

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V _{DSS}	R _{DS(on)}	I _D
IRFZ40	50 V	< 0.028 Ω	50 A
IRFZ40FI	50 V	< 0.028 Ω	27 A

- TYPICAL R_{DS(on)} = 0.022 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRFZ40	IRFZ40FI	
V _{DS}	Drain-source Voltage (V _{GS} = 0)	50	50	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 kΩ)	50	50	V
V _{GS}	Gate-source Voltage	± 20		V
I _D	Drain Current (cont.) at T _c = 25 °C	50	27	A
I _D	Drain Current (cont.) at T _c = 100 °C	35	19	A
I _{DM} (•)	Drain Current (pulsed)	200	200	A
P _{tot}	Total Dissipation at T _c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V _{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T _{stg}	Storage Temperature	-65 to 175		°C
T _j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

IRFZ40/FI

THERMAL DATA

		TO-220	ISOWATT220		
R _{thj-case}	Thermal Resistance Junction-case	Max	1	3.33	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	62.5		°C/W
R _{thc-s}	Thermal Resistance Case-sink	Typ	0.5		°C/W
T _l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max, δ < 1%)	50	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 25 V)	400	mJ
E _{AR}	Repetitive Avalanche Energy (pulse width limited by T _j max, δ < 1%)	100	mJ
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (T _c = 100 °C, pulse width limited by T _j max, δ < 1%)	35	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA V _{GS} = 0	50			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating x 0.8 T _c = 125 °C			250 1000	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} I _D = 250 μA	2	2.9	4	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V I _D = 29 A		0.022	0.028	Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} x R _{DS(on)max} V _{GS} = 10 V	50			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} x R _{DS(on)max} I _D = 29 A	17	22		S
C _{iss}	Input Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		1700	2200	pF
C _{oss}	Output Capacitance			630	850	pF
C _{rss}	Reverse Transfer Capacitance			200	260	pF

ELECTRICAL CHARACTERISTICS (continued)
SWITCHING RESISTIVE LOAD

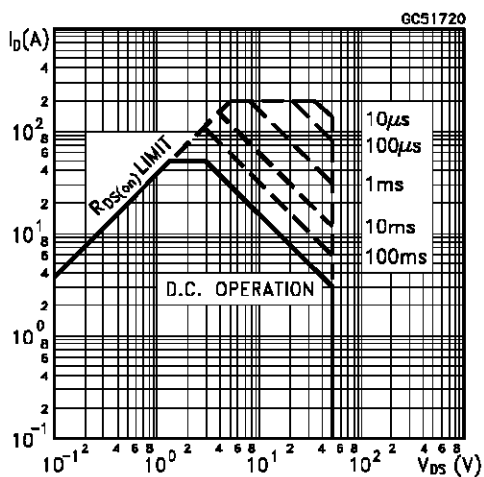
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 25\text{ V}$ $I_D = 29\text{ A}$		50	70	ns
t_r	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$		110	160	ns
$t_{d(off)}$	Turn-off Delay Time	(see test circuit)		60	90	ns
t_f	Fall Time			25	35	ns
Q_g	Total Gate Charge	$I_D = 64\text{ A}$ $V_{GS} = 10\text{ V}$		50	70	nC
Q_{gs}	Gate-Source Charge	$V_{DD} = \text{Max Rating} \times 0.8$		15		nC
Q_{gd}	Gate-Drain Charge	(see test circuit)		27		nC

SOURCE DRAIN DIODE

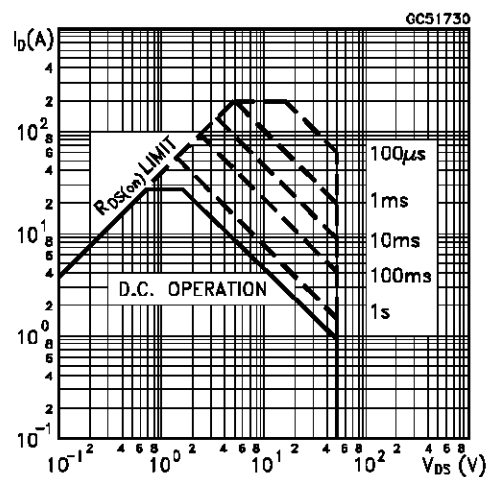
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				50	A
$I_{SDM(\bullet)}$	Source-drain Current (pulsed)				200	A
$V_{SD} (*)$	Forward On Voltage	$V_{GS} = 0$ $I_{SD} = 50\text{ A}$			2	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 50\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$		150		ns
Q_{rr}	Reverse Recovery Charge			0.45		μC

