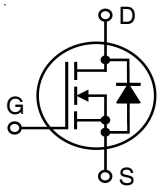
IXYS

X2-Class HiPerFET™ Power MOSFET

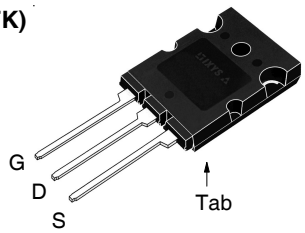
IXFK120N65X2
IXFX120N65X2

V_{DSS} = 650V
I_{D25} = 120A
$R_{DS(on)}$ ≤ 24mΩ

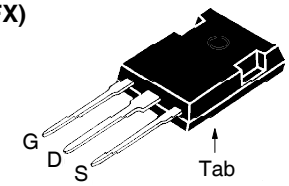
N-Channel Enhancement Mode
Avalanche Rated
Fast Intrinsic Diode



TO-264 (IXFK)



PLUS247 (IXFX)



G = Gate D = Drain
S = Source Tab = Drain

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	650	V
V_{DGR}	T_J = 25°C to 150°C, R_{GS} = 1MΩ	650	V
V_{GSS}	Continuous	± 30	V
V_{GSM}	Transient	± 40	V
I_{D25}	T_C = 25°C	120	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	240	A
I_A	T_C = 25°C	15	A
E_{AS}	T_C = 25°C	3.5	J
P_D	T_C = 25°C	1250	W
dv/dt	I_S ≤ I_{DM}, V_{DD} ≤ V_{DSS}, T_J ≤ 150°C	50	V/ns
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
M_d	Mounting Torque (TO-264)	1.13/10	Nm/lb.in
F_C	Mounting Force (PLUS247)	20..120 /4.5..27	N/lb
Weight	TO-264	10	g
	PLUS247	6	g

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{DSS}	V_{GS} = 0V, I_D = 3mA	650			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 8mA	3.5		5.0	V
I_{GSS}	V_{GS} = ± 30V, V_{DS} = 0V			± 100	nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0V			50	μA
	T_J = 125°C			5	mA
$R_{DS(on)}$	V_{GS} = 10V, I_D = 0.5 • I_{D25}, Note 1			24	mΩ

Features

- International Standard Packages
- Low 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

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Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max	
g_{fs}	V_{DS} = 10V, I_D = 0.5 • I_{D25}, Note 1	46	76		S
R_{Gi}	Gate Input Resistance		0.74		Ω
C_{iss}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz		14		nF
C_{oss}			8700		pF
C_{rss}			5.5		pF
	Effective Output Capacitance				
$C_{o(er)}$	Energy related; V_{GS} = 0V, V_{DS} = 0.8 • V_{DSS}		455		pF
$C_{o(tr)}$	Time related; V_{GS} = 0V, V_{DS} = 0.8 • V_{DSS}		1930		pF
$t_{d(on)}$	**Resistive Switching Times** V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}, R_G = 1Ω (External)		39		ns
t_r			26		ns
$t_{d(off)}$			82		ns
t_f			12		ns
$Q_{g(on)}$	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		240		nC
Q_{gs}			87		nC
Q_{gd}			65		nC
R_{thJC}				0.10	°C/W
R_{thCS}			0.15		°C/W

Source-Drain Diode

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
I_S	V_{GS} = 0V			120	A
I_{SM}	Repetitive, Pulse Width Limited by T_{JM}			480	A
V_{SD}	I_F = I_S , V_{GS} = 0V, Note 1			1.4	V
t_{rr}	I_F = 60A, -di/dt = 100A/μs, V_R = 100V, V_{GS} = 0V		220		ns
Q_{RM}			2.3		μC
I_{RM}			21.0		A

Note 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

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 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 = 25ºC

