SGS-THOMSON
MICROELECTRONICS

MTP3N60
MTP3N60FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

PRELIMINARY DATA

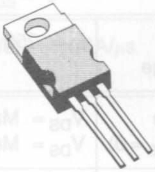
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
MTP3N60	600 V	2.5 Ω	3 A
MTP3N60FI	600 V	2.5 Ω	2.5 A

- HIGH VOLTAGE FOR OFF-LINE APPLICATIONS
- ULTRA FAST SWITCHING TIMES FOR OPERATION AT > 100KHz
- EASY DRIVE FOR REDUCED COST AND SIZE

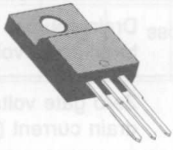
INDUSTRIAL APPLICATIONS

- SWITCHING POWER SUPPLIES

N - channel enhancement mode POWER MOS field effect transistors. Easy drive and fast switching times make these POWER MOS ideal for very high speed switching applications. Typical uses include SMPS and uninterruptible power supplies.

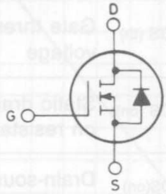


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

V_{DS}	Drain-source voltage ($V_{GS} = 0$)	600		V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20\ K\Omega$)	600		V
V_{GS}	Gate-source voltage	± 20		V
		TO-220	ISOWATT220	
I_D	Drain current (cont.) at $T_c = 25°C$	3	2.5	A
I_{DM}	Drain current (pulsed)	10	10	A
P_{tot}	Total dissipation at $T_c < 25°C$	75	35	W
	Derating factor	0.6	0.28	W/°C
T_{stg}	Storage temperature	– 65 to 150		°C
T_j	Max. operating junction temperature	150		°C

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	62.5		°C/W

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

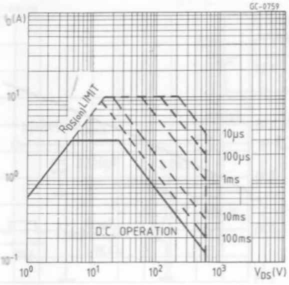
	Parameters	Test Conditions	Min.	Typ.	Max.	Unit
OFF						
$V_{(BR)\ DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	600			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125°C$			200 1000	µA µA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\ V$			±100	nA
ON						
$V_{GS\ (th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ $I_D = 1\ mA$ $V_{DS} = V_{GS}$ $I_D = 1\ mA$ $T_c = 100°C$	2 1.5		4.5 4	V V
$R_{DS\ (on)}$	Static drain-source on resistance	$V_{GS} = 10\ V$ $I_D = 1.5\ A$			2.5	Ω
$V_{DS(on)}$	Drain-source on voltage	$V_{GS} = 10\ V$ $I_D = 3\ A$ $V_{GS} = 10\ V$ $I_D = 1.5\ A$ $T_c = 100°C$			9 7.5	V V
DYNAMIC						
g_{fs}	Forward transconductance	$V_{DS} = 15\ V$ $I_D = 1.5\ A$	1.5			mho
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\ V$ $f = 1\ MHz$ $V_{GS} = 0$			1000 300 80	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	$V_{DD} = 25\ V$ $I_D = 1.5\ A$ $R_i = 50\ \Omega$ $V_i = 10\ V$			50 100 180 80	ns ns ns ns

ELECTRICAL CHARACTERISTICS (Continued)

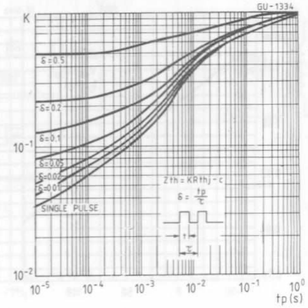
SOURCE DRAIN DIODE

Parameters		Test Conditions		Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain current Source-drain current (pulsed)					3 10	A A
V_{SD}	Forward on voltage	$I_{SD} = 3$ A	$V_{GS} = 0$		1.1		V
t_{rr}	Reverse recovery time	$I_{SD} = 3$ A	di/dt = 100A/μs		165		ns

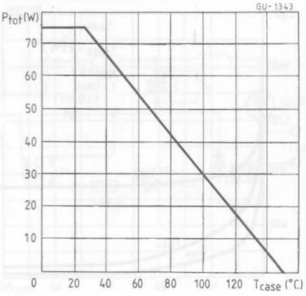
Safe operating areas (standard package)



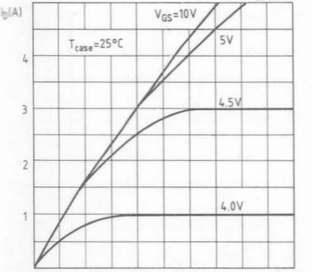
Thermal impedance (standard package)



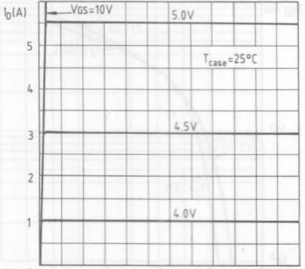
Derating curve (standard package)



