SGS-THOMSON MICROELECTRONICS

BUZ11S2
BUZ11S2FI

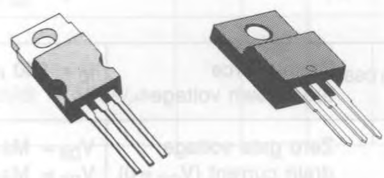
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D ▪
BUZ11S2	60 V	0.04 Ω	30 A
BUZ11S2FI	60 V	0.04 Ω	20 A

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

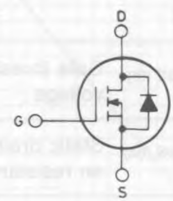
INDUSTRIAL APPLICATIONS:
- AUTOMATIVE POWER ACTUATORS

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.



TO-220 **ISOWATT 220**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

V_{DS}	Drain-source voltage ($V_{GS} = 0$)	60		V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20$ KΩ)	60		V
V_{GS}	Gate-source voltage	± 20		V
I_{DM}	Drain current (pulsed) $T_c = 25°C$	120		A
		BUZ11S2	**BUZ11S2FI**	
I_D ▪	Drain current (continuous) $T_c = 30°C$	30	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	ISOWATT220	
$R_{thj-case}$	Thermal resistance junction-case	max	1.67	3.57	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	max	75		°C/W

ELECTRICAL CHARACTERISTICS ($T_j = 25°C$ unless otherwise specified)

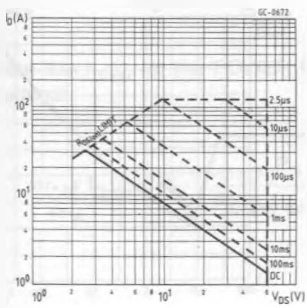
Parameters		Test Conditions		Min.	Typ.	Max.	Unit
OFF							
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu A$	$V_{GS} = 0$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating	 $T_j = 125°C$			250 1000	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V				± 100	nA
ON							
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$	$I_D = 1$ mA	2.1		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10$ V	$I_D = 15$ A			0.04	Ω
DYNAMIC							
g_{fs}	Forward transconductance	$V_{DS} = 25$ V	$I_D = 15$ A	4			mho
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25$ V $V_{GS} = 0$	f = 1 MHz			2000 1100 400	pF pF pF
SWITCHING							
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on time Rise time Turn-off delay time Fall time	$V_{DD} = 30$ V $R_{GS} = 50\ \Omega$	$I_D = 3$ A $V_{GS} = 10$ V			45 110 230 170	ns ns ns ns

■ See note on ISOWATT 220 in this datasheet

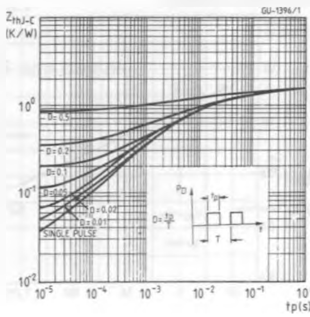
ELECTRICAL CHARACTERISTICS (Continued)

Parameters		Test Conditions		Min.	Typ.	Max.	Unit
SOURCE DRAIN DIODE							
I_{SD} I_{SDM}	Source-drain current Source-drain current (pulsed)	$T_c = 25°C$				30 120	A A
V_{SD}	Forward on voltage	$I_{SD} = 60$ A	$V_{GS} = 0$			2.6	V
t_{rr} Q_{rr}	Reverse recovery time Reverse recovered charge	$I_{SD} = 30$ A	di/dt = 100A/μs		200 0.25		ns μC

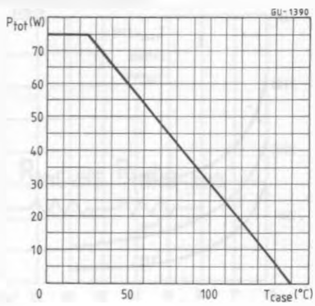
Safe operating areas (standard package)



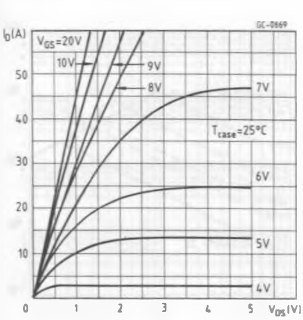
Thermal impedance (standard package)



