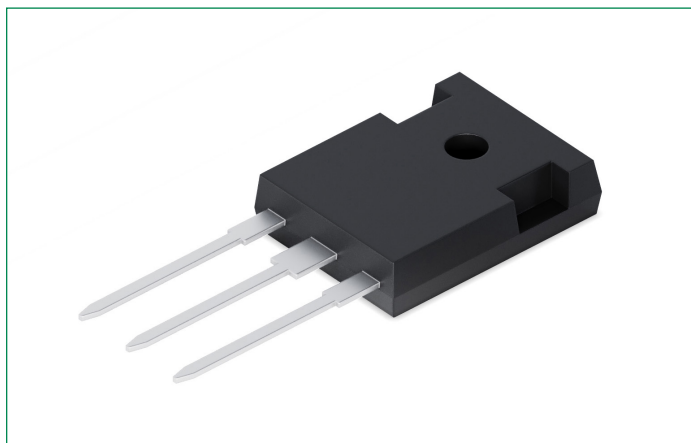


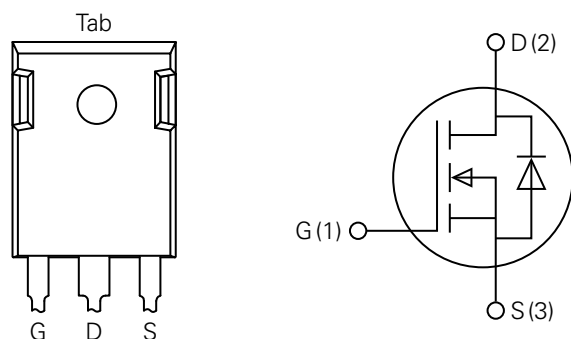
IXFH46N65X2W

650 V, 69 mΩ, X2 Class HiPerFET™ Power MOSFET

N-Channel Enhancement Mode



Pinout Diagram TO-247 (IXFH)



G: Gate; **D:** Drain; **S:** Source; **Tab:** Drain

Features

- International standard package
- High power density
- Low $R_{DS(on)}$ and Q_g
- Avalanche rated
- Low package inductance

Benefits

- Reduced conduction losses
- Reduced driver power requirements
- 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

Product Summary

Characteristic	Value	Unit
V_{DSS}	650	V
I_{D25}	46	A
$R_{DS(on)}$	≤ 69	mΩ

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{DSS}	Drain-source voltage	$T_{vj} = 25\text{ }^{\circ}\text{C}$ to $150\text{ }^{\circ}\text{C}$	650	V
V_{GSS}	Gate-source voltage	Continuous	± 30	V
V_{GSM}		Transient	± 40	
I_D	Drain current	$T_c = 25\text{ }^{\circ}\text{C}$	46	A
I_{DM}	Peak drain current	$T_c = 25\text{ }^{\circ}\text{C}$, pulse width limited by $T_{vj(max)}$	55	
I_A	Avalanche current	$T_c = 25\text{ }^{\circ}\text{C}$	10	A
E_{AS}	Avalanche energy	$T_c = 25\text{ }^{\circ}\text{C}$	1.3	J
dv/dt	Reverse diode dv/dt	$I_S \leq I_{DM}$, $V_{DD} \leq V_{DSS}$, $T_{vj} \leq 150\text{ }^{\circ}\text{C}$	50	V/ns
P_D	Power dissipation	$T_c = 25\text{ }^{\circ}\text{C}$	660	W
T_{vj}	Virtual junction temperature range	–	–55 to +150	$^{\circ}\text{C}$
$T_{vj(max)}$	Maximum virtual junction temperature	–	150	
T_{stg}	Storage temperature range	–	–55 to +150	
T_{sld}	Soldering temperature	1.6 mm (0.062 in.) from case for 10 s	300	$^{\circ}\text{C}$
M_d	Mounting torque	–	1.13 / 10	Nm/lb.in
G	Weight	–	6	g

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal resistance junction to case	–	–	0.19	K/W
$R_{th(c-h)}$	Thermal resistance case to heat sink	–	0.21	–	K/W

