

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

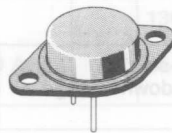
TYPE	V _{DSS}	R _{DS(on)}	I _D
IRF450	500 V	0.4 Ω	13 A
IRF451	450 V	0.4 Ω	13 A
IRF452	500 V	0.5 Ω	11 A
IRF453	450 V	0.5 Ω	11 A

- HIGH VOLTAGE - 450V FOR OFF LINE SMPS
- HIGH CURRENT - 11A FOR UP TO 350W SMPS
- ULTRA FAST SWITCHING - FOR OPERATION AT > 100 KHz
- EASY DRIVE - REDUCES COST AND SIZE
- HERMETIC PACKAGE TO-3

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 applications include switched mode power supplies, uninterrupted power supplies and motor speed control.



TO-3

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

		IRF			
		450	451	452	453
V _{DS} *	Drain-source voltage (V _{GS} = 0)	500	450	500	450
V _{DGR} *	Drain-gate voltage (R _{GS} = 20 KΩ)	500	450	500	450
V _{GS}	Gate-source voltage			± 20	
I _D	Drain current (cont.) at T _c = 25°C	13	13	11	11
I _D	Drain current (cont.) at T _c = 100°C	8.1	8.1	7.2	7.2
I _{DM} (*)	Drain current (pulsed)	52	52	44	44
I _{DLM}	Drain inductive current, clamped (L = 100 μH)	52	52	44	44
P _{tot}	Total dissipation at T _c < 25°C		150		
	Derating factor		1.2		
T _{stg}	Storage temperature		-55 to 150		
T _j	Max. operating junction temperature		150		

* T_j = 25°C to 125°C

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

THERMAL DATA

$R_{thj-case}$	Thermal resistance junction-case	max	0.83	°C/W
R_{thc-s}	Thermal resistance case-sink	typ	0.1	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	max	30	°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 IRF450/IRF452 for IRF451/IRF453	$V_{GS} = 0$	500 450	V V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$	$T_c = 125^\circ\text{C}$	250 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	$V_{DS} = V_{GS}$	$I_D = 250 \mu\text{A}$	2	4	V
$I_{D(on)}$	On-state drain current	$V_{DS} > I_{D(on)} \times R_{DS(on) max}$ for IRF450/IRF451 for IRF452/IRF453	$V_{GS} = 10 \text{ V}$	13 11	A A	
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}$ for IRF450/IRF451 for IRF452/IRF453	$I_D = 7.2 \text{ A}$		0.4 0.5	Ω Ω

DYNAMIC

g_{fs}^{**}	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on) max}$ $I_D = 7.2 \text{ A}$	8.7			mho
C_{iss}	Input capacitance	$V_{DS} = 25 \text{ V}$	$f = 1 \text{ MHz}$		3000	pF
C_{oss}	Output capacitance	$V_{GS} = 0$			600	pF
C_{rss}	Reverse transfer capacitