

**Polar3™ HiPerFET™  
Power MOSFET**
**(Electrically Isolated Tab)**

 N-Channel Enhancement Mode  
 Avalanche Rated  
 Fast Intrinsic Rectifier

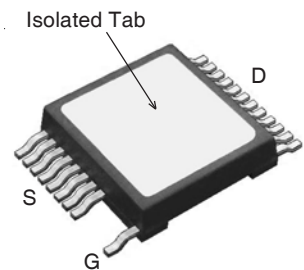
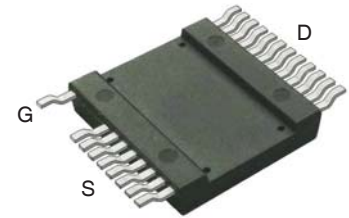
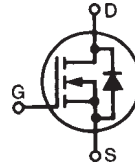
**MMIX1F210N30P3**

$$V_{DSS} = 300V$$

$$I_{D25} = 108A$$

$$R_{DS(on)} \leq 16m\Omega$$

$$t_{rr} \leq 250ns$$


 G = Gate      D = Drain  
 S = Source

Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ C$ to $150^\circ C$	300	V
$V_{DGR}$	$T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$	300	V
$V_{GSS}$	Continuous	$\pm 20$	V
$V_{GSM}$	Transient	$\pm 30$	V
$I_{D25}$	$T_C = 25^\circ C$	108	A
$I_{DM}$	$T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$	550	A
$I_A$	$T_C = 25^\circ C$	105	A
$E_{AS}$	$T_C = 25^\circ C$	4	J
$dv/dt$	$I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$	35	V/ns
$P_D$	$T_C = 25^\circ C$	520	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6 mm (0.062in.) from Case for 10s	260	$^\circ C$
$V_{ISOL}$	50/60 Hz, 1 Minute	2500	V~
$F_C$	Mounting Force	50..200 / 11..45	N/lb
<b>Weight</b>		8	g

**Features**

- Silicon Chip on Direct-Copper-Bond Substrate
  - High Power Dissipation
  - Isolated Mounting Surface
  - 2500V~ Electrical Isolation
- Dynamic  $dv/dt$  Rating
- Avalanche Rated
- Fast Intrinsic Rectifier
- Low  $R_{DS(on)}$
- Low Drain-to-Tab Capacitance
- Low Package Inductance

**Advantages**

- Easy to Mount
- Space Savings

**Applications**

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- Uninterrupted Power Supplies
- AC Motor Drives
- High Speed Power Switching Applications

Symbol	Test Conditions ( $T_J = 25^\circ C$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSS}$	$V_{GS} = 0V$ , $I_D = 3mA$	300		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 8mA$	2.5		5.0 V
$I_{GSS}$	$V_{GS} = \pm 20V$ , $V_{DS} = 0V$			$\pm 200$ nA
$I_{DSS}$	$V_{DS} = V_{DSS}$ , $V_{GS} = 0V$ Note 2, $T_J = 125^\circ C$			50 $\mu A$ 1.5 mA
$R_{DS(on)}$	$V_{GS} = 10V$ , $I_D = 105A$ , Note 1			16 m $\Omega$

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$V_{DS} = 10\text{V}, I_D = 60\text{A}$ , Note 1	60	100	S
$C_{iss}$ $C_{oss}$ $C_{rss}$	} $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$		16.2	nF
			2550	pF
			42	pF
$R_{Gi}$	Gate Input Resistance		1.0	$\Omega$
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$	} <b>Resistive Switching Times</b> $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{DSS}$ $R_G = 1\Omega$ (External)		46	ns
			25	ns
			94	ns
			13	ns
$Q_{g(on)}$ $Q_{gs}$ $Q_{gd}$	} $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{DSS}$		268	nC
			80	nC
			72	nC
$R_{thJC}$ $R_{thCS}$ $R_{thJA}$				0.24 $^\circ\text{C/W}$ 0.05 $^\circ\text{C/W}$ 30 $^\circ\text{C/W}$

