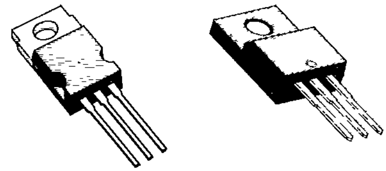
SGS-THOMSON MICROELECTRONICS

IRF 740/FI-741/FI
IRF 742/FI-743/FI

S G S-THOMSON

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



TO-220 ISOWATT220

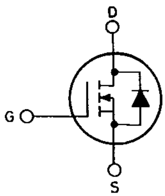
- HIGH VOLTAGE - FOR SWITCHING POWER SUPPLIES
- ULTRA FAST SWITCHING
- EASY DRIVE - FOR REDUCED COST AND SIZE

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.

INTERNAL SCHEMATIC DIAGRAM



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
		740	741	742	743	
I_D	Drain current (cont.) at T_c = 25°C	10	10	8.3	8.3	A
I_D	Drain current (cont.) at T_c = 100°C	6.3	6.3	5.2	5.2	A
		740FI	741FI	742FI	743FI	
I_D ■	Drain current (cont.) at T_c = 25°C	5.5	5.5	4.5	4.5	A
I_D ■	Drain current (cont.) at T_c = 100°C	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.

June 1988

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°C unless otherwise specified)

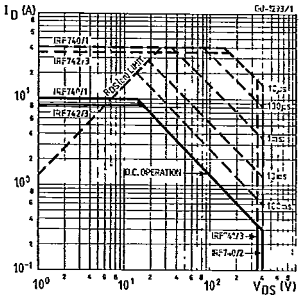
Parameters		Test Conditions	Min.	Typ.	Max.	Unit
OFF						
$V_{(BR)\ DSS}$	Drain-source breakdown voltage	I_D = 250 μA V_{GS} = 0 for **IRF740/742/740FI/742FI** for **IRF741/743/741FI/743FI**	 400 350			 V V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125°C			250 1000	μA μA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ±20 V			±500	nA
ON **						
$V_{GS\ (th)}$	Gate threshold voltage	V_{DS} = V_{GS} I_D = 250 μA	2		4	V
$I_{D(on)}$	On-state drain current	V_{DS} > $I_{D\ (on)} \times R_{DS(on)\ max}$ V_{GS} = 10 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 V I_D = 5.2 A for **IRF740/741/740FI/741FI** for **IRF742/743/742FI/743FI**			 0.55 0.8	 Ω Ω
DYNAMIC						
g_{fs} **	Forward transconductance	V_{DS} > $I_{D\ (on)} \times R_{DS\ (on)\ max}$ I_D = 5.2 A	4.0			mho
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0			1600 450 150	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} = 175 V I_D = 5.0 A R_i = 4.7 Ω (see test circuit)			35 15 90 35	ns ns ns ns
Q_g	Total Gate Charge	V_{GS} = 10 V I_D = 10 A V_{DS} = Max Rating × 0.8 (see test circuit)			63	nC

ELECTRICAL CHARACTERISTICS (Continued)

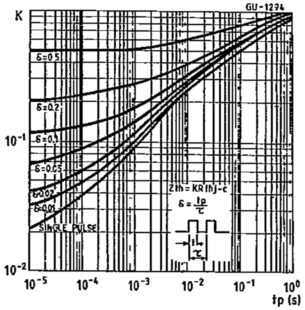
Parameters		Test Conditions		Min.	Typ.	Max.	Unit
SOURCE DRAIN DIODE							
I_{SD} I_{SDM} (•)	Source-drain current Source-drain current (pulsed)					10 40	A A
V_{SD}	Forward on voltage	I_{SD} = 10 A	V_{GS} = 0			2.0	V
t_{rr} Q_{rr}	Reverse recovery time Reverse recovered charge	T_j = 150°C I_{SD} = 10 A	 di/dt = 100 A/μs		800 5.7		ns μC

** Pulsed: Pulse duration ≤ 300 μs, duty cycle ≤ 1.5%
(•) Repetitive Rating: Pulse width limited by max junction temperature
■ See note on ISOWATT220 in this datasheet

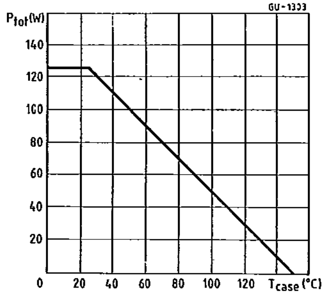
Safe operating areas (standard package)



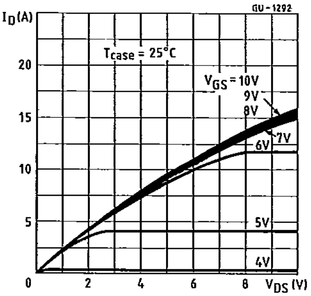
Thermal impedance (standard package)



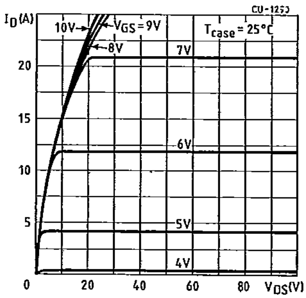
Derating curve (standard package)



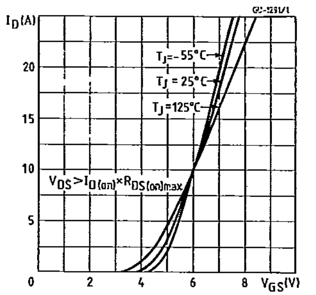
Output characteristics



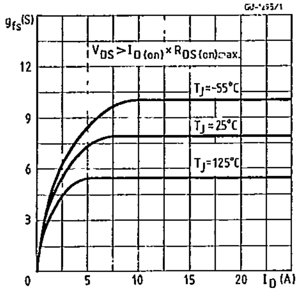
Output characteristics



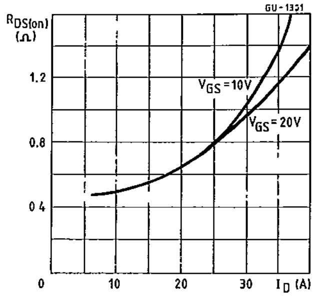
Transfer characteristics



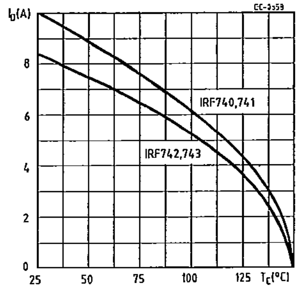
Transconductance



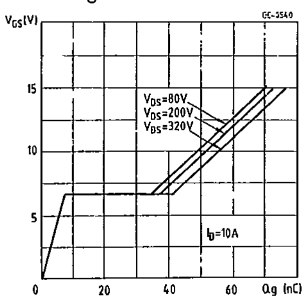
Static drain-source on resistance



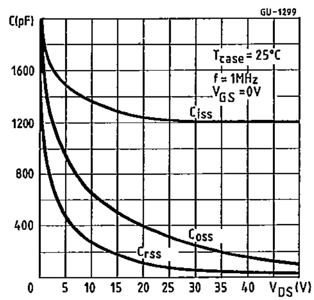
Maximum drain current vs temperature



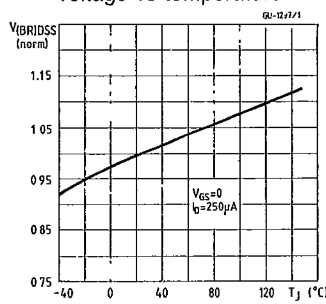
Gate charge vs gate-source voltage



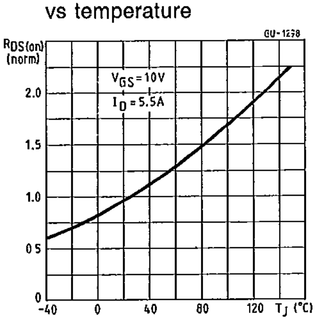
Capacitance variation



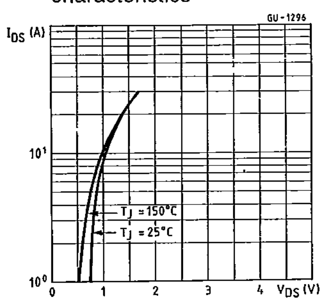
Normalized breakdown voltage vs temperature



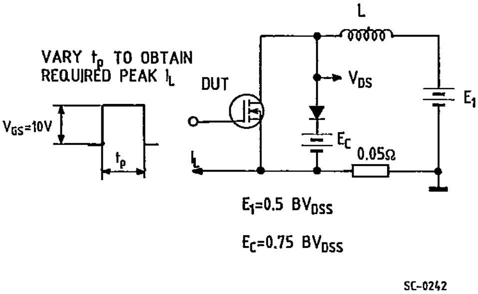
Normalized on resistance vs temperature



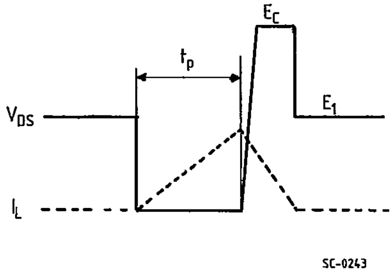
Source-drain diode forward characteristics



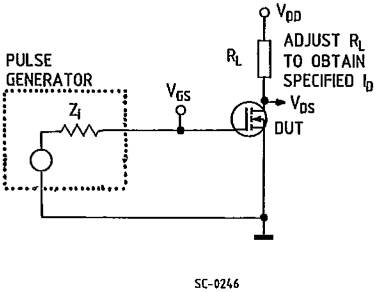
Clamped inductive test circuit



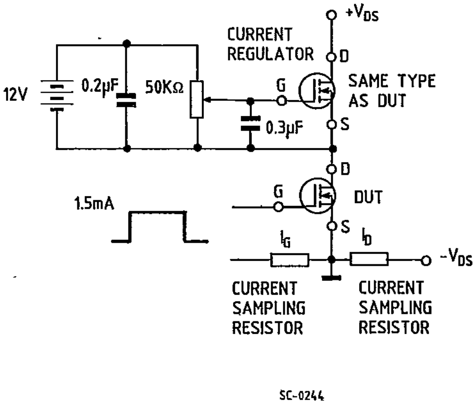
Clamped inductive waveforms



Switching times test circuit



Gate charge test circuit



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:

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

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:

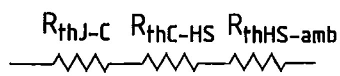
$$Z_{th} = R_{thJ-C}$$

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

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

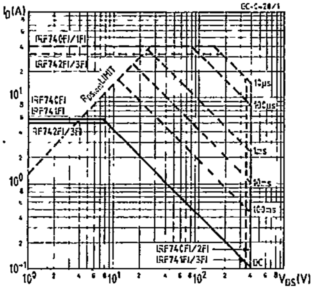
It is often possibile to discern these areas on transient thermal impedance curves.

Fig. 1

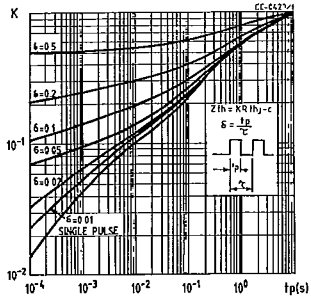


ISOWATT DATA

Safe operating areas



Thermal impedance



Derating curve