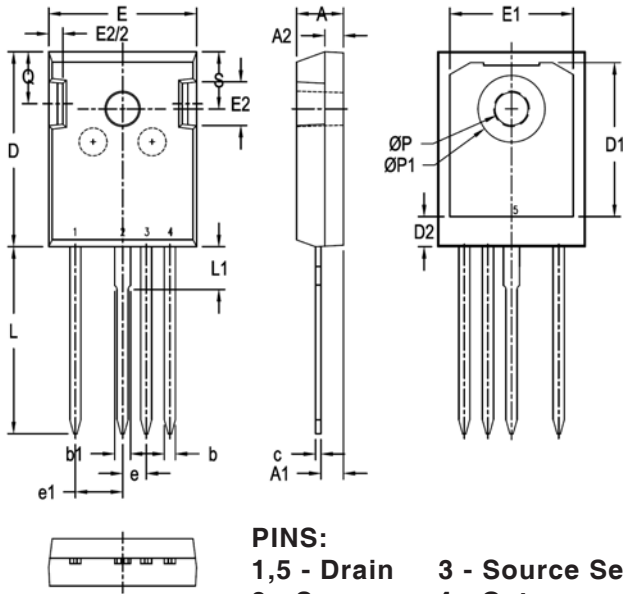
IXYS MOSFETs and IGBTs are covered	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065B1	6,683,344	6,727,585	7,005,734B2	7,157,338B2
by one or more of the following U.S. patents:	4,860,072	5,017,508	5,063,307	5,381,025	6,259,123B1	6,534,343	6,710,405B2	6,759,692	7,063,975B2	
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728B1	6,583,505	6,710,463	6,771,478B2	7,071,537	

**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$** 

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 30\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 30\text{A}$  Value vs. Drain Current**

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


**Fig. 7. Maxing 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-247 - 4L Outline**


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.189	.205	4.80	5.20
A1	.090	.098	2.30	2.50
A2	.075	.083	1.90	2.10
b	.043	.055	1.10	1.40
b1	.063	.071	1.60	1.80
c	.020	.031	0.50	0.80
D	.819	.839	20.80	21.30
D1	.630	.670	16.00	17.00
D2	.118	.138	3.00	3.50
E	.620	.636	15.75	16.15
E1	.531	.559	13.50	14.20
E2	.169	.193	4.30	4.90
e	.100 BSC		2.54 BSC	
e1	.200 BSC		5.08 BSC	
L	.780	.799	19.80	20.30
L1	.157	.177	4.00	4.50
ØP	.140	.144	3.55	3.65
ØP1	.280	.287	7.10	7.30
Q	.213	.236	5.40	6.00
S	.242 BSC		6.15 BSC	

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