**Source-Drain Diode**

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$I_S$	$V_{GS} = 0\text{V}$			210 A
$I_{SM}$	Repetitive, Pulse Width Limited by $T_{JM}$			840 A
$V_{SD}$	$I_F = 100\text{A}, V_{GS} = 0\text{V}$ , Note 1			1.5 V
$t_{rr}$ $Q_{RM}$ $I_{RM}$	} $I_F = 105\text{A}, -di/dt = 100\text{A}/\mu\text{s}$ $V_R = 100\text{V}, V_{GS} = 0\text{V}$		4.1	250 ns $\mu\text{C}$
			28	A

**Notes:**

1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Part must be heatsunk for high-temp  $I_{DSS}$  measurement.

**PRELIMINARY TECHNICAL INFORMATION**

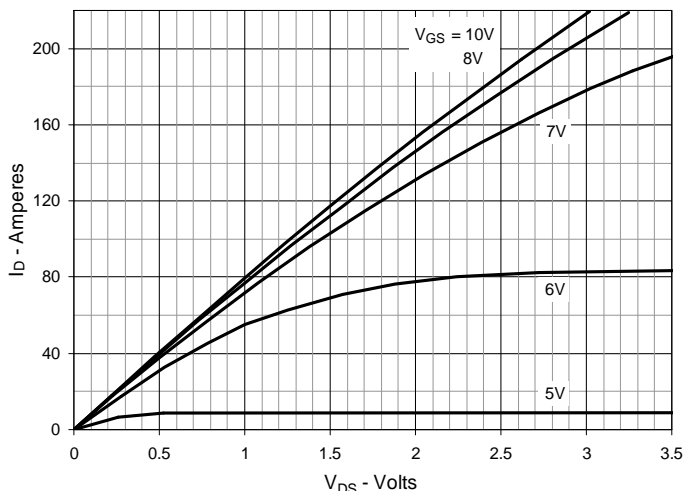
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test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

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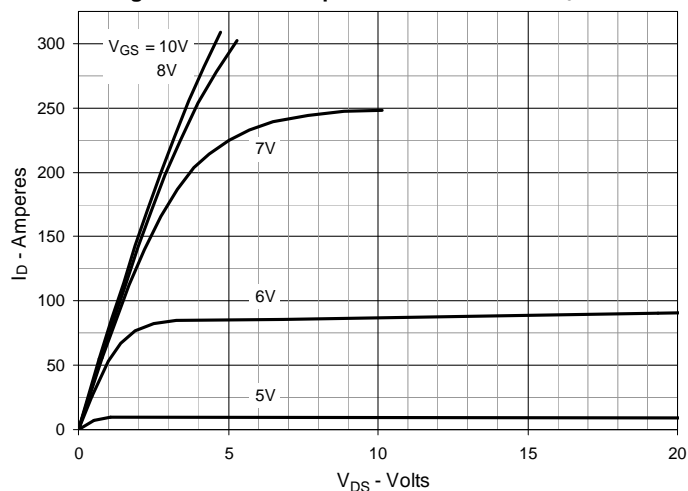
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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	7,005,734 B2	7,157,338B2
4,860,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2	7,071,537	

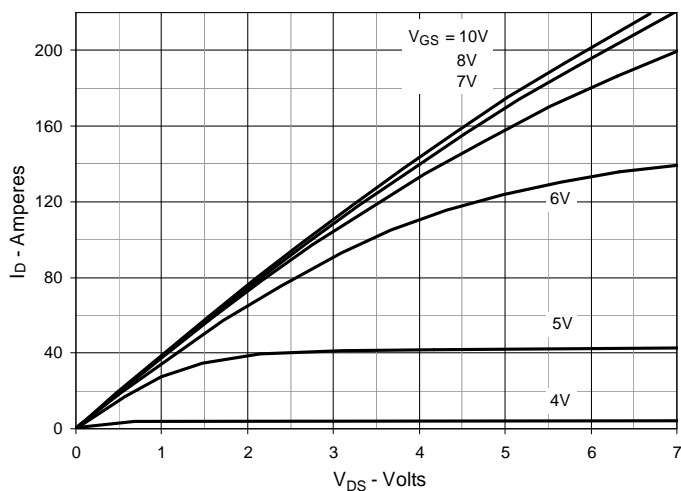
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