Electrical Characteristics – Static ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	650	–	–	V
$V_{GS(th)}$	Gate threshold voltage	$I_D = 4\text{ mA}$, $V_{GS} = V_{DS}$	3.5	–	5.5	V
I_{GSS}	Gate-source leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 30\text{ V}$	–	–	± 100	nA
I_{DSS}	Drain-source leakage current	$V_{DS} = V_{DSS}$, $V_{GS} = 0\text{ V}$	–	–	25	μA
		$V_{DS} = V_{DSS}$, $V_{GS} = 0\text{ V}$, $T_{vj} = 125\text{ }^{\circ}\text{C}$	–	–	2	mA
$R_{DS(on)}$	Drain-source on-resistance ¹	$V_{GS} = 10\text{ V}$, $I_D = 0.5 \times I_{D25}$	–	–	69	m Ω

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

Electrical Characteristics – Dynamic ($T_{vj} = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
g_{fs}	Transconductance ¹	$V_{DS} = 10\text{ V}, I_D = 0.5 \times I_{D25}$	24	38	–	S
$R_{g(int)}$	Gate input resistance	–	–	0.9	–	Ω
C_{iss}	Input capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	–	4640	–	pF
C_{oss}	Output capacitance		–	2070	–	
C_{rss}	Reverse transfer capacitance		–	1.6	–	
$C_{o(er)}$	Effective output capacitance – energy related	$V_{GS} = 0\text{ V}, V_{DS} = 0.8 \times V_{DSS}$	–	173	–	pF
$C_{o(tr)}$	Effective output capacitance – time related		–	634	–	
Q_g	Total gate charge	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 \times V_{DSS},$ $I_D = 0.5 \times I_{D25}$	–	90	–	nC
Q_{gs}	Gate-source charge		–	29	–	
Q_{gd}	Gate-drain charge		–	32	–	
$t_{d(on)}$	Turn-on delay time	Resistive Switching $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \times V_{DSS},$ $I_D = 0.5 \times I_{D25}, R_{G(ext)} = 3\ \Omega$	–	28	–	ns
t_r	Rise time		–	21	–	
$t_{d(off)}$	Turn-off delay time		–	53	–	
t_f	Fall time		–	12	–	

Note 1: Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle, $d \leq 2\%$ **Source-Drain Diode Characteristics** ($T_{vj} = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
I_S	Continuous diode forward current	$V_{GS} = 0\text{ V}$	–	–	46	A
I_{SM}	Diode pulse current	Repetitive, pulse width limited by $T_{vj(max)}$	–	–	184	A
V_{SD}	Diode forward voltage ¹	$I_F = I_S, V_{GS} = 0\text{ V}$	–	–	1.4	V
t_{rr}	Reverse recovery time	$I_F = 23\text{ A}, -di/dt = 100\text{ A}/\mu\text{s},$ $V_R = 100\text{ V}, V_{GS} = 0\text{ V}$	–	206	–	ns
Q_{rr}	Reverse recovery charge		–	1.90	–	μC
I_{rrm}	Reverse recovery current		–	18.6	–	A