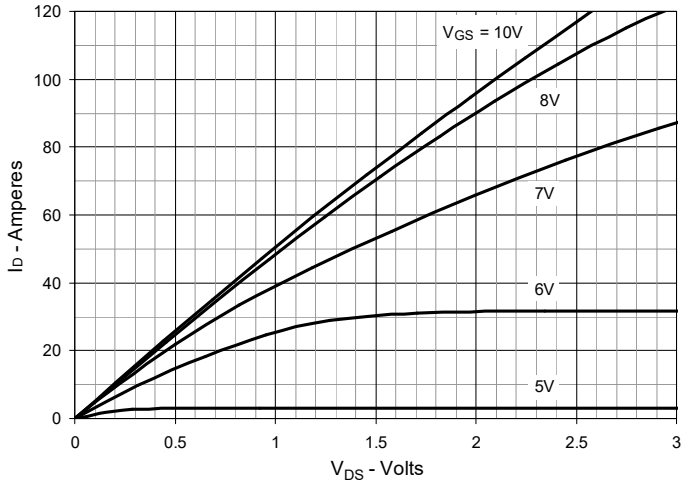

Fig. 2. Extended Output Characteristics @ T_J = 25ºC

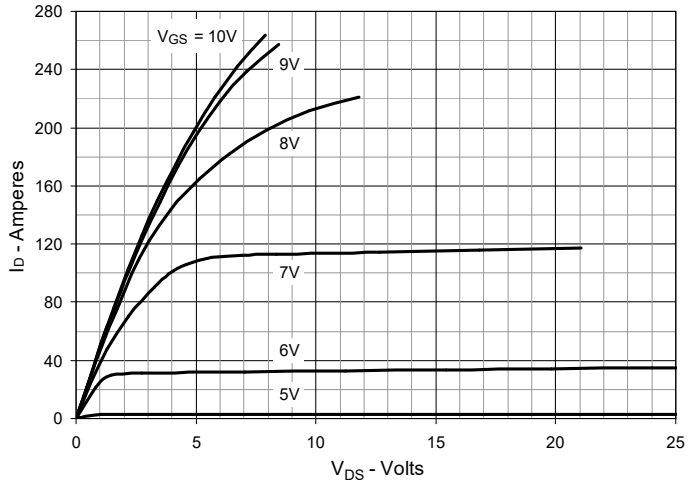

Fig. 3. Output Characteristics @ T_J = 125ºC

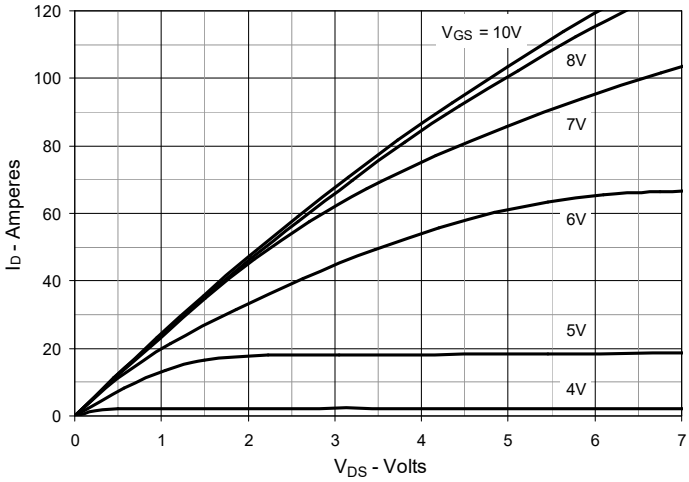

Fig. 4. $R_{DS(on)}$ Normalized to I_D = 60A Value vs. Junction Temperature

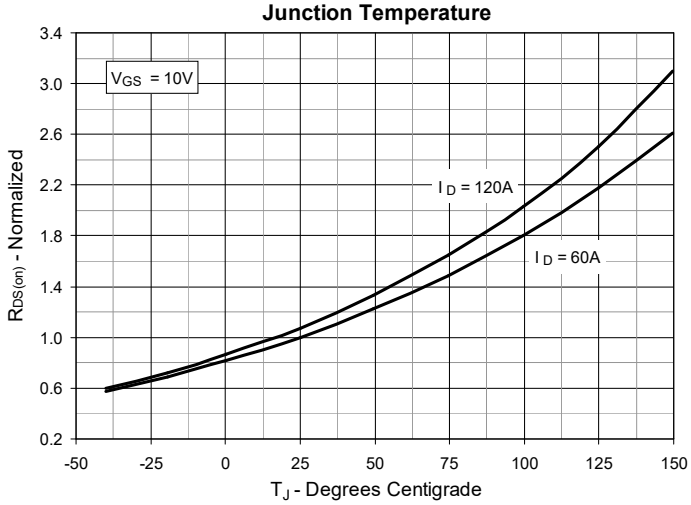

