

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

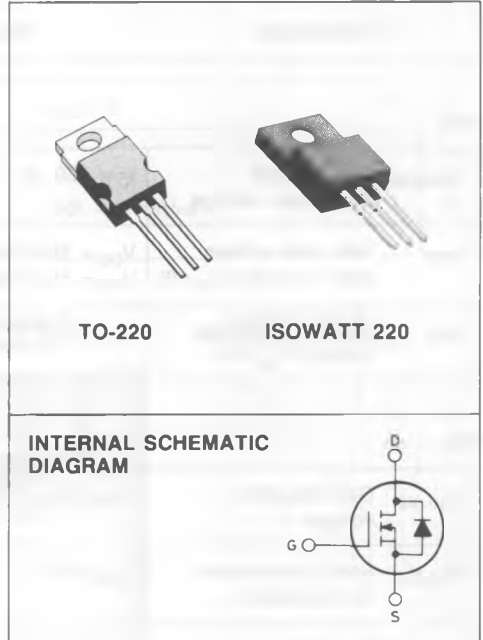
TYPE	V _{DSS}	R _{DS(on)}	I _D [■]
BUZ11	50 V	0.04 Ω	30 A
BUZ11FI	50 V	0.04 Ω	20 A

- HIGH SPEED SWITCHING
- VERY LOW ON-LOSSES
- LOW DRIVE ENERGY FOR EASY DRIVE
- HIGH TRANSCONDUCTANCE/C_{rSS} RATIO

INDUSTRIAL APPLICATIONS:

- AUTOMOTIVE POWER ACTUATORS

N - channel enhancement mode POWER MOS field effect transistors. Easy drive and very fast switching times make these POWER MOS transistors ideal for high speed switching circuits in applications such as power actuator driving, motor drive including brushless motors, hydraulic actuators and many other uses in automotive applications. They also find use in DC/DC converters and uninterruptible power supplies.



ABSOLUTE MAXIMUM RATINGS

V _{DS}	Drain-source voltage (V _{GS} = 0)	50	V
V _{DGR}	Drain-gate voltage (R _{GS} = 20 KΩ)	50	V
V _{GS}	Gate-source voltage	± 20	V
I _{DM}	Drain current (pulsed) T _c = 25°C	120	A
I _D [■]	Drain current (continuous) T _c = 30°C	BUZ 11 30	BUZ11FI 20 A
P _{tot} [■]	Total dissipation at T _c < 25°C	75	35 W
T _{stg}	Storage temperature	- 55 to 150 °C	
T _j	Max. operating junction temperature	150 °C	
	DIN humidity category (DIN 40040)	E	
	IEC climatic category (DIN IEC 68-1)	55/150/56	

■ See note on ISOWATT 220 in this datasheet

THERMAL DATA *

TO-220 | ISOWATT 220

$R_{thj - case}$	Thermal resistance junction-case	max	1.67	3.57	°C/W
$R_{thj - amb}$	Thermal resistance junction-ambient	max	75		°C/W

ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Parameters	Test Conditions	Min.	Typ.	Max.	Unit
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OFF

$V_{(BR) DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu\text{A}$	$V_{GS} = 0$	50		V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$	$V_{DS} = \text{Max Rating}$			250 μA 1000 μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 \text{ V}$				± 100 nA

ON

$V_{GS (th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$	$I_D = 1 \text{ mA}$	2.1		4 V
$R_{DS (on)}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}$	$I_D = 15 \text{ A}$			0.04 Ω

DYNAMIC

g_{fs}	Forward transconductance	$V_{DS} = 25 \text{ V}$	$I_D = 15 \text{ A}$	4		mho
C_{iss}	Input capacitance	$V_{DS} = 25 \text{ V}$ $V_{GS} = 0$	$f = 1 \text{ MHz}$			2000 pF
C_{oss}	Output capacitance					1100 pF
C_{rss}	Reverse transfer capacitance					400 pF

SWITCHING

$t_{d (on)}$	Turn-on time	$V_{DD} = 30 \text{ V}$	$I_D = 3 \text{ A}$			45 ns
t_r	Rise time	$R_{GS} = 50 \Omega$	$V_{GS} = 10 \text{ V}$			110 ns
$t_{d (off)}$	Turn-off delay time					230 ns
t_f	Fall time					170 ns