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %
 (•) Pulse width limited by safe operating area

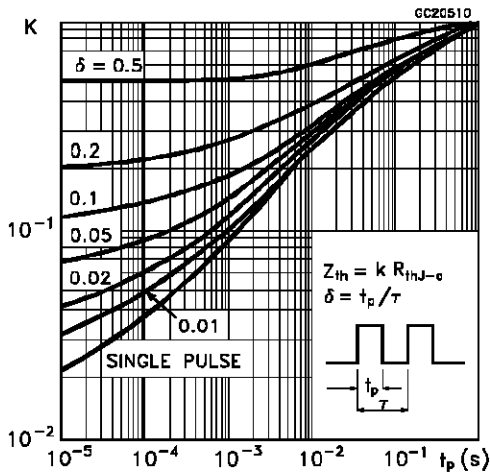
Safe Operating Area for TO-220



Safe Operating Area for ISOWATT220



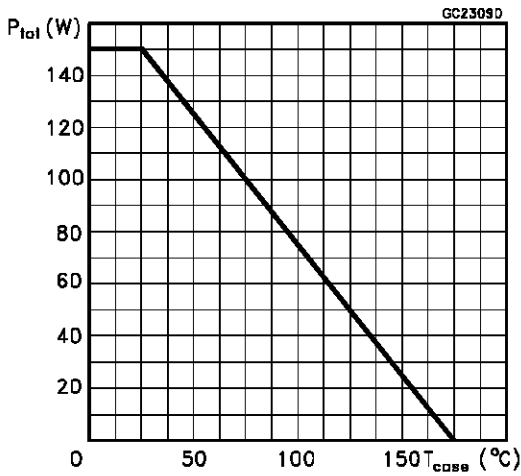
Thermal Impedance for TO-220



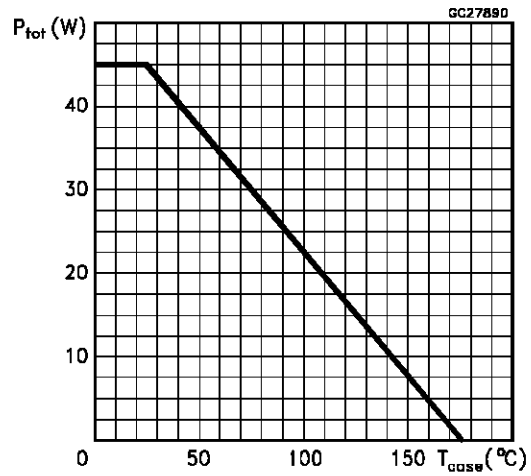
Thermal Impedance for ISOWATT220



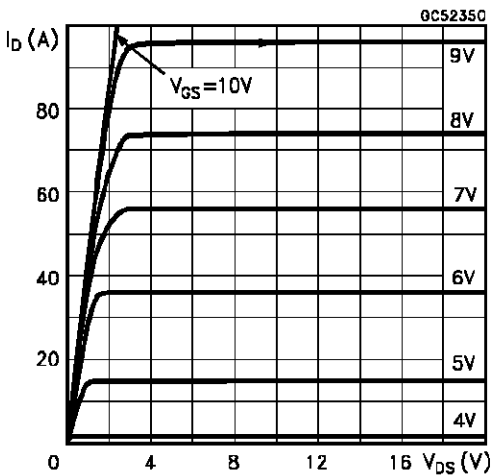
