SGS-THOMSON MICROELECTRONICS

MTP3055A
MTP3055AFI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

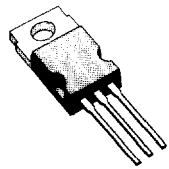
TYPE	V_{DSS}	$R_{DS(on)}$	I_D ■
MTP3055A	60 V	0.15 Ω	12 A
MTP3055AFI	60 V	0.15 Ω	10 A

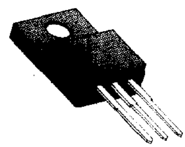
- ULTRA FAST SWITCHING - UP TO > 100KHz
- LOW DRIVE ENERGY FOR EASY DRIVE REDUCES SIZE AND COST
- INTEGRAL SOURCE - DRAIN DIODE

INDUSTRIAL APPLICATIONS:

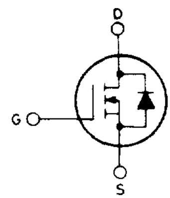
- GENERAL PURPOSE SWITCH
- SERIES REGULATOR

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


TO-220


ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

	TO-220 / ISOWATT220	MTP3055A / MTP3055AFI		
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)	26		A
I_{GM}	Gate current (pulsed)	1.5		A
		TO-220	**ISOWATT220**	
I_D ■	Drain current (continuous)	12	10	A
P_{tot} ■	Total dissipation at $T_c < 25$°C	40	30	W
■	Derating factor	0.32	0.24	W/°C
T_{stg}	Storage temperature	−65 to 150		°C
T_j	Max. operating junction temperature	150		°C

■ See note on ISOWATT220 in this datasheet

THERMAL DATA *

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal resistance junction-case	max	3.12	4.16	°C/W
T_l	Maximum lead temperature for soldering purpose	max	275		°C

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

OFF

Parameters		Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 250 μA V_{GS} = 0	60			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			50 1000	μA μA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ±20 V			±100	nA

ON *

Parameters		Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	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 = 6 A		0.15	Ω	
$V_{DS(on)}$	Drain-source on voltage	V_{GS} = 10 V I_D = 12 A V_{GS} = 10 V I_D = 6 A V_{GS} = 10 V I_D = 6 A T_c = 100°C			2.0 0.9 1.5	V V V

DYNAMIC

Parameters		Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} *	Forward transconductance	V_{DS} = 10 V I_D = 6 A	4.5			mho
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0			500 200 100	pF pF pF
Q_g	Total gate charge	V_{DS} = 48 V I_D = 12A V_{GS} = 10 V			17	nC

SWITCHING

Parameters		Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on time Rise time *Turn-off delay time* Fall time	V_{DD} = 25 V I_D = 6 A R_{gen} = 50 Ω			20 60 65 65	ns ns ns ns

ELECTRICAL CHARACTERISTICS (Continued)

Parameters	Test Conditions	Min.	Typ.	Max.	Unit

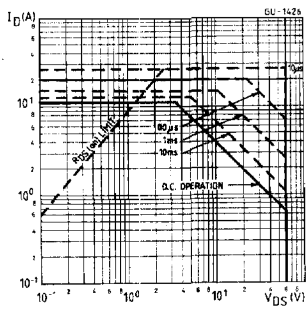
SOURCE DRAIN DIODE

V_{SD} Forward on voltage	I_{SD} = 12 A V_{GS} = 0			2	V
t_{rr} Reverse recovery time	I_{SD} = 12 A V_{GS} = 0			75	ns

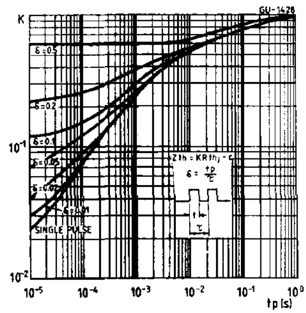
* Pulsed: Pulse duration ⩽ 300 μs, duty cycle ⩽ 2%

■ See note on ISOWATT220 in this datasheet

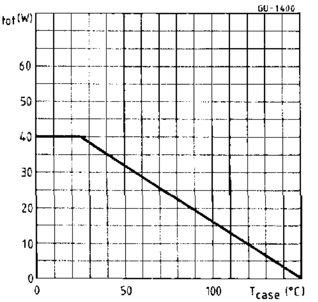
Safe operating areas (standard package)



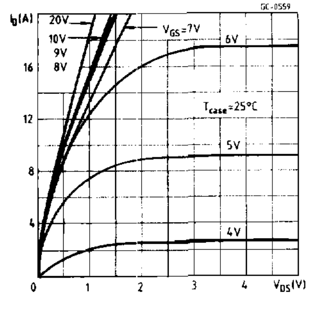
Thermal impedance (standard package)



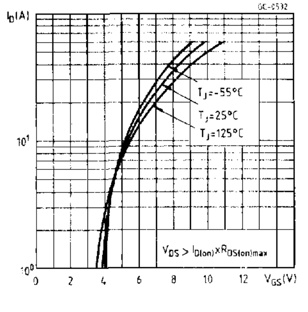
Derating curve (standard package)