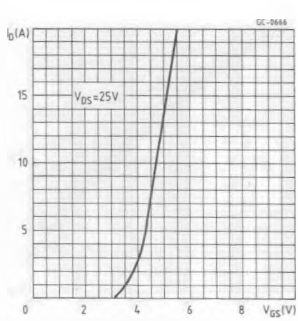
Derating curve (standard package)



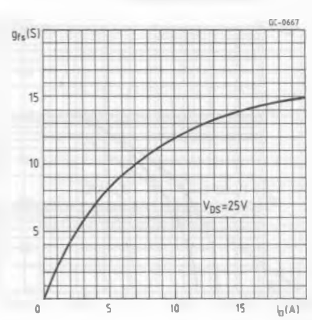
Output characteristics



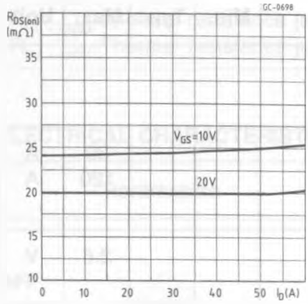
Transfer characteristics



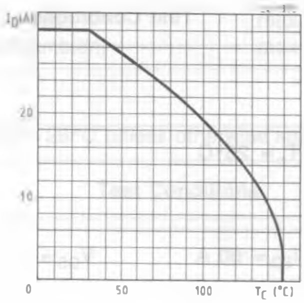
Transconductance



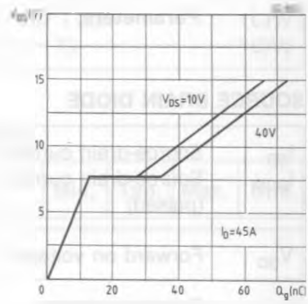
Static drain-source on resistance



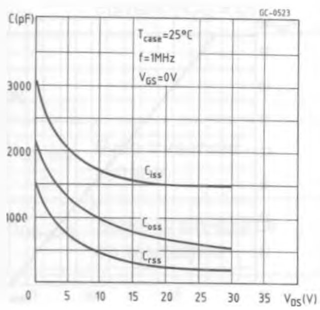
Maximum drain current vs temperature



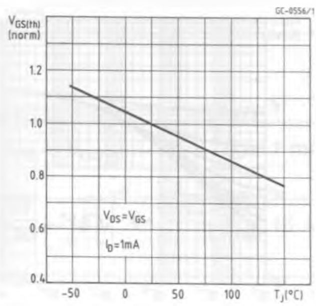
Gate charge vs gate-source voltage



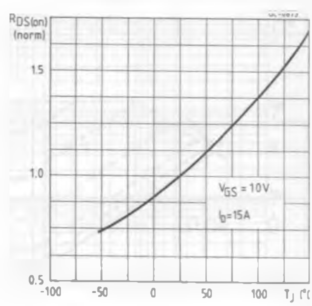
Capacitance variation



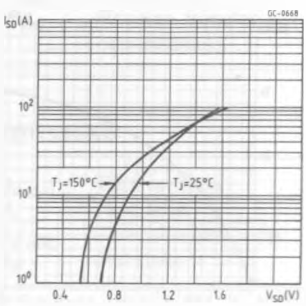
Gate threshold voltage vs temperature



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 optimised 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 the 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:

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

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;

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

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

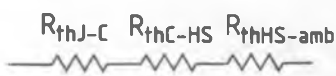
$$Z_{th} = R_{thJ\text{-}C}$$

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

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

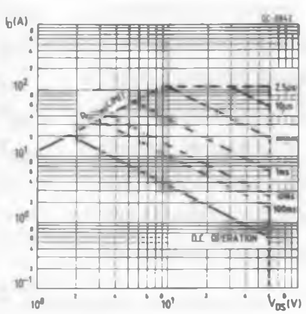
It is often possibile to discern these areas on transient thermal impedance curves.

Fig. 1

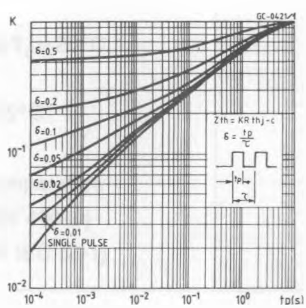


ISOWATT DATA

Safe operating areas



Thermal impedance



Derating curve