



N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

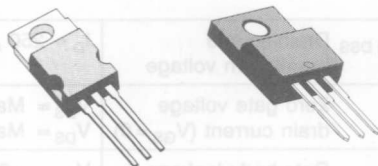
TYPE	V _{DSS}	R _{DS(on)}	I _D [■]
MTP3055A	60 V	0.15 Ω	12 A
MTP3055AFI	60 V	0.15 Ω	10 A

- 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

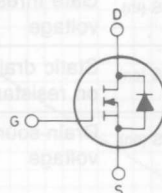
N - channel enhancement mode POWER MOS field effect transistors. Easy drive and very fast times make these POWER MOS transistors ideal for high speed switching circuit in applications such as power actuator driving, motor drive including brushless motors, robotics, actuators lamp driving, series regulator 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_I	Maximum lead temperature for soldering purpose	max	275		°C

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

Parameters	Test Conditions	Min.	Typ.	Max.	Unit
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OFF

$V_{(BR)} DSS$	Drain-source breakdown voltage	$I_D = 250 \mu\text{A}$	$V_{GS} = 0$	60	V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$	$T_c = 125^{\circ}\text{C}$	50 1000	μA 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	$V_{DS} = V_{GS}$ $V_{DS} = V_{GS}$	$I_D = 1 \text{ mA}$ $I_D = 1 \text{ mA}$	2 1.5	4.5 4	V V
$R_{DS (on)}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}$	$I_D = 6 \text{ A}$	0.15	Ω	
$V_{DS (on)}$	Drain-source on voltage	$V_{GS} = 10 \text{ V}$ $V_{GS} = 10 \text{ V}$ $V_{GS} = 10 \text{ V}$	$I_D = 12 \text{ A}$ $I_D = 6 \text{ A}$ $I_D = 6 \text{ A}$		2.0 0.9 1.5	V V V

DYNAMIC

g_{fs}^*	Forward transconductance	$V_{DS} = 10 \text{ V}$	$I_D = 6 \text{ A}$	4.5		mho
C_{iss}	Input capacitance	$V_{DS} = 25 \text{ V}$	$f = 1 \text{ MHz}$		500	pF
C_{oss}	Output capacitance	$V_{GS} = 0$			200	pF
C_{rss}	Reverse transfer capacitance				100	pF
Q_g	Total gate charge	$V_{DS} = 48 \text{ V}$ $V_{GS} = 10 \text{ V}$	$I_D = 12 \text{ A}$		17	nC

SWITCHING

$t_d (on)$	Turn-on time	$V_{DD} = 25 \text{ V}$	$I_D = 6 \text{ A}$		20	ns
t_r	Rise time	$R_{gen} = 50 \Omega$			60	ns
$t_d (off)$	Turn-off delay time				65	ns
t_f	Fall time				65	ns

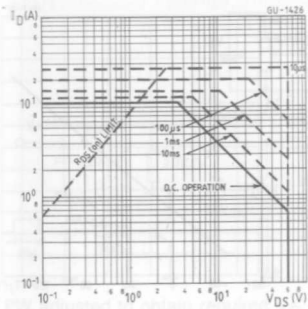
ELECTRICAL CHARACTERISTICS (Continued)

Parameters		Test Conditions		Min.	Typ.	Max.	Unit
V_{SD}	Forward on voltage	$I_{SD} = 12\text{ A}$	$V_{GS} = 0$			2	V
t_{rr}	Reverse recovery time	$I_{SD} = 12\text{ A}$	$V_{GS} = 0$			75	ns

* Pulsed: Pulse duration $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
■ See note on ISOWATT220 in this datasheet

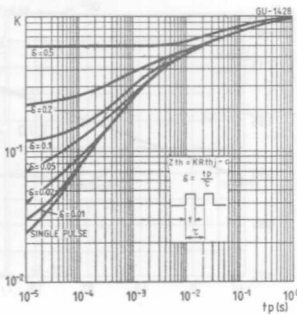
Safe operating areas

(standard package)



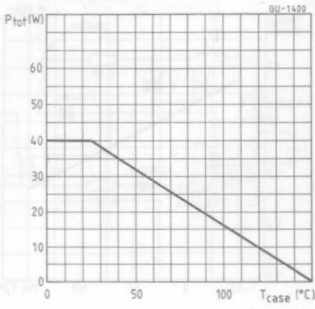
Thermal impedance

(standard package)

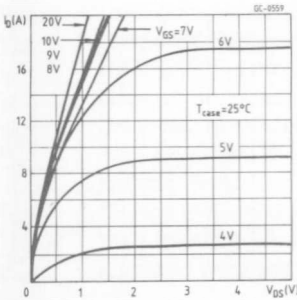


Derating curve

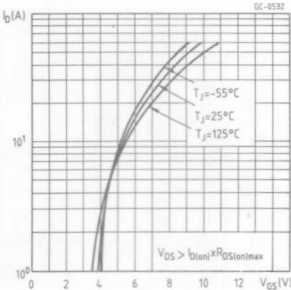
(standard package)



