

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

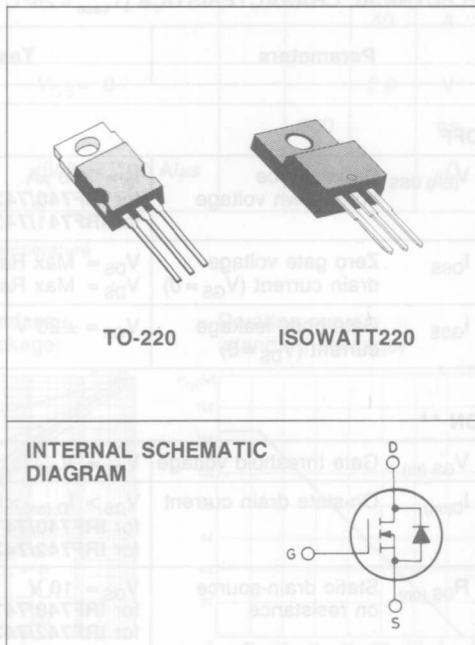
TYPE	V _{DSS}	R _{DS(on)}	I _D ■
IRF740	400 V	0.55 Ω	10 A
IRF740FI	400 V	0.55 Ω	5.5 A
IRF741	350 V	0.55 Ω	10 A
IRF741FI	350 V	0.55 Ω	5.5 A
IRF742	400 V	0.8 Ω	8.3 A
IRF742FI	400 V	0.8 Ω	4.5 A
IRF743	350 V	0.8 Ω	8.3 A
IRF743FI	350 V	0.8 Ω	4.5 A

- HIGH VOLTAGE - FOR SWITCHING POWER SUPPLIES
- ULTRA FAST SWITCHING
- EASY DRIVE - FOR REDUCED COST AND SIZE

INDUSTRIAL APPLICATIONS:

- SWITCHING POWER SUPPLIES
- DC SWITCH

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 applications. Applications include DC switch, switching power supplies, ultrasonic equipment and electronic ballast for fluorescent lamps.



ABSOLUTE MAXIMUM RATINGS

		TO-220 ISOWATT220		IRF				
				740 740FI	741 741FI	742 742FI	743 743FI	
V _{DS} *	Drain-source voltage (V _{GS} = 0)			400	350	400	350	V
V _{DGR} *	Drain-gate voltage (R _{GS} = 20 KΩ)			400	350	400	350	V
V _{GS}	Gate-source voltage			± 20				V
I _{DM} (●)	Drain current (pulsed)			40	40	33	33	A
I _{DLM}	Drain inductive current, clamped (L = 100 μH)			40	40	33	33	A
I _D	Drain current (cont.) at T _c = 25°C			740	741	742	743	A
I _D	Drain current (cont.) at T _c = 100°C			10	10	8.3	8.3	A
				6.3	6.3	5.2	5.2	A
				740FI	741FI	742FI	743FI	A
				5.5	5.5	4.5	4.5	A
				3	3	2.5	2.5	A
				TO-220		ISOWATT220		
P _{tot} ■	Total dissipation at T _c < 25°C			125		40		W
■	Derating factor			1		0.32		W/°C
T _{stg}	Storage temperature			-55 to 150				°C
T _j	Max. operating junction temperature			150				°C

* T_j = 25°C to 125°C

(●) Repetitive Rating: Pulse width limited by max junction temperature.

■ See note on ISOWATT220 on this datasheet.