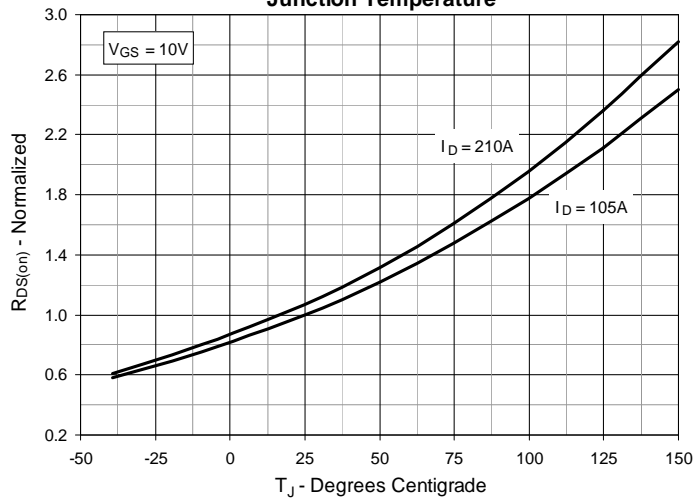
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



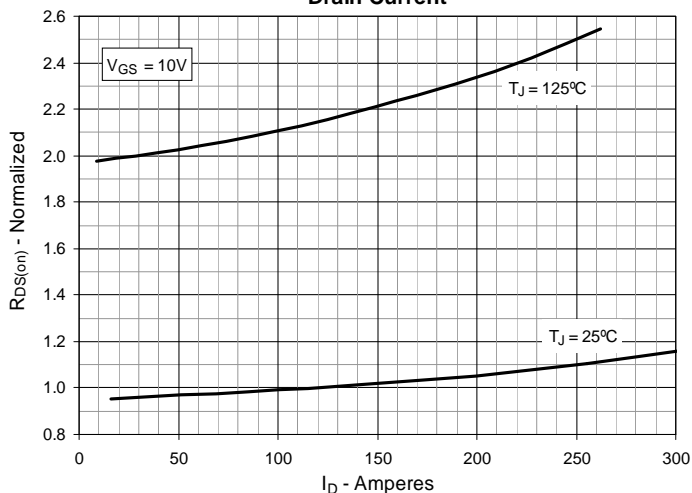
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



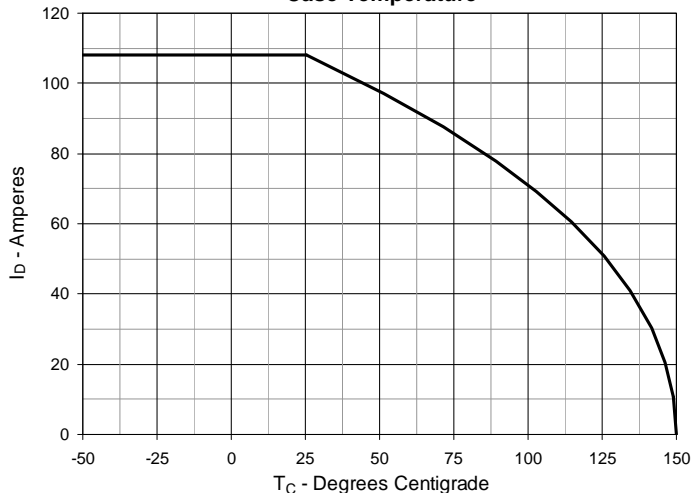
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 105\text{A}$  Value vs. Junction Temperature**