* See note on ISOWATT 220 in this datasheet

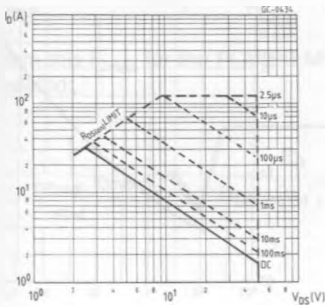
ELECTRICAL CHARACTERISTICS (Continued)

Parameters	Test Conditions	Min.	Typ.	Max.	Unit
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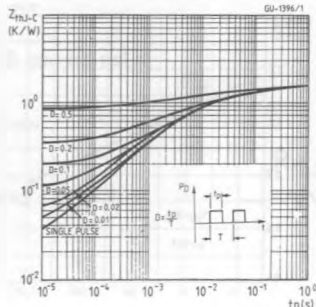
SOURCE DRAIN DIODE

I_{SD} I_{SDM}	Source-drain current Source-drain current (pulsed)	$T_c = 25^\circ\text{C}$		30 120	A A
V_{SD}	Forward on voltage	$I_{SD} = 60\text{ A}$	$V_{GS} = 0$	2.6	V
t_{rr}	Reverse recovery time			200	ns
Q_{rr}	Reverse recovered charge	$I_{SD} = 30\text{ A}$	$di/dt = 100\text{A}/\mu\text{s}$	0.25	μC

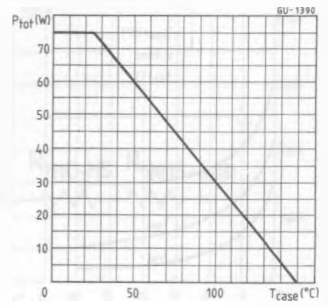
Safe operating areas (standard package)



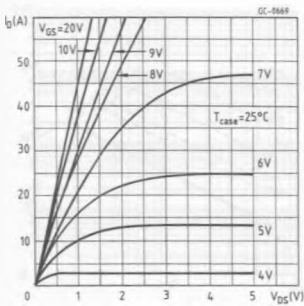
Thermal impedance (standard package)



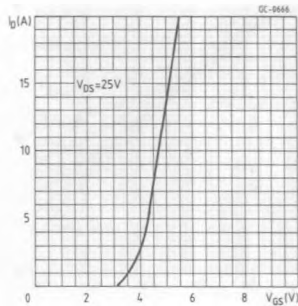
Derating curve (standard package)