Derating Curve for TO-220



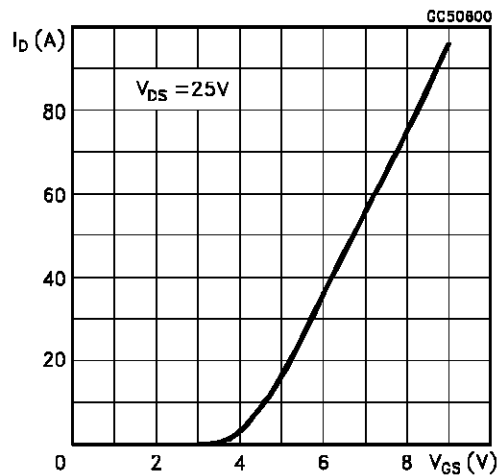
Derating Curve for ISOWATT220



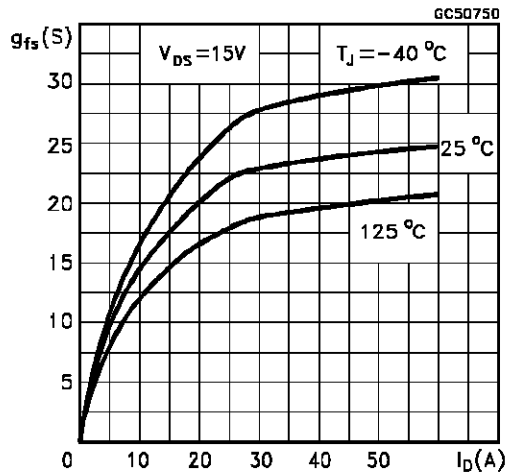
Output Characteristics



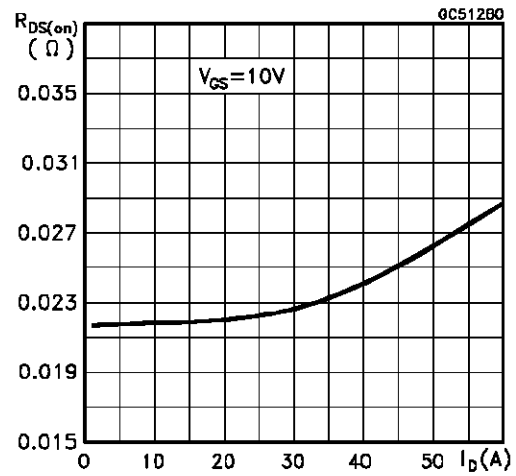
Transfer Characteristics



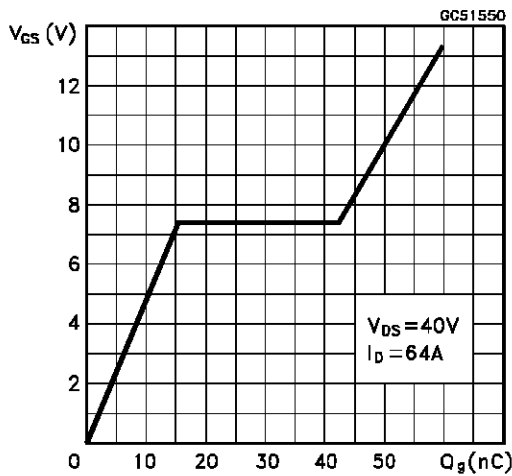
Transconductance



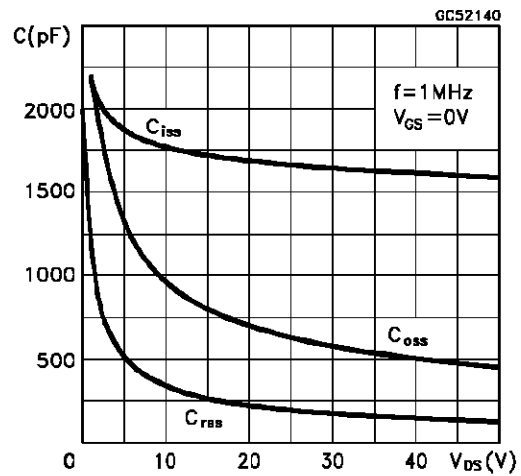
Static Drain-source On Resistance