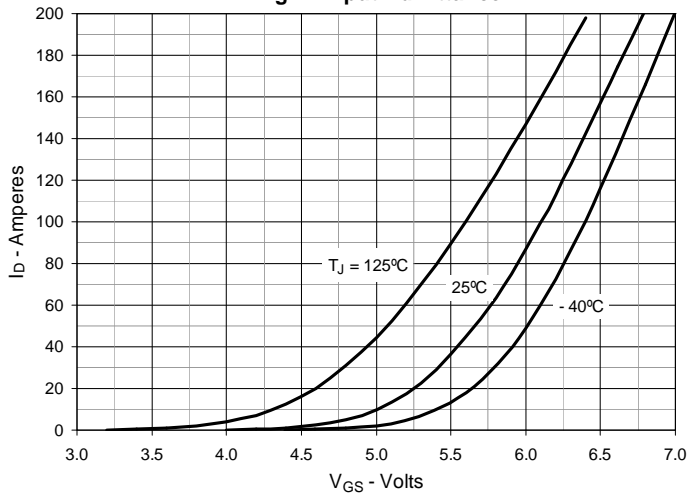
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 105\text{A}$  Value vs. Drain Current**



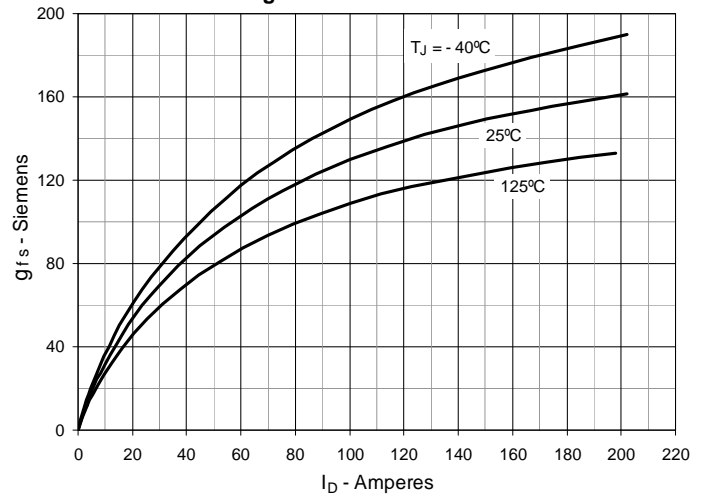
**Fig. 6. Maximum Drain Current vs. Case Temperature**