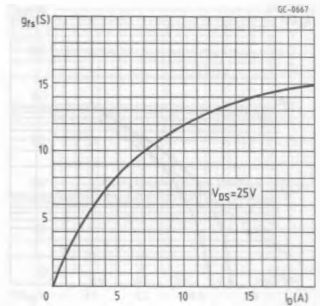
Output characteristics



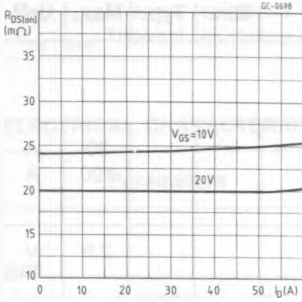
Transfer characteristics



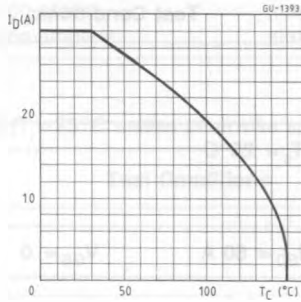
Transconductance



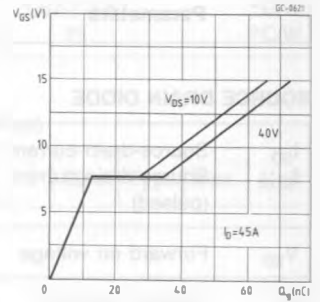
Static drain-source on resistance



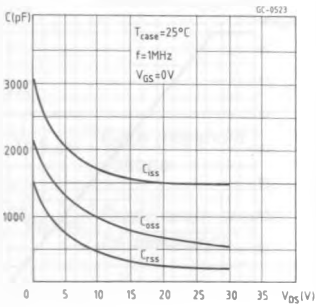
Maximum drain current vs temperature



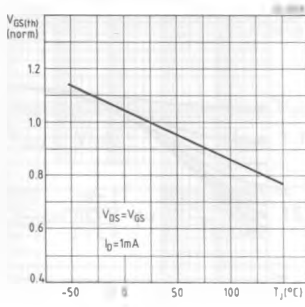
Gate charge vs gate-source voltage



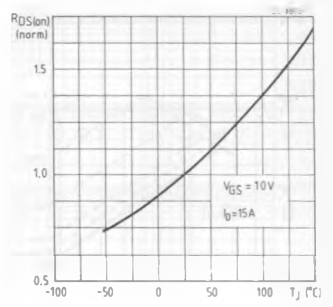
Capacitance variation



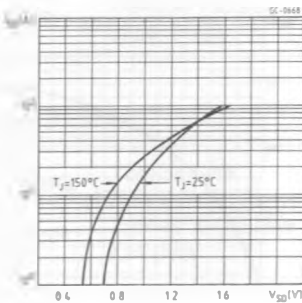
Gate threshold voltage vs temperature



Drain-source on resistance vs temperature



Source-drain diode forward characteristics



ISOWATT220 PACKAGE CHARACTERISTICS AND APPLICATION.

ISOWATT220 is fully isolated to 2000V dc. Its thermal impedance, given in the data sheet, is optimized to give efficient thermal conduction together with excellent electrical isolation.

The structure of the case ensures optimum distances between the pins and heatsink. The ISOWATT220 package eliminates the need for external isolation so reducing fixing hardware. Accurate moulding techniques used in manufacture assure consistent heat spreader-to-heatsink capacitance.

ISOWATT220 thermal performance is better than that of the standard part, mounted with a 0.1mm mica washer. The thermally conductive plastic has a higher breakdown rating and is less fragile than mica or plastic sheets. Power derating for ISOWATT220 packages is determined by:

$$P_D = \frac{T_J - T_C}{R_{th}}$$

from this I_{Dmax} for the POWER MOS can be calculated:

$$I_{Dmax} \leq \sqrt{\frac{P_D}{R_{DS(on)} \text{ (at } 150^\circ\text{C)}}}$$

THERMAL IMPEDANCE OF ISOWATT220 PACKAGE

Fig. 1 illustrates the elements contributing to the thermal resistance of transistor heatsink assembly, using ISOWATT220 package.

The total thermal resistance $R_{th (tot)}$ is the sum of each of these elements.

The transient thermal impedance, Z_{th} for different pulse durations can be estimated as follows:

1 - for a short duration power pulse less than 1ms;

$$Z_{th} < R_{thJ-C}$$

2 - for an intermediate power pulse of 5ms to 50ms:

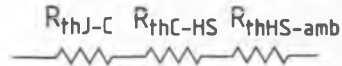
$$Z_{th} = R_{thJ-C}$$

3 - for long power pulses of the order of 500ms or greater:

$$Z_{th} = R_{thJ-C} + R_{thC-HS} + R_{thHS-amb}$$

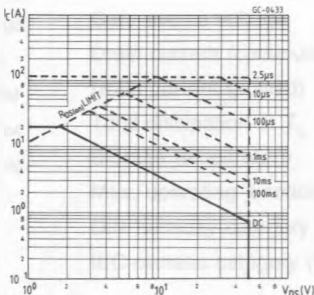
It is often possible to discern these areas on transient thermal impedance curves.

Fig. 1

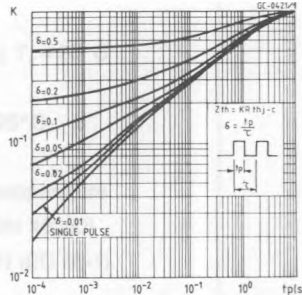


ISOWATT DATA

Safe operating areas



Thermal impedance



Derating curve