Fig. 5. $R_{DS(on)}$ Normalized to I_D = 60A Value vs. Drain Current

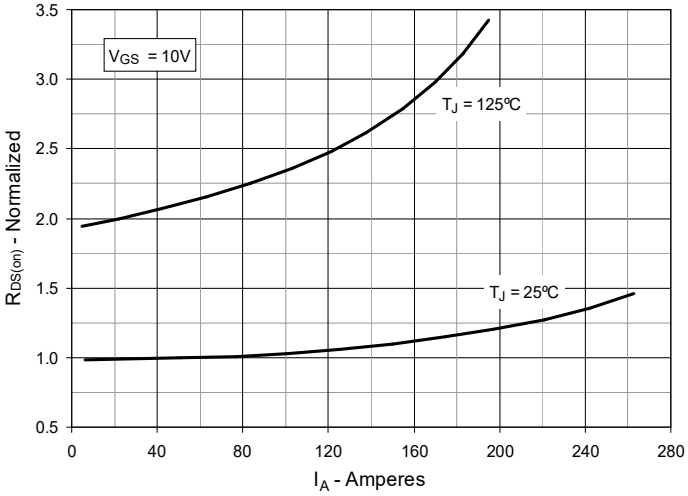

Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature

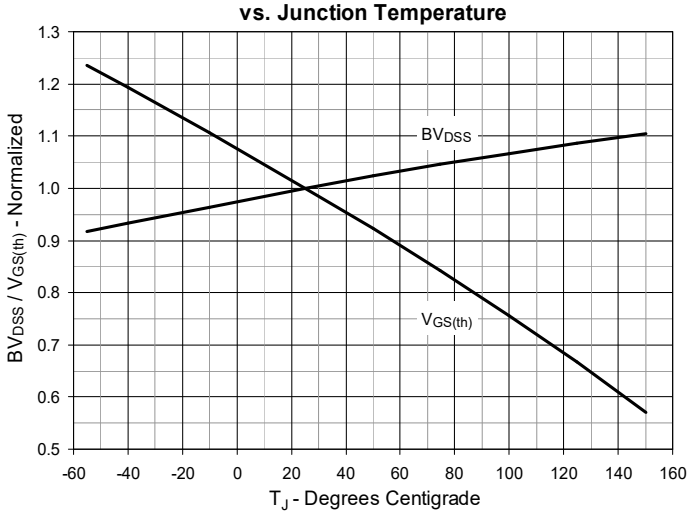

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Fig. 7. Maximum Drain Current vs. Case Temperature