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

Characteristic Curves

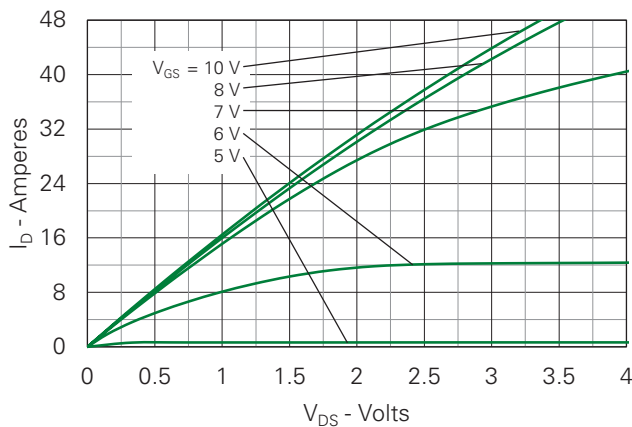
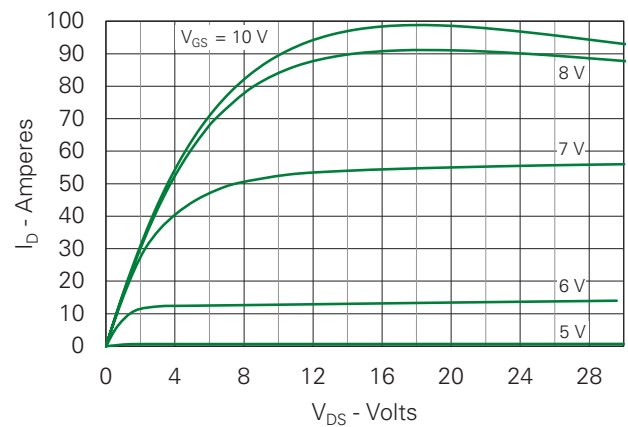
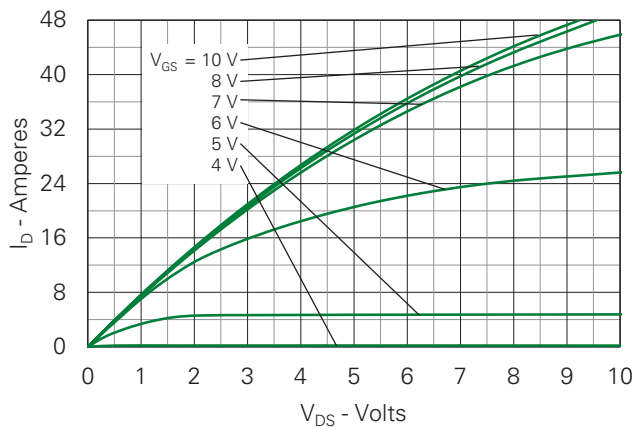
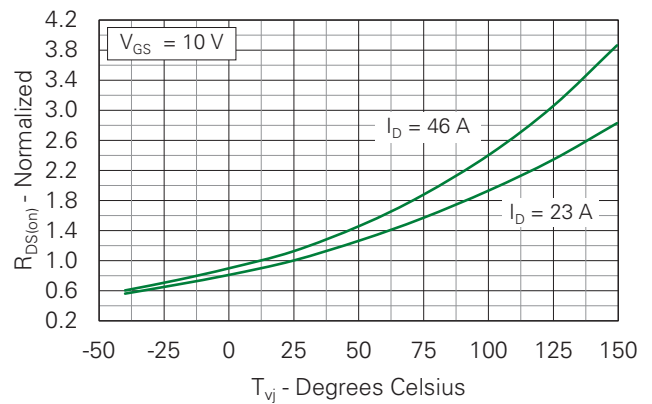
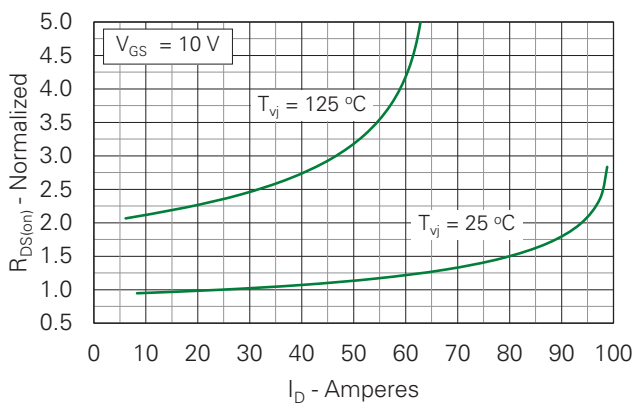
Fig. 1. Output Characteristics @ $T_{vj} = 25^\circ\text{C}$ Fig. 2. Extended Output Characteristics @ $T_{vj} = 25^\circ\text{C}$ Fig. 3. Output Characteristics @ $T_{vj} = 125^\circ\text{C}$ Fig. 4. $R_{DS(on)}$ Normalized to $I_D = 23\text{ A}$ Value vs. Junction TemperatureFig. 5. $R_{DS(on)}$ Normalized to $I_D = 23\text{ A}$ Value vs. Drain Current