THERMAL DATA*

TO-220 | ISOWATT220

$R_{thj - case}$	Thermal resistance junction-case	max	1	3.12	°C/W
R_{thc-s}	Thermal resistance case-sink	typ	0.5		°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	max	80		°C/W
T_l	Maximum lead temperature for soldering purpose		300		°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	$I_D = 250 \mu\text{A}$ for IRF740/742/740FI/742FI for IRF741/743/741FI/743FI	$V_{GS} = 0$	400 350	V V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$	$T_c = 125^\circ\text{C}$	250 1000	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 \text{ V}$		± 500	nA

ON **

$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	2		4	V
$I_{D(on)}$	On-state drain current	$V_{DS} > I_{D(on)} \times R_{DS(on) \text{ max}}$ $V_{GS} = 10 \text{ V}$ for IRF740/741/740FI/741FI for IRF742/743/742FI/743FI	10 8.3			A A
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}$ $I_D = 5.2 \text{ A}$ for IRF740/741/740FI/741FI for IRF742/743/742FI/743FI			0.55 0.8	Ω Ω

DYNAMIC

g_{fs}^{**}	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on) \text{ max}}$ $I_D = 5.2 \text{ A}$	4.0		mho
C_{iss}	Input capacitance	$V_{DS} = 25 \text{ V}$	$f = 1 \text{ MHz}$	1600	pF
C_{oss}	Output capacitance	$V_{GS} = 0$		450	pF
C_{rss}	Reverse transfer capacitance			150	pF

SWITCHING

$t_d(on)$	Turn-on time	$V_{DD} = 175 \text{ V}$	$I_D = 5.0 \text{ A}$	35	ns
t_r	Rise time	$R_l = 4.7 \Omega$		15	ns
$t_d(off)$	Turn-off delay time	(see test circuit)		90	ns
t_f	Fall time			35	ns
Q_g	Total Gate Charge	$V_{GS} = 10 \text{ V}$ $V_{DS} = \text{Max Rating} \times 0.8$ (see test circuit)	$I_D = 10 \text{ A}$	63	nC

ELECTRICAL CHARACTERISTICS (Continued)

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

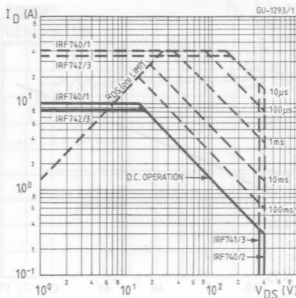
I_{SD}	Source-drain current			10	A
$I_{SDM}^{(*)}$	Source-drain current (pulsed)			40	A
V_{SD}	Forward on voltage	$I_{SD} = 10\text{ A}$	$V_{GS} = 0$	2.0	V
t_{rr}	Reverse recovery time	$T_J = 150^\circ\text{C}$		800	ns
Q_{rr}	Reverse recovered charge	$I_{SD} = 10\text{ A}$	$di/dt = 100\text{ A}/\mu\text{s}$	5.7	μC

** Pulsed: Pulse duration $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 1.5\%$

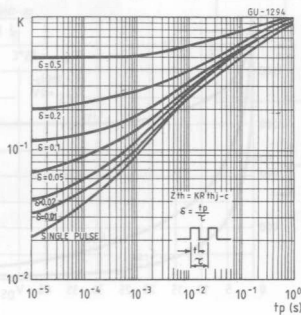
(*) Repetitive Rating: Pulse width limited by max junction temperature

■ See note on ISOWATT220 in this datasheet

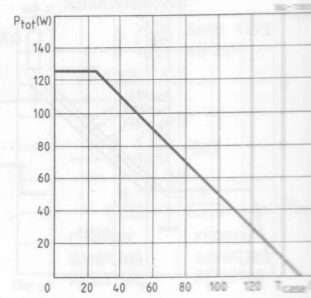
Safe operating areas (standard package)



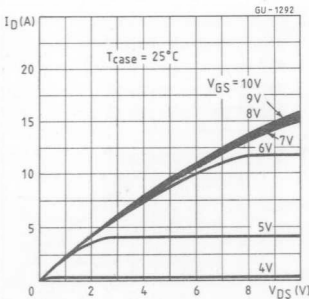
Thermal impedance (standard package)



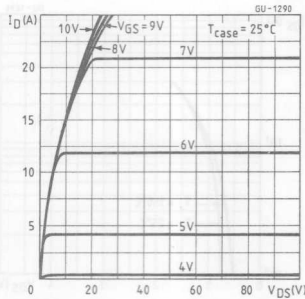
Derating curve (standard package)