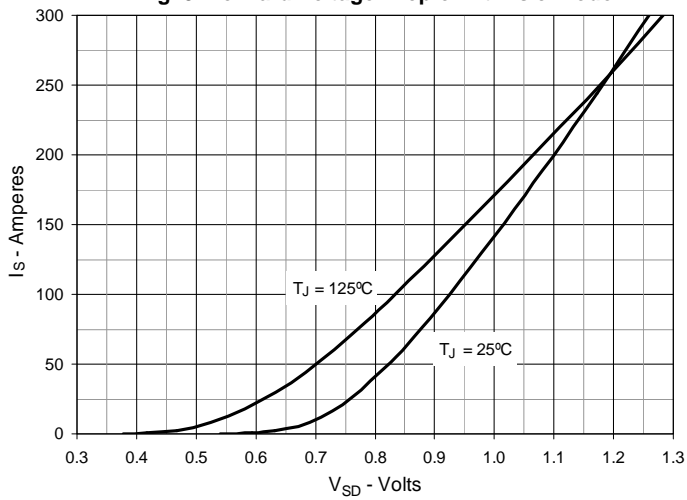
**Fig. 7. Input Admittance**



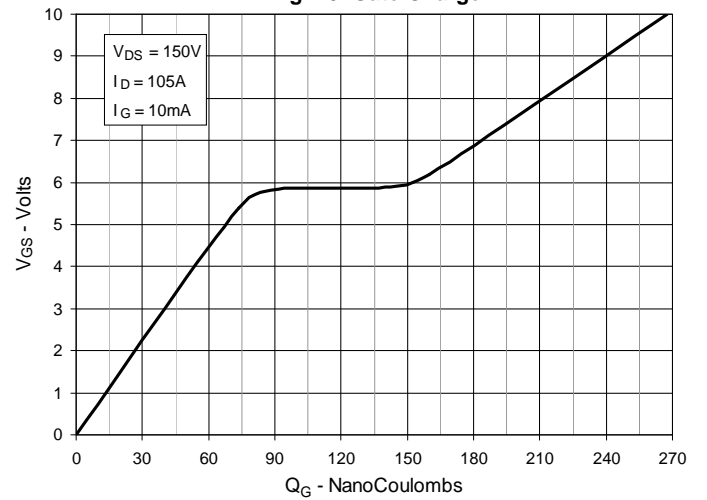
**Fig. 8. Transconductance**



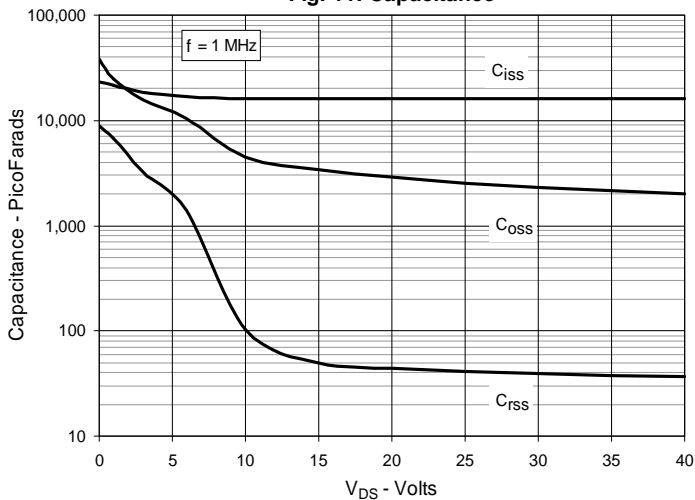
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Forward-Bias Safe Operating Area**