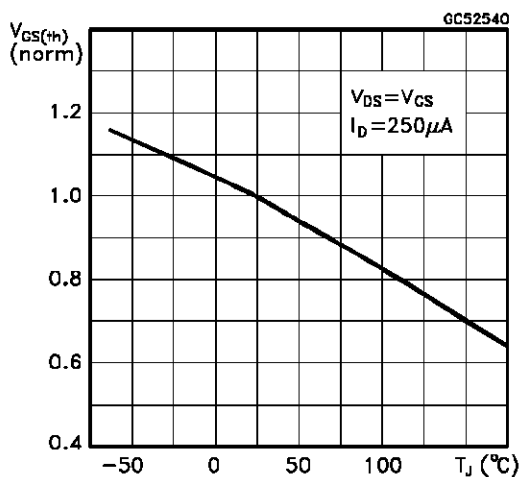
Gate Charge vs Gate-source Voltage



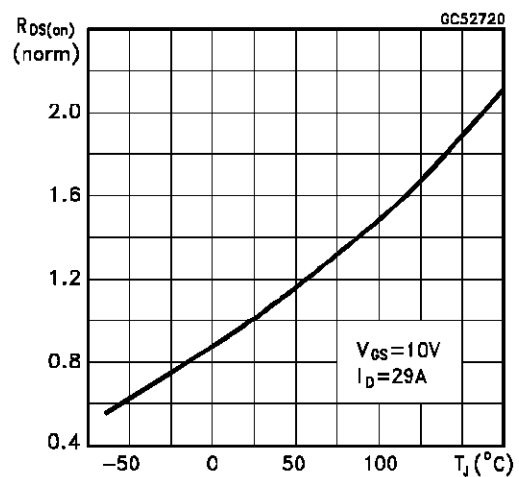
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature

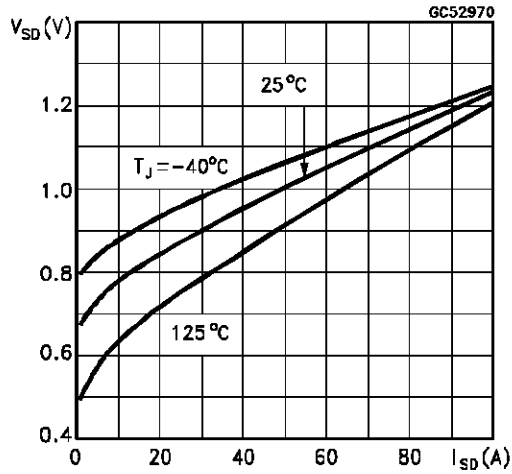


Normalized On Resistance vs Temperature

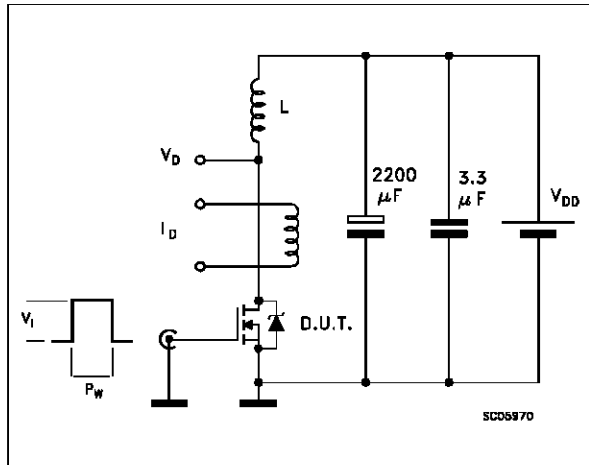


IRFZ40/FI

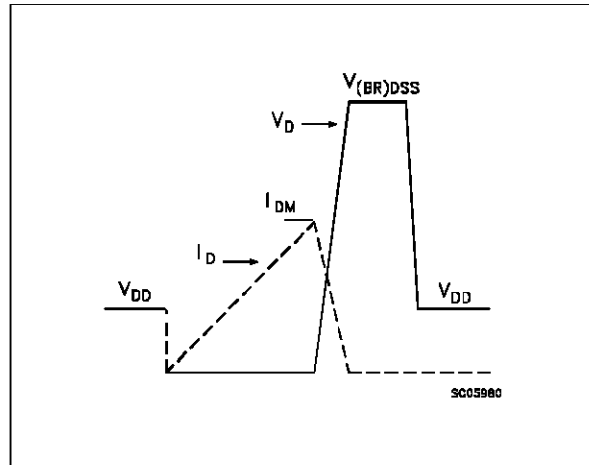
Source-drain Diode Forward Characteristics