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

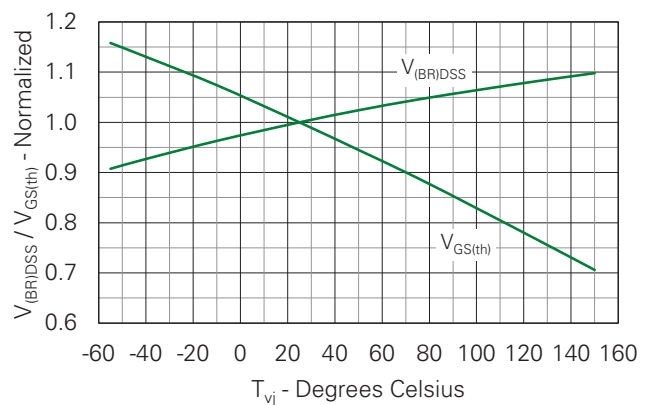


Fig. 7. Maximum Drain Current vs. Case Temperature

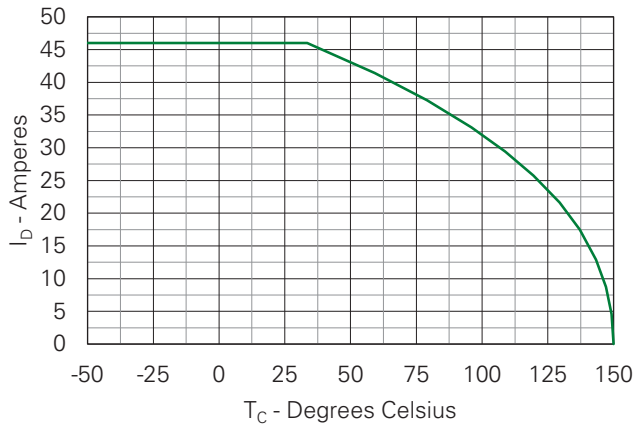


Fig. 8. Input Admittance

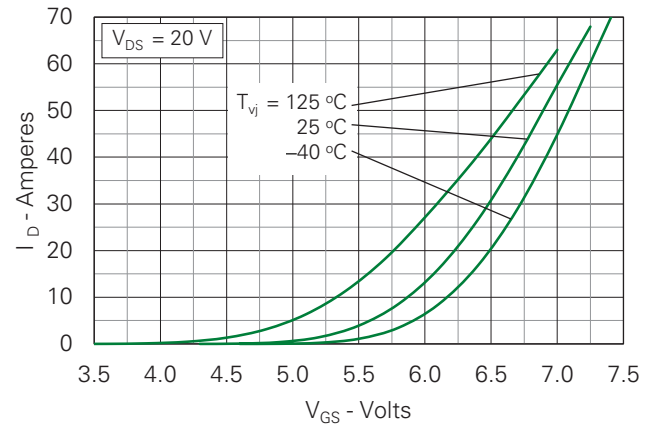


Fig. 9. Transconductance

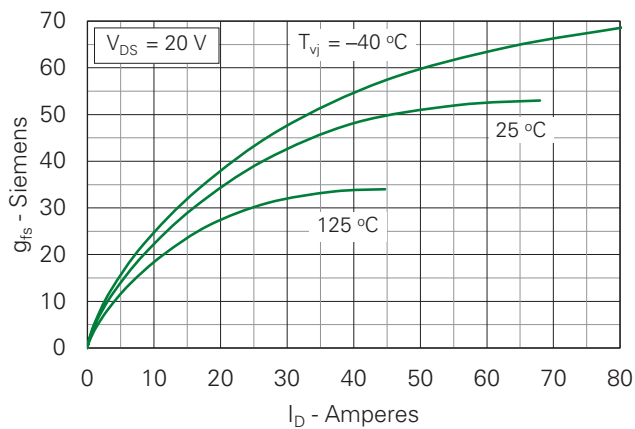


Fig. 10. Forward Voltage Drop of Intrinsic Diode

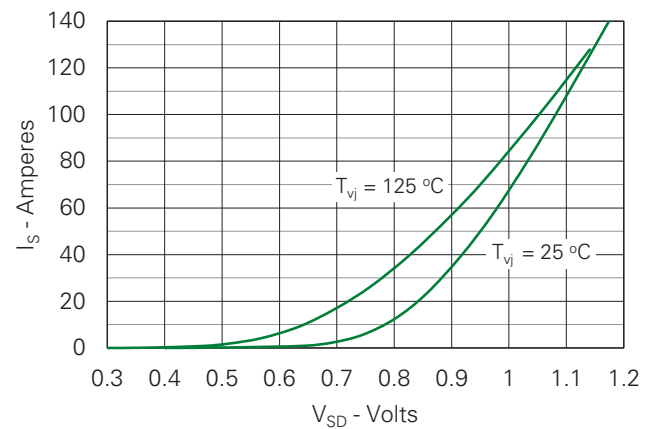


Fig. 11. Gate Charge

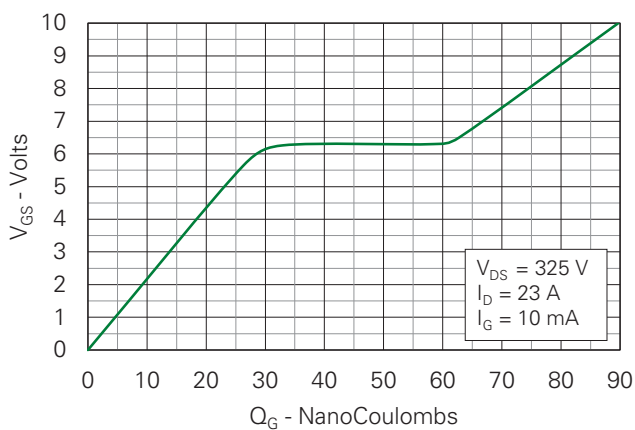


Fig. 12. Capacitance