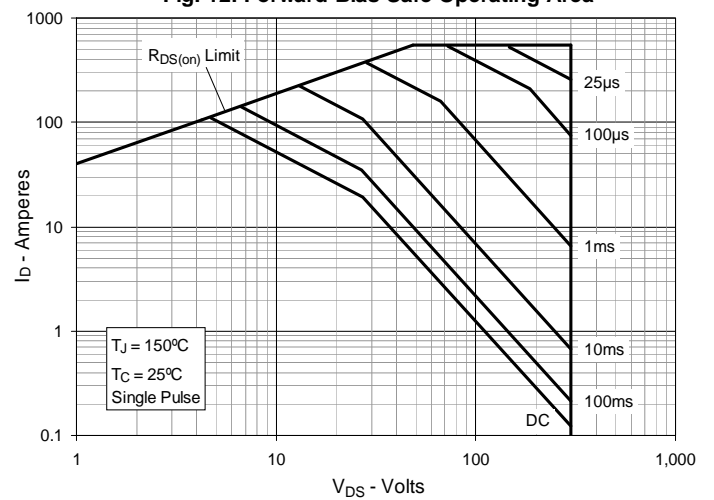
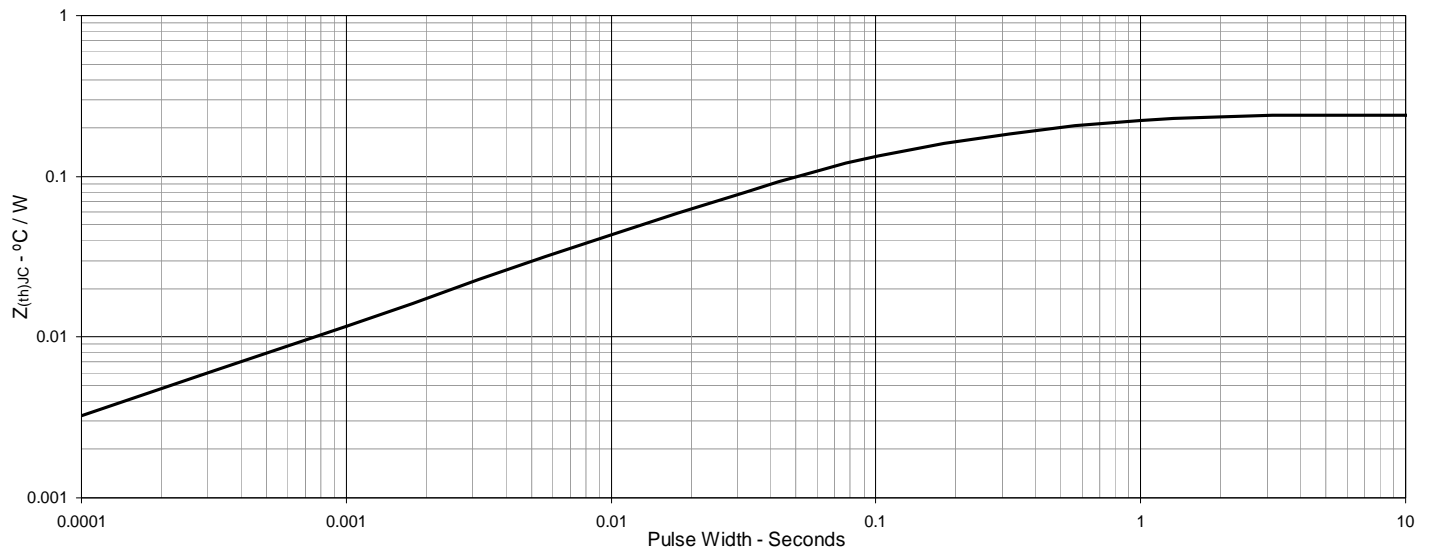
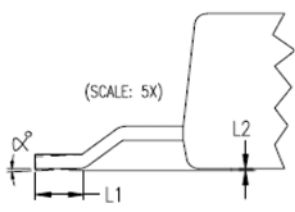
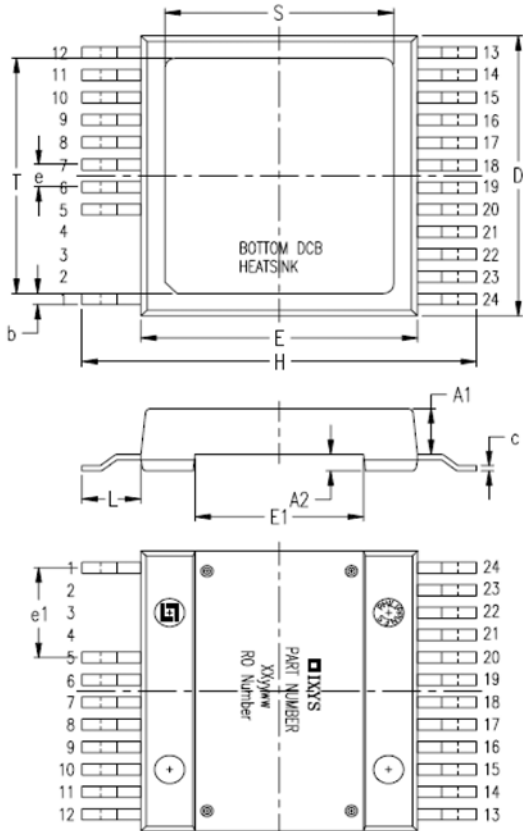


Fig. 13. Maximum Transient Thermal Impedance



**Package Outline**


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.209	.224	5.30	5.70
A1	.154	.161	3.90	4.10
A2	.055	.063	1.40	1.60
b	.035	.045	0.90	1.15
c	.018	.026	0.45	0.65
D	.976	.994	24.80	25.25
E	.898	.915	22.80	23.25
E1	.543	.559	13.80	14.20
e	.079 BSC		2.00 BSC	
e1	.315 BSC		8.00 BSC	
H	1.272	1.311	32.30	33.30
L	.181	.209	4.60	5.30
L1	.051	.067	1.30	1.70
L2	.000	.006	0.00	0.15
S	.736	.760	18.70	19.30
T	.815	.839	20.70	21.30
α	0	4°	0	4°

**PIN: 1 = Gate**  
**5-12 = Source**  
**13-24 = Drain**



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