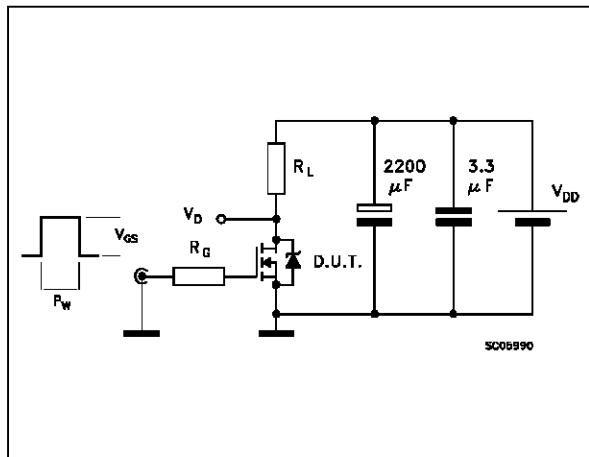
Unclamped Inductive Load Test Circuit



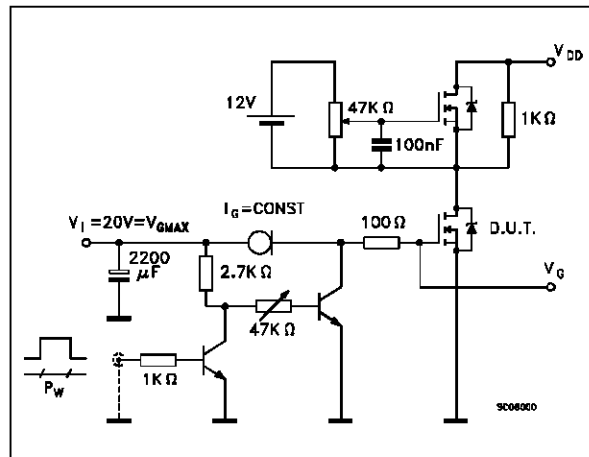
Unclamped Inductive Waveforms



Switching Time Test Circuit

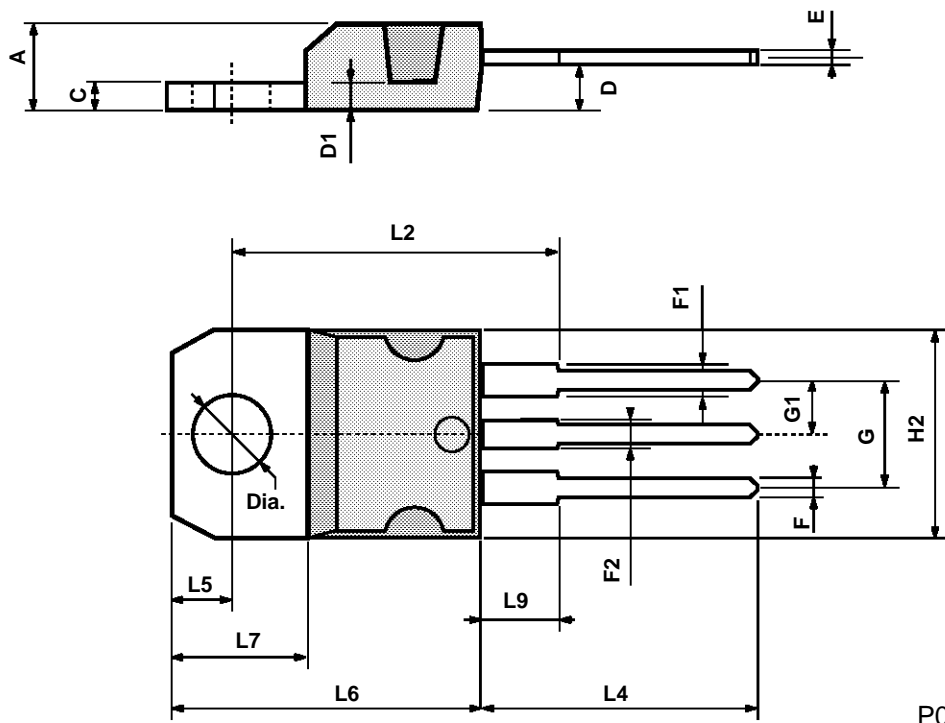


Gate Charge Test Circuit



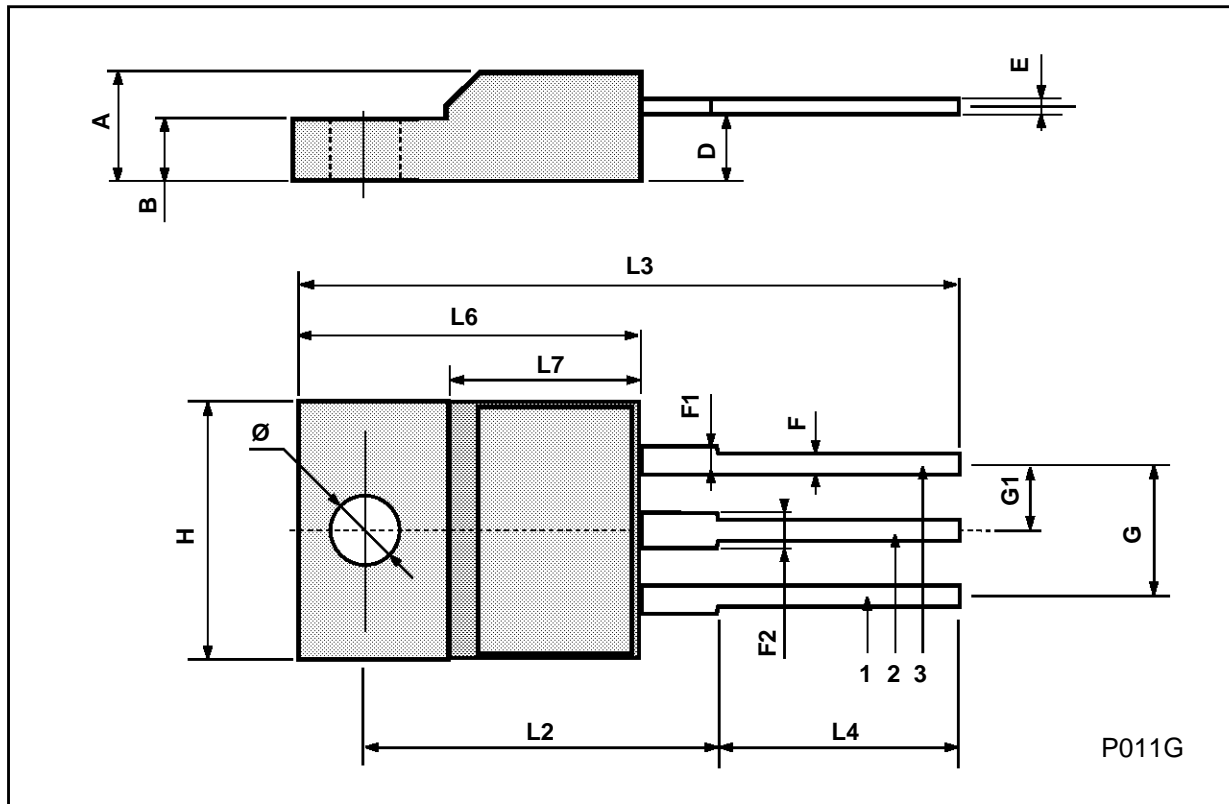
TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



ISOWATT220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.4		0.7	0.015		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
∅	3		3.2	0.118		0.126



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