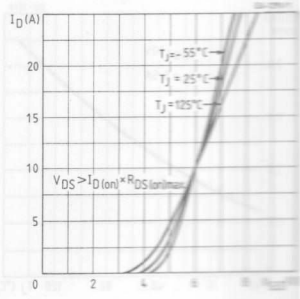
Output characteristics



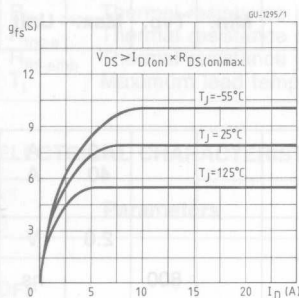
Output characteristics



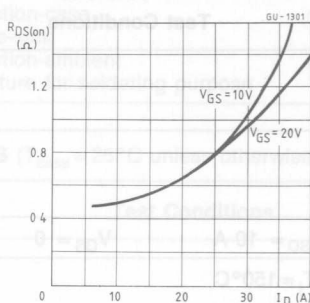
Transfer characteristics



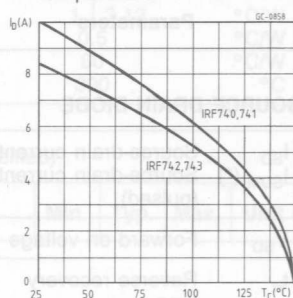
Transconductance



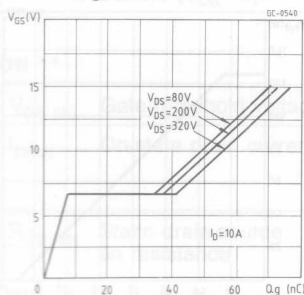
Static drain-source on resistance



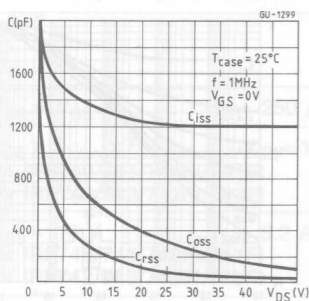
Maximum drain current vs temperature



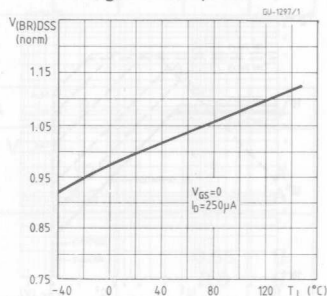
Gate charge vs gate-source voltage



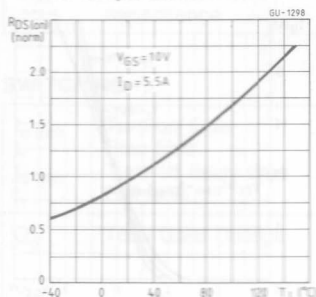
Capacitance variation



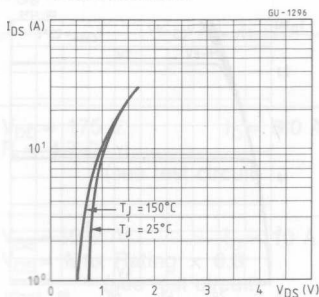
Normalized breakdown voltage vs temperature



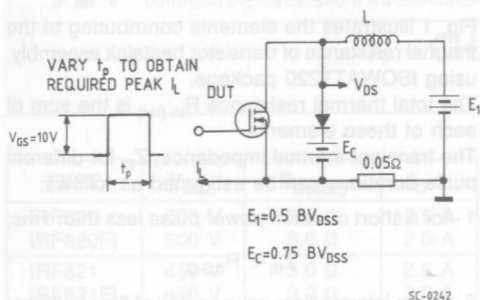
Normalized on resistance vs temperature



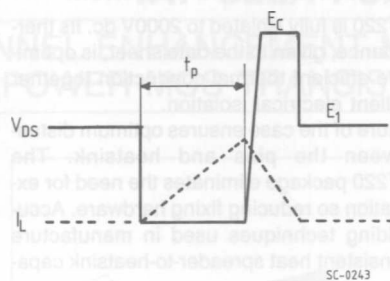
Source-drain diode forward characteristics