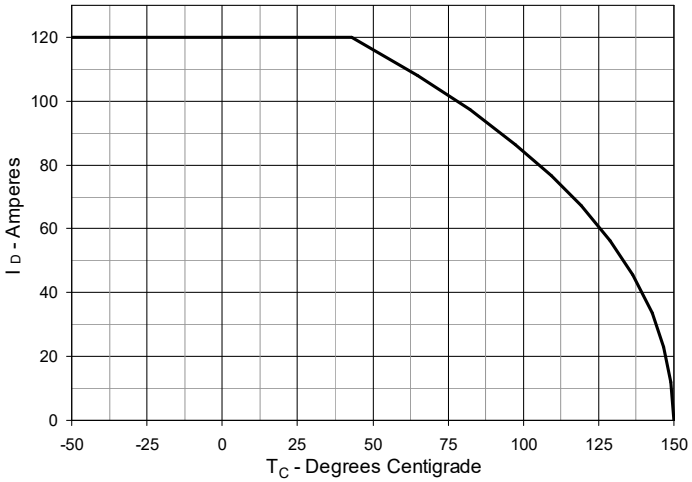

Fig. 8. Input Admittance

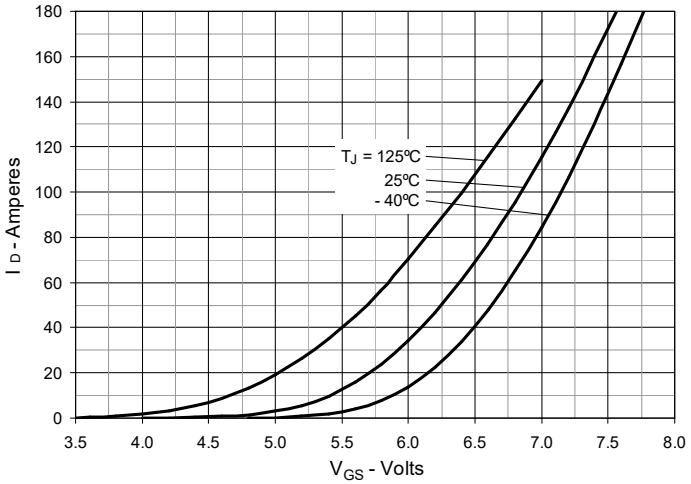

Fig. 9. Transconductance

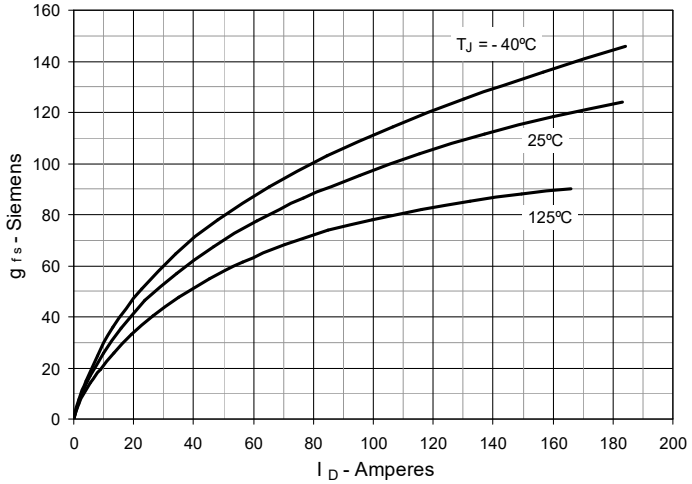

Fig. 10. Forward Voltage Drop of Intrinsic Diode

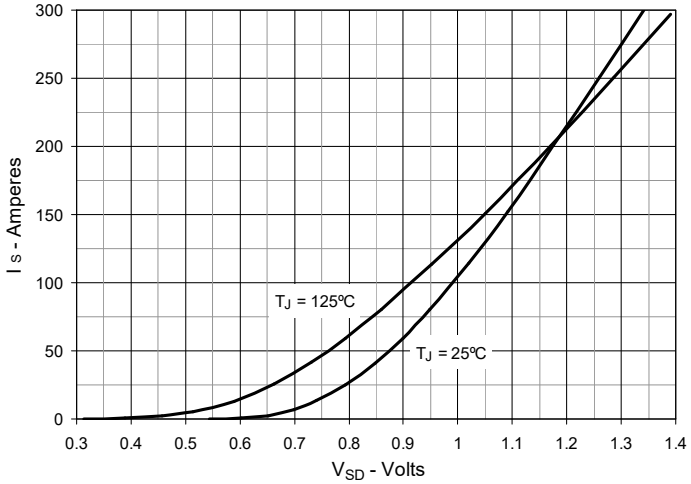

Fig. 11. Gate Charge

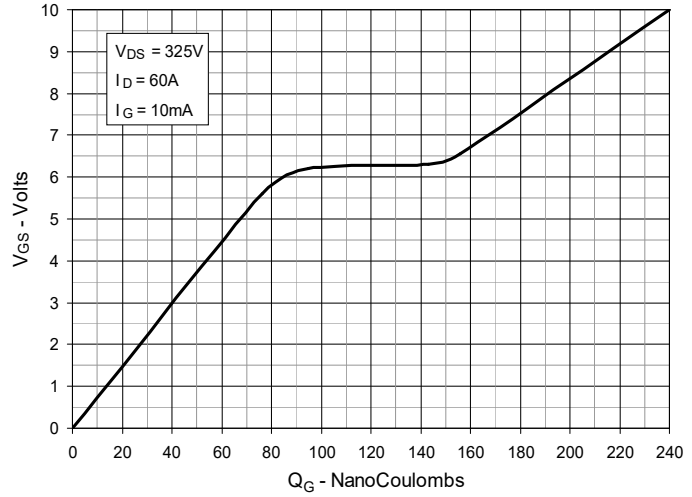

Fig. 12. Capacitance

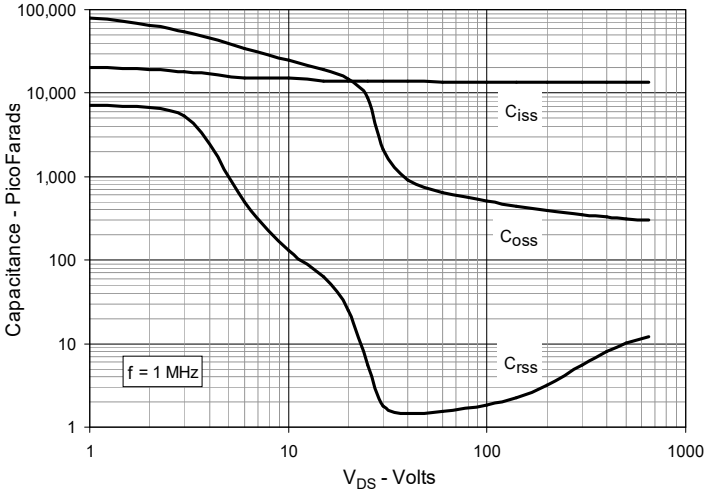

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Fig. 13. Output Capacitance Stored Energy

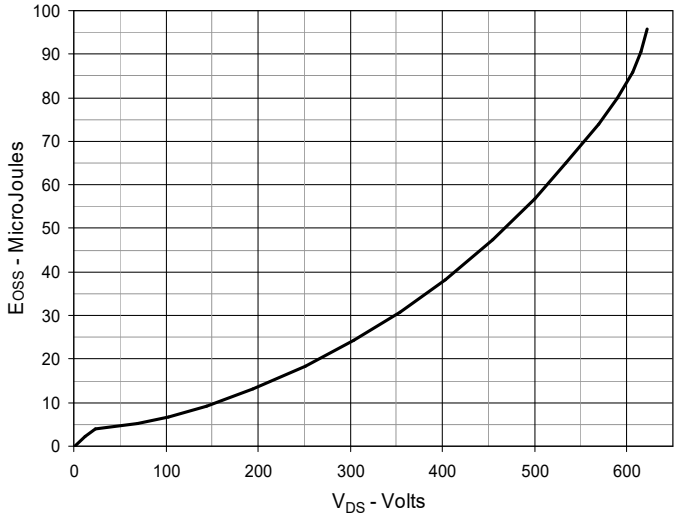


Fig. 14. Forward-Bias Safe Operating Area

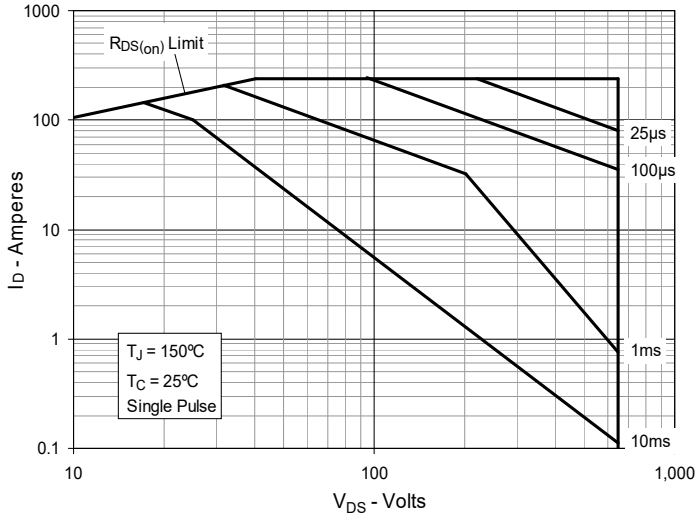
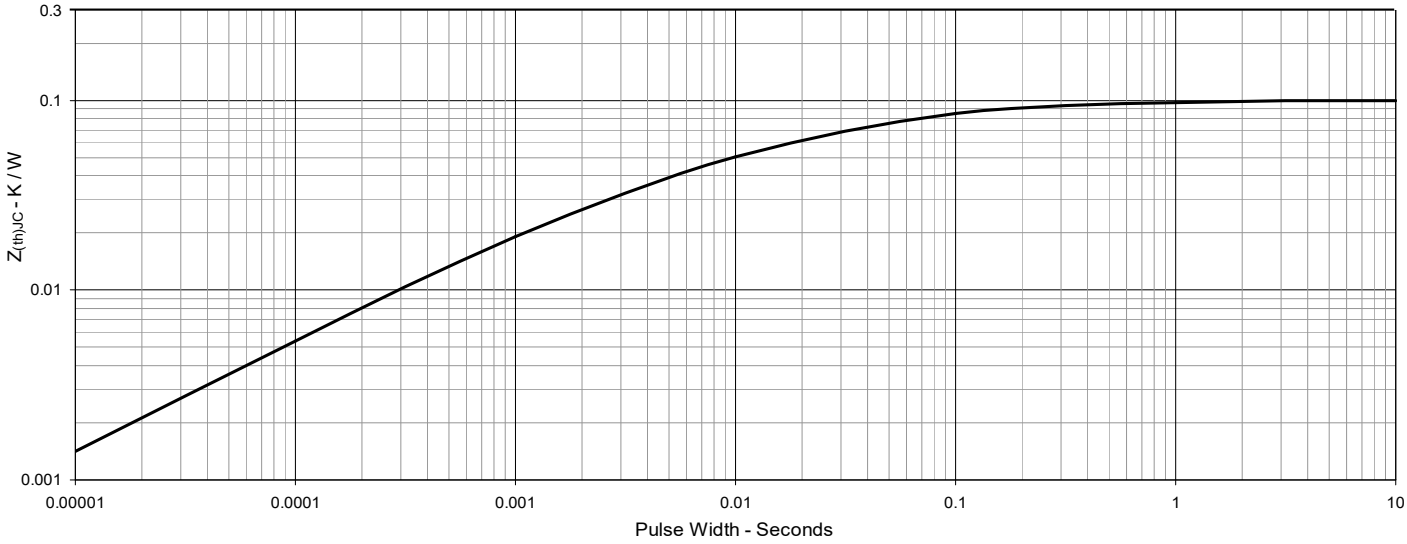


