

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

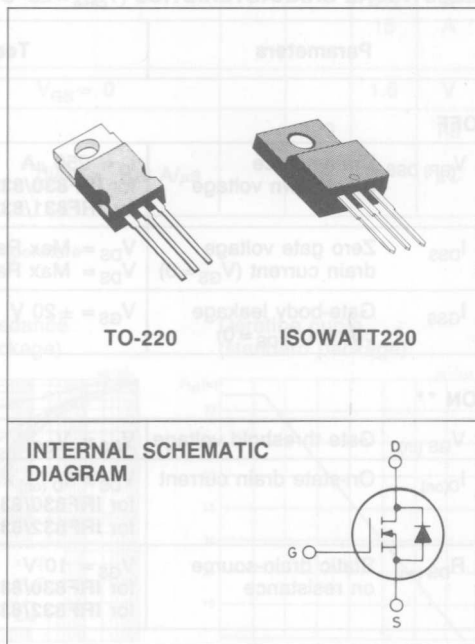
TYPE	V _{DSS}	R _{DS(on)}	I _D *
IRF830	500 V	1.5 Ω	4.5 A
IRF830FI	500 V	1.5 Ω	3.0 A
IRF831	450 V	1.5 Ω	4.5 A
IRF831FI	450 V	1.5 Ω	3.0 A
IRF832	500 V	2.0 Ω	4.0 A
IRF832FI	500 V	2.0 Ω	2.5 A
IRF833	450 V	2.0 Ω	4.0 A
IRF833FI	450 V	2.0 Ω	2.5 A

- HIGH VOLTAGE - 450 V FOR OFF LINE SMPS
- ULTRA FAST SWITCHING - FOR OPERATION AT > KHz
- EASY DRIVE- FOR REDUCED COST AND SIZE
- COST EFFECTIVE PLASTIC PACKAGE

INDUSTRIAL APPLICATIONS:

- SWITCHING POWER SUPPLIES
- MOTOR CONTROLS

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. Typical uses include SMPS, lamp ballast and motor control.



ABSOLUTE MAXIMUM RATINGS

		TO-220 ISOWATT220		830 830FI	831 831FI	832 832FI	833 833FI	
V_{DS} *	Drain-source voltage ($V_{GS}=0$)	500	450	500	450	V		
V_{DGR} *	Drain-gate voltage ($R_{GS}=20\text{ K}\Omega$)	500	450	500	450	V		
V_{GS}	Gate-source voltage	± 20				V		
I_{DM} (•)	Drain current (pulsed)	15	15	13	13	A		
I_{DLM}	Drain inductive current, clamped ($L=100\text{ }\mu\text{H}$)	15	15	13	13	A		
		830	831	832	833			
I_D	Drain current (cont.) at $T_c=25^\circ\text{C}$	4.5	4.5	4	4	A		
I_D	Drain current (cont.) at $T_c=100^\circ\text{C}$	3	3	2.5	2.5	A		
		830FI	831FI	832FI	833FI			
I_D ■	Drain current (cont.) at $T_c=25^\circ\text{C}$	3	3	2.5	2.5	A		
I_D ■	Drain current (cont.) at $T_c=100^\circ\text{C}$	1.8	1.8	1.5	1.5	A		
		TO-220		ISOWATT220				
P_{tot} ■	Total dissipation at $T_c<25^\circ\text{C}$	74		35		W		
■	Derating factor	0.59		0.28		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	1.69	3.57	°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 ($T_{case} = 25^{\circ}C$ unless otherwise specified)

Parameters	Test Conditions	Min.	Typ.	Max.	Unit
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OFF

$V_{(BR) DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu A$ for IRF830/832/830FI/832FI for IRF831/833/831FI/833FI	$V_{GS} = 0$	500 450	V V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$	$T_c = 125^{\circ}C$	250 1000	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 V$		± 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	$V_{DS} > I_{D(on)} \times R_{DS(on) max}$ for IRF830/831/830FI/831FI for IRF832/833/832FI/833FI	$V_{GS} = 10 V$	4.5 4.0		A A
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 V$ for IRF830/831/830FI/831FI for IRF832/833/832FI/833FI	$I_D = 2.5 A$		1.5 2.0	Ω Ω

DYNAMIC

$g_{fs} **$	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on) max}$ $I_D = 2.5 A$	2.7			mho
C_{iss}	Input capacitance				800	pF
C_{oss}	Output capacitance	$V_{DS} = 25 V$	$f = 1 MHz$		200	pF
C_{rss}	Reverse transfer capacitance	$V_{GS} = 0$			60	pF