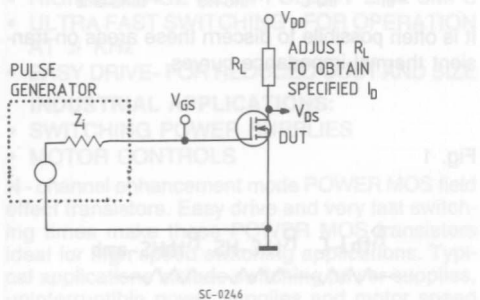
Clamped inductive test circuit



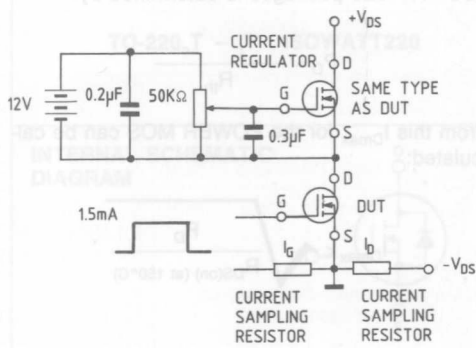
Clamped inductive waveforms



Switching times test circuit



Gate charge test circuit



ABSOLUTE MAXIMUM RATINGS

V_{GS}	Gate-source voltage ($I_D = 0$)
V_{DS}	Drain-source voltage ($I_D = 0$)
V_{GS}	Gate-source voltage
I_D	Drain current (pulsed)
I_{DCL}	Drain current (continuous, clamped)

I_D	Drain current (pulsed)
I_{DCL}	Drain current (continuous, clamped)
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I_D	Drain current (pulsed)
I_{DCL}	Drain current (continuous, clamped)
I_D	Drain current (pulsed)
I_{DCL}	Drain current (continuous, clamped)
I_D	Drain current (pulsed)
I_{DCL}	Drain current (continuous, clamped)

T_J	Junction temperature
T_{STG}	Storage temperature
T_{MAX}	Maximum junction temperature

TO-220	820	821	822	823
ISOWATT220	820FI	821FI	822FI	823FI
V_{GS}	500	450	500	450
V_{DS}	500	450	500	450
I_D	8	8	7	7
I_{DCL}	8	8	7	7
I_D	4.5	4.5	4.5	4.5
I_{DCL}	1.5	1.5	1.5	1.5
I_D	2.5	2.5	2.5	2.5
I_{DCL}	1.2	1.2	1.2	1.2
T_J	150	150	150	150
T_{STG}	-55	-55	-55	-55
T_{MAX}	150	150	150	150

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:

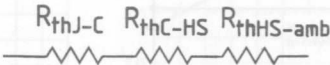
$$Z_{th} = R_{thJ-C}$$

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

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

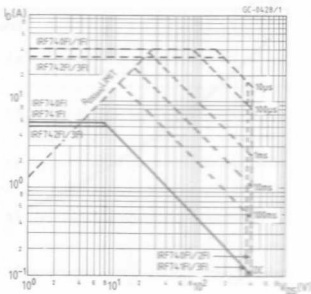
It is often possible to discern these areas on transient thermal impedance curves.

Fig. 1

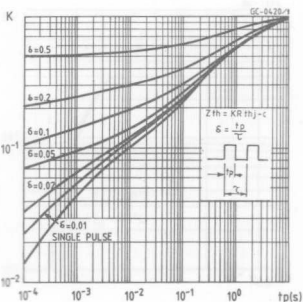


ISOWATT DATA

Safe operating areas



Thermal impedance



Derating curve