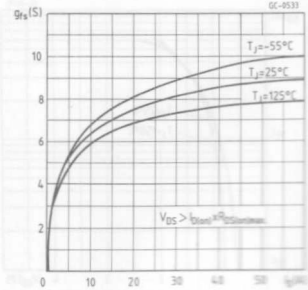
Output characteristics



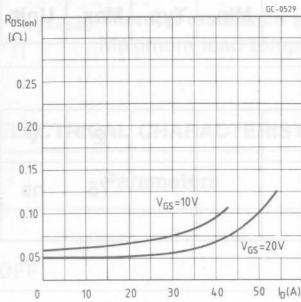
Transfer characteristics



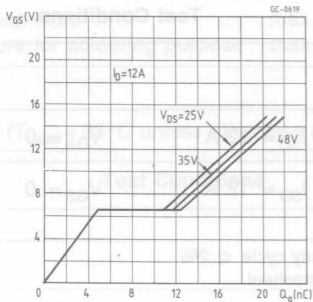
Transconductance



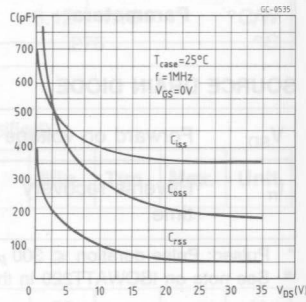
Static drain-source on resistance



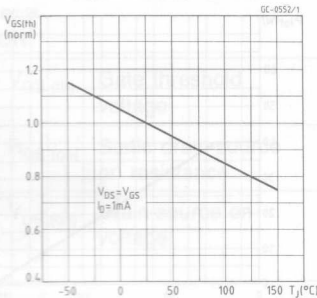
Gate charge vs gate-source voltage



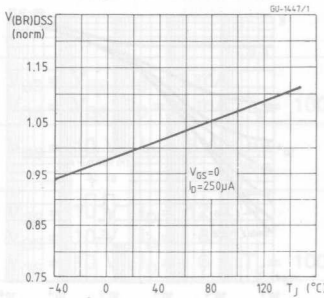
Capacitance variation



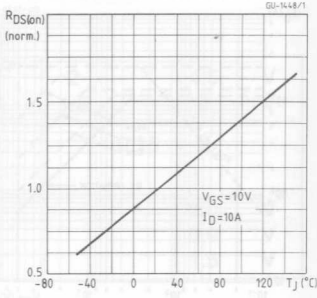
Normalized gate threshold voltage vs temperature



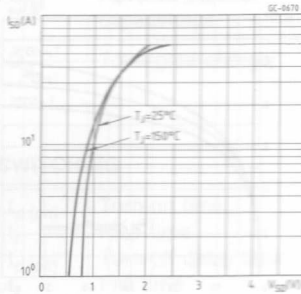
Normalized breakdown voltage vs temperature



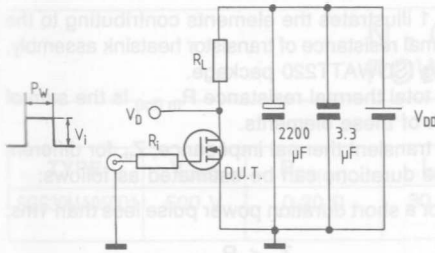
Normalized on resistance vs temperature



Source-drain diode forward characteristics

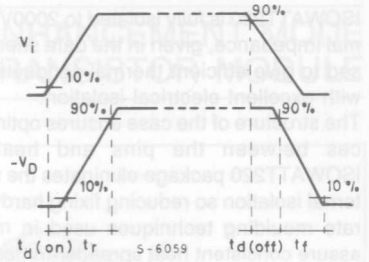


Switching times test circuit for resistive load

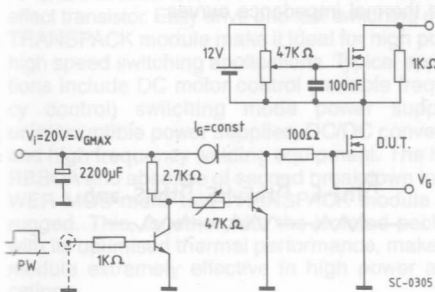
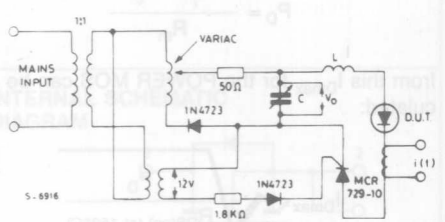
Pulse width $\leq 100 \mu\text{s}$ Duty cycle $\leq 2\%$

SC-0008/1

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

ABSOLUTE MAXIMUM RATINGS

V_{GS}	Gate-source voltage (max)	±20V
V_{DS}	Drain-source voltage (max)	±30V
I_D	Drain current (max)	100mA
I_G	Gate current (max)	100mA
T_J	Junction temperature (max)	150°C
T_{stg}	Storage temperature (max)	175°C

$R_{\theta JA}$	Thermal resistance (junction to ambient)	62.5°C/W
$R_{\theta JC}$	Thermal resistance (junction to case)	1.5°C/W

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:

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

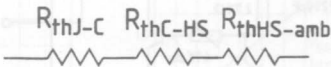
THERMAL IMPEDANCE OF ISOWATT220 PACKAGE

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

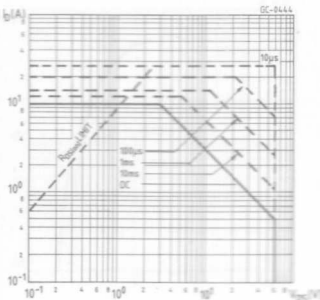
It is often possible to discern these areas on transient thermal impedance curves.

Fig. 1

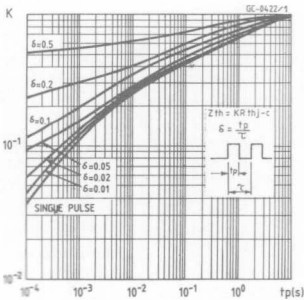


ISOWATT DATA

Safe operating areas



Thermal impedance



Derating curve