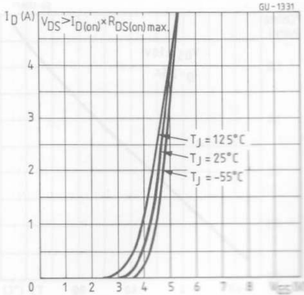
Output characteristics



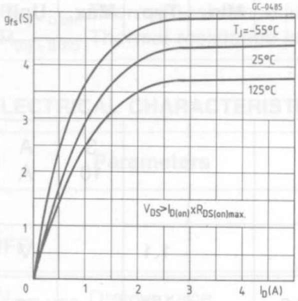
Output characteristics



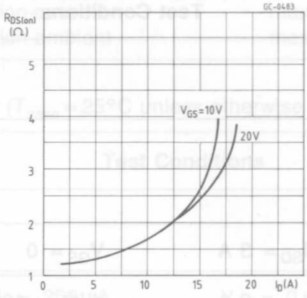
Transfer characteristics



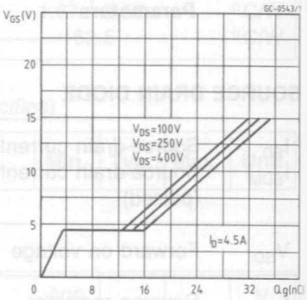
Transconductance



Static drain-source on resistance



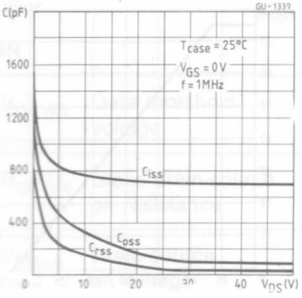
Gate charge vs gate-source voltage

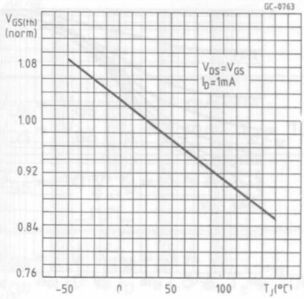


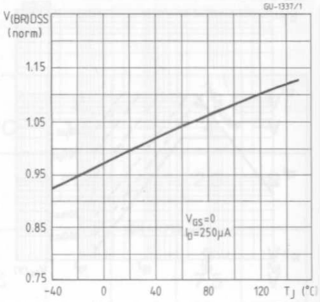
Capacitance variation

Normalized gate threshold voltage vs temperature

Normalized breakdown voltage vs temperature

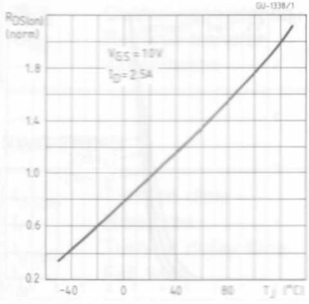


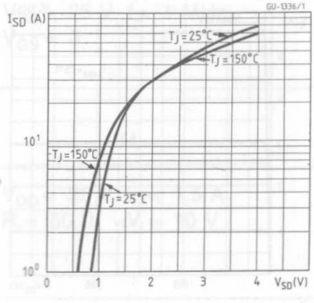




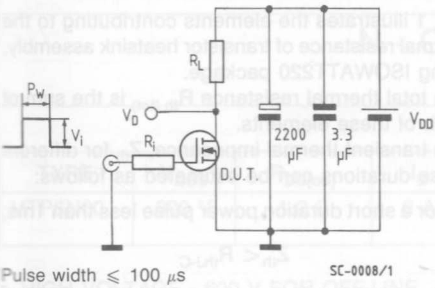
Normalized on resistance vs temperature

Source-drain diode forward characteristics



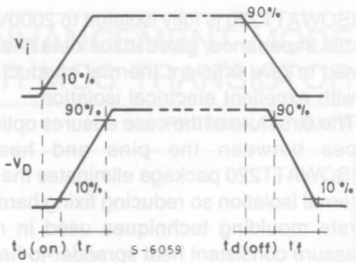


Switching times test circuit for resistive load

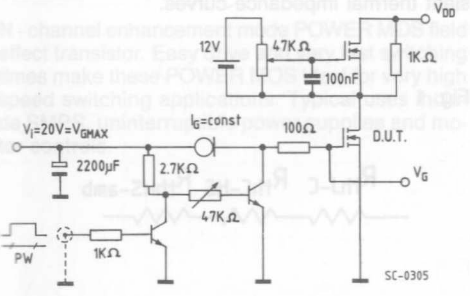


Pulse width ≤ 100 µs
Duty cycle ≤ 2%

Switching time waveforms for resistive load

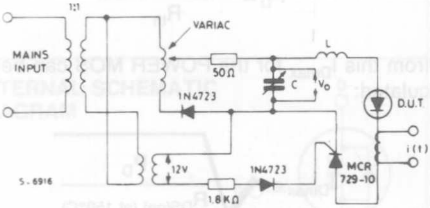


Gate charge test circuit



PW adjusted to obtain required V_G

Body-drain diode t_{rr} measurement Jedec test circuit



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 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:

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

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:

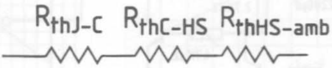
$$Z_{th} = R_{thJ\text{-}C}$$

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

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

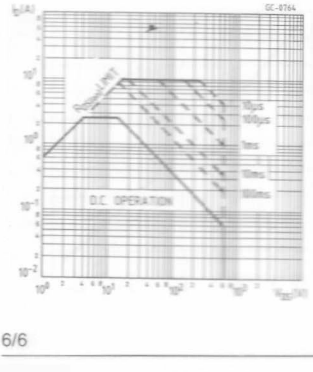
It is often possibile to discern these areas on transient thermal impedance curves.

Fig. 1

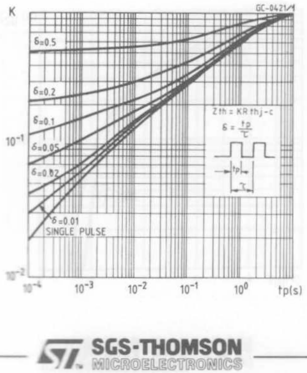


ISOWATT DATA

Safe operating areas



Thermal impedance



Derating curve