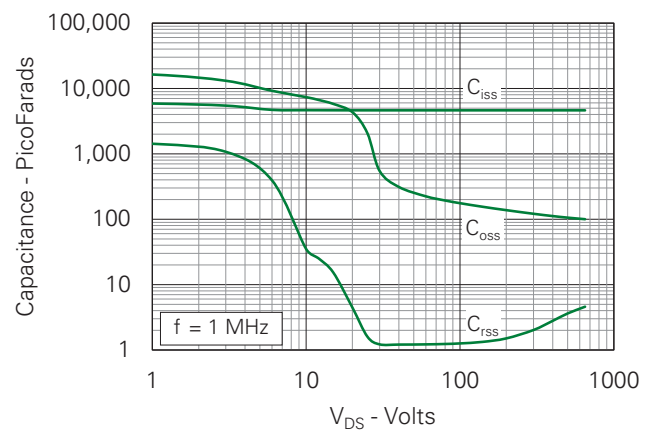


Fig. 13. Output Capacitance Stored Energy

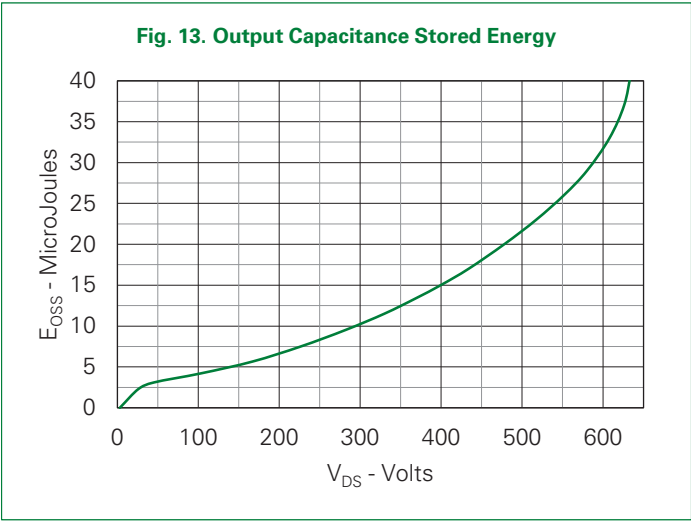


Fig. 14. Forward-Bias Safe Operating Area

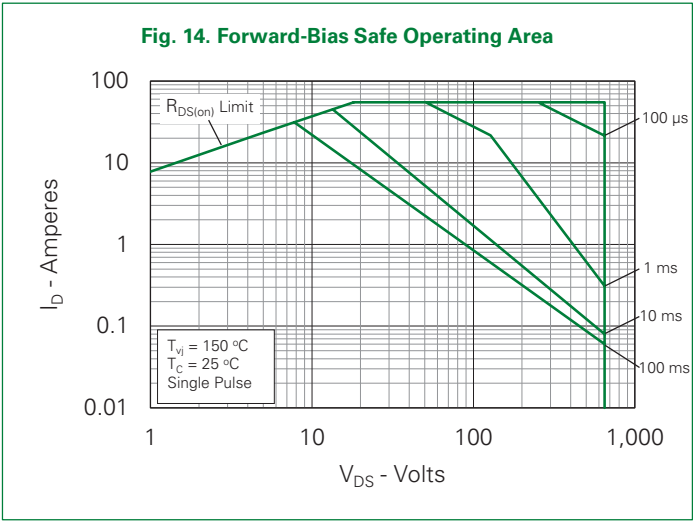
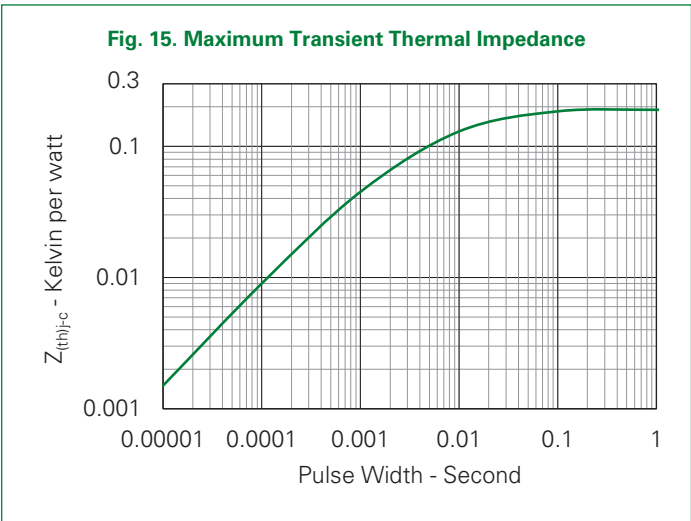
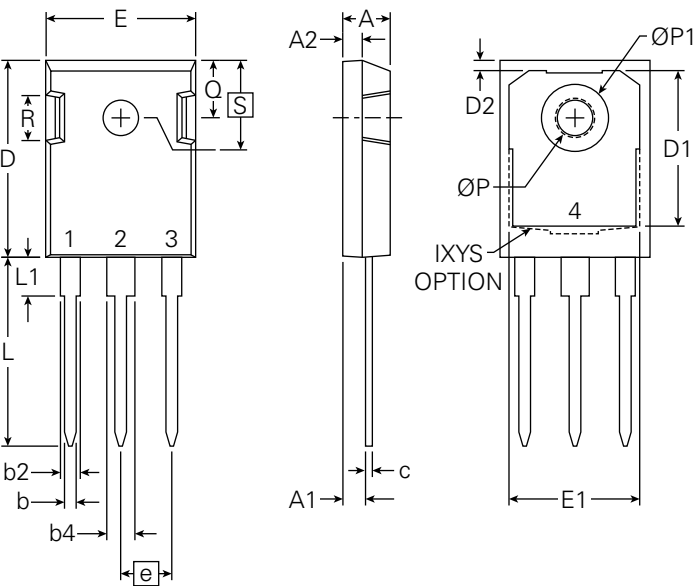


Fig. 15. Maximum Transient Thermal Impedance



Part Outline Drawing TO-247 (IXFH)



Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max
A	0.190	–	0.205	4.83	–	5.21
A1	0.090	–	0.100	2.29	–	2.54
A2	0.075	–	0.085	1.91	–	2.16
b	0.045	–	0.055	1.14	–	1.40
b2	0.075	–	0.087	1.91	–	2.20
b4	0.115	–	0.126	2.92	–	3.20
c	0.024	–	0.031	0.61	–	0.80
D	0.819	–	0.840	20.80	–	21.34
D1	0.650	–	0.690	16.51	–	17.53
D2	0.035	–	0.050	0.89	–	1.27
E	0.620	–	0.635	15.57	–	16.13
E1	0.545	–	0.565	13.84	–	14.35
e	0.215 BSC			5.45 BSC		
L	0.780	–	0.810	19.81	–	20.57
L1	0.150	–	0.170	3.81	–	4.32
ØP	0.140	–	0.144	3.55	–	3.65
ØP1	0.275	–	0.290	6.99	–	7.37
Q	0.220	–	0.244	5.59	–	6.20
R	0.170	–	0.190	4.62	–	4.83
S	0.242 BSC			6.15 BSC		

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