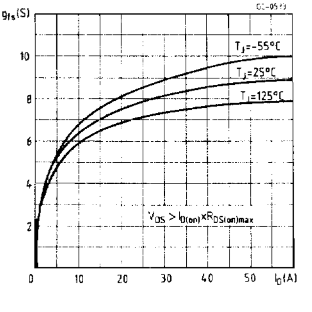
Output characteristics



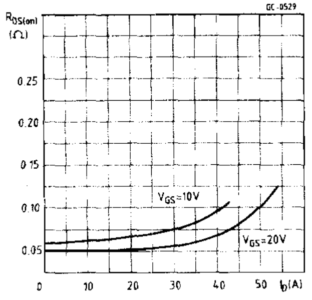
Transfer characteristics



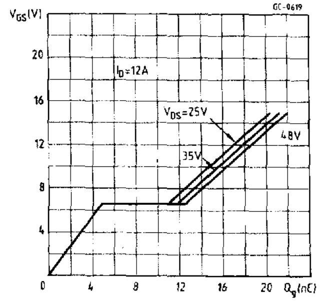
Transconductance



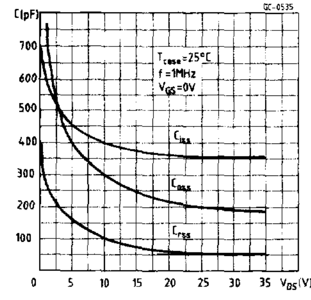
Static drain-source on resistance



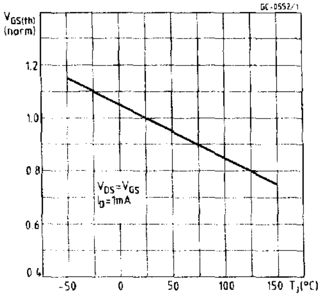
Gate charge vs gate-source voltage



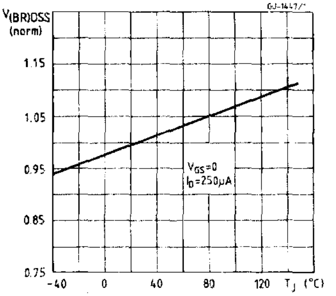
Capacitance variation



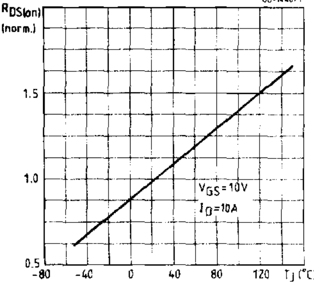
Normalized gate threshold voltage vs temperature



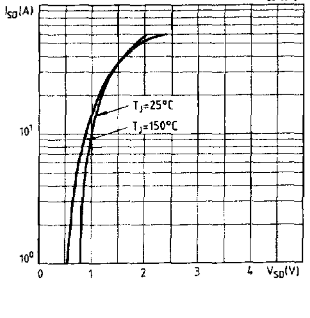
Normalized breakdown voltage vs temperature



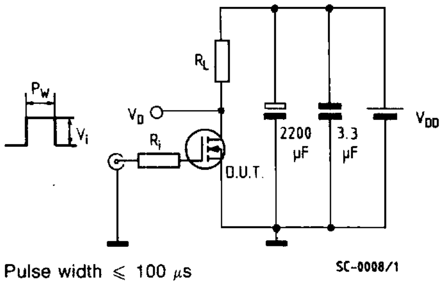
Normalized on resistance vs temperature



Source-drain diode forward characteristics

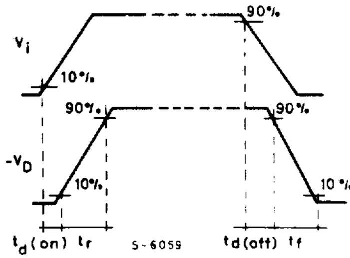


Switching times test circuit for resistive load

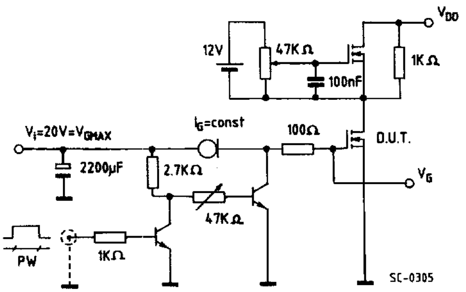


Pulse width ⩽ 100 μs
Duty cycle ⩽ 2%

Switching time waveforms for resistive load

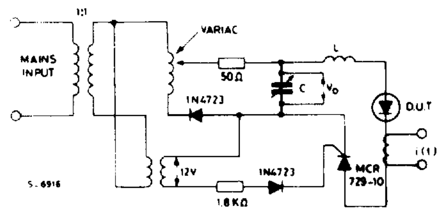


Gate charge test circuit



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:

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

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:

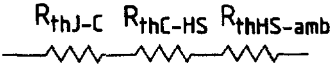
$$Z_{th} = R_{thJ\text{-}C}$$

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

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

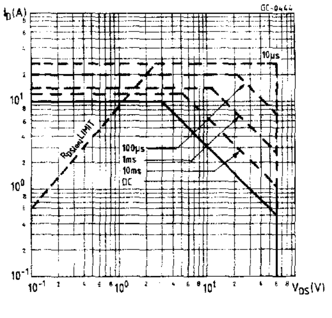
It is often possibile to discern these areas on transient thermal impedance curves.

Fig. 1

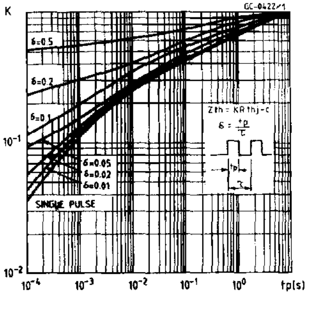


ISOWATT DATA

Safe operating areas



Thermal impedance



Derating curve