Fig. 15. Maximum Transient Thermal Impedance



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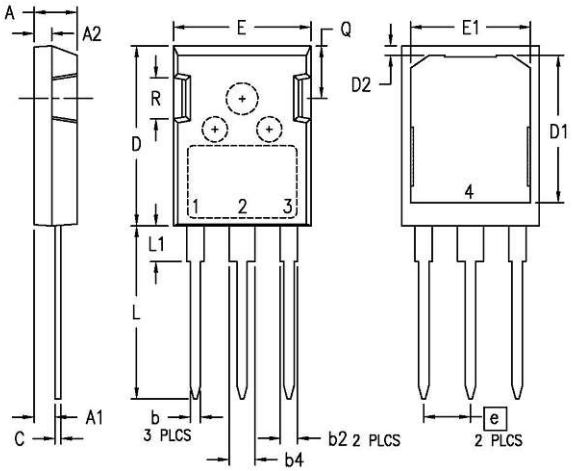
PLUS247 Outline

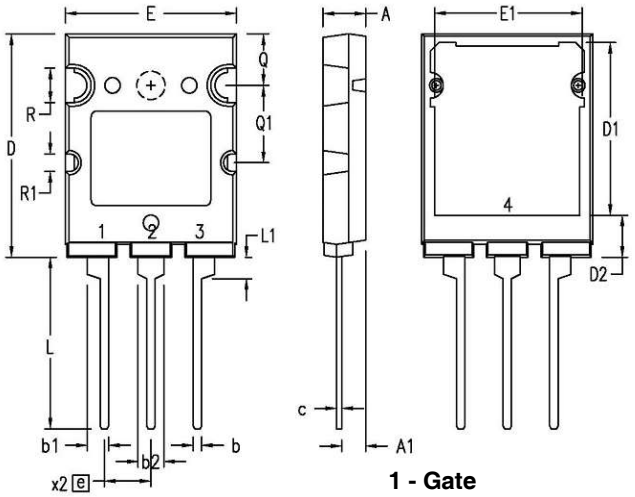


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	16.13
E1	.520	.560	13.08	14.22
e	.215 BSC		5.45 BSC	
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83

1 - Gate
2,4 - Drain
3 - Source

NOTE:
1. This drawing will meet all dimensions requirement of JEDEC outline TO-247 AD (R-PSIP-F3) except screw mounting hole.
2. Pin #2 is connected to the bottom heatsink (#4).
3. Lead finish – One of the following depending on the packaging plants.
   3.1 Matte pure tin plating on the leads and back heatsink.
   3.2 Pb free solder dip on the leads and pre Ni plated back heatsink.

TO-264 Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.209	4.70	5.30
A1	.102	.118	2.60	3.00
b	.035	.049	0.90	1.25
b1	.091	.106	2.30	2.70
b2	.110	.126	2.80	3.20
c	.020	.033	0.50	0.85
D	1.012	1.035	25.70	26.30
D1	.783	.799	19.90	20.30
D2	.185	.205	4.70	5.20
E	.776	.799	19.70	20.30
E1	.661	.677	16.80	17.20
e	.215 BSC		5.46 BSC	
L	.768	.807	19.50	20.50
L1	.091	.106	2.30	2.70
Q	.228	.244	5.80	6.20
Q1	.346	.362	8.80	9.20
øR	.150	.165	3.80	4.20
øR1	.071	.087	1.80	2.20

1 - Gate
2,4 - Drain
3 - Source

NOTE: Leads and back heatsink are Matte Pure Tin plated.

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