SWITCHING

$t_{d(on)}$	Turn-on time	$V_{DD} = 225 V$	$I_D = 2.5 A$		30	ns
t_r	Rise time	$R_l = 15 \Omega$			30	ns
$t_{d(off)}$	Turn-off delay time	(see test circuit)			55	ns
t_f	Fall time				30	ns
Q_g	Total Gate Charge	$V_{GS} = 10 V$ $V_{DS} = \text{Max Rating} \times 0.8$ (see test circuit)	$I_D = 4.5 A$		32	nC

* See note on ISOWATT220 in this datasheet

** Pulsed: Pulse duration $\leq 300 \mu s$, duty cycle $\leq 2\%$

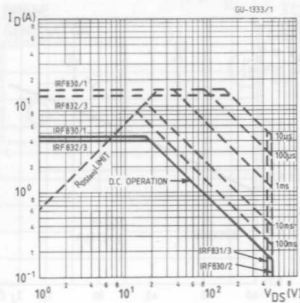
ELECTRICAL CHARACTERISTICS (Continued)

Parameters	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} Source-drain current				4.5	A
I_{SDM} (*) Source-drain current (pulsed)				15	A
V_{SD} ** Forward on voltage	$I_{SD} = 4.5$ A $V_{GS} = 0$			1.6	V
t_{rr} Reverse recovery time	$T_J = 150^\circ\text{C}$		800		ns
Q_{rr} Reverse recovered charge	$I_{SD} = 4.5$ A $di/dt = 100$ A/ μs		4.6		μC

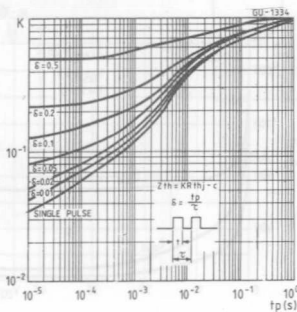
** Pulsed: Pulse duration ≤ 300 μs , duty cycle $\leq 1.5\%$

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

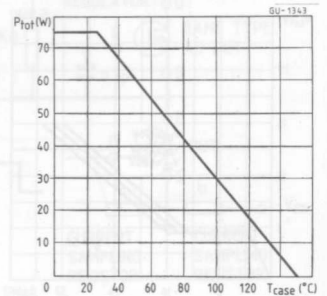
Safe operating areas (standard package)



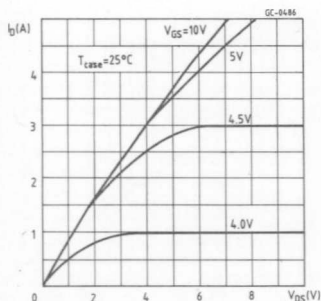
Thermal impedance (standard package)



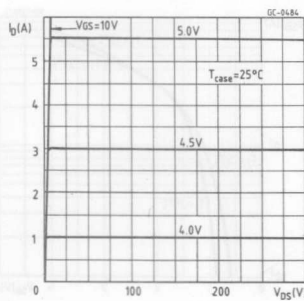
Derating curve (standard package)



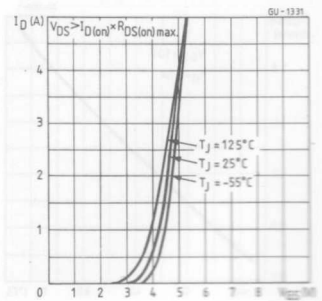
Output characteristics



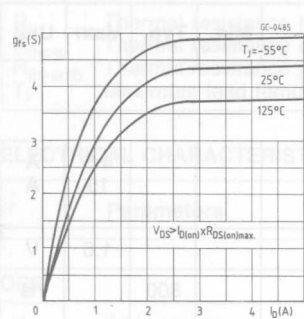
Output characteristics



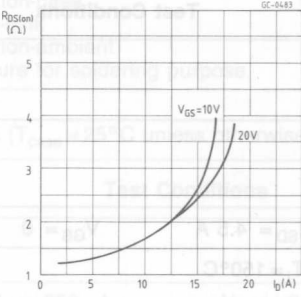
Transfer characteristics



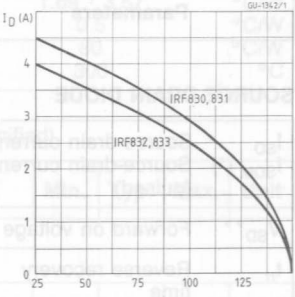
Transconductance



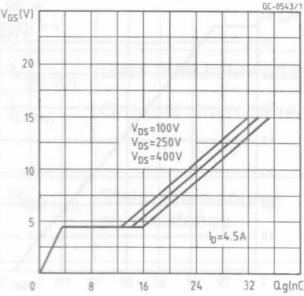
Static drain-source on resistance



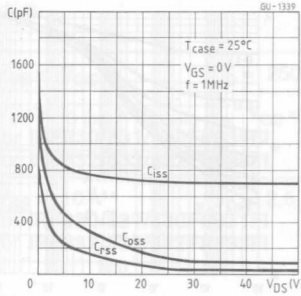
Maximum drain current vs temperature



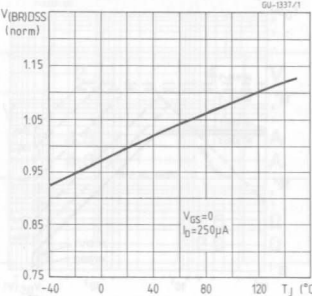
Gate charge vs gate-source voltage



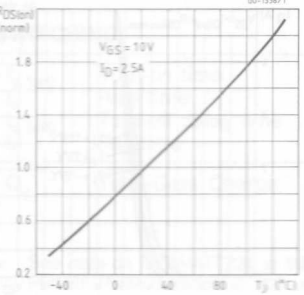
Capacitance variation



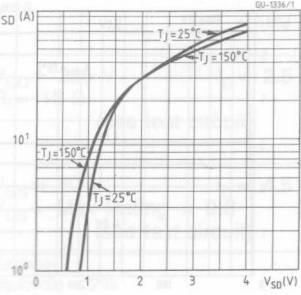
Normalized breakdown voltage vs temperature



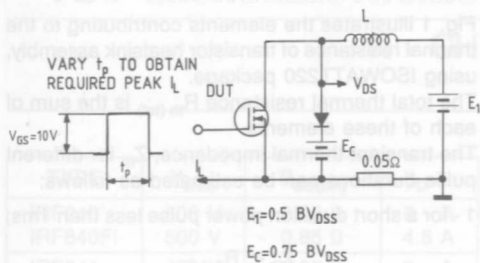
Normalized on resistance vs temperature



Source-drain diode forward characteristics

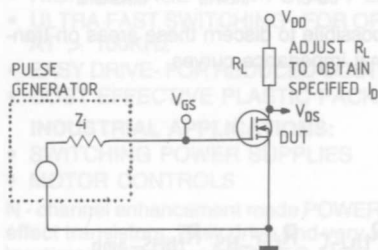


Clamped inductive test circuit



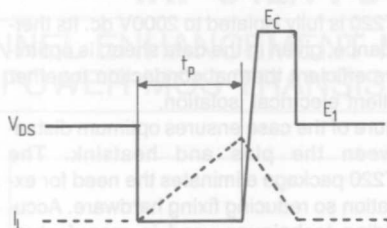
SC-0242

Switching times test circuit



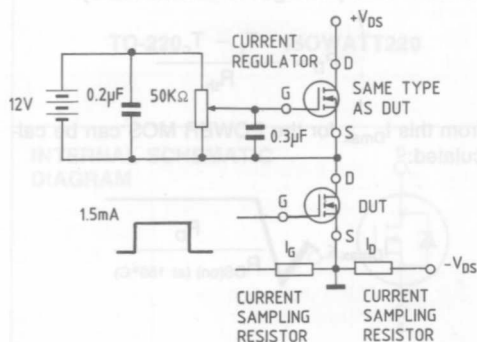
SC-0246

Clamped inductive waveforms



SC-0243

Gate charge test circuit



SF-0244

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:

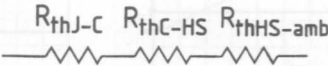
- 1 - for a short duration power pulse less than 1ms;
- 2 - for an intermediate power pulse of 5ms to 50ms;
- 3 - for long power pulses of the order of 500ms or greater:

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

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

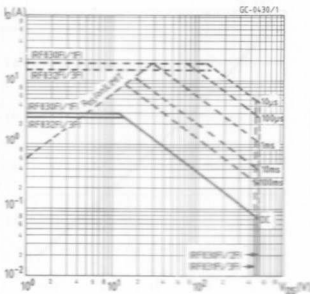
It is often possible to discern these areas on transient thermal impedance curves.

Fig. 1

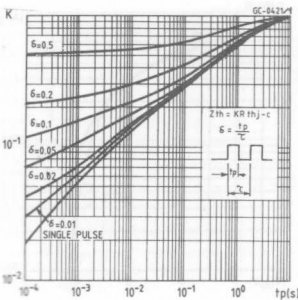


ISOWATT DATA

Safe operating areas



Thermal impedance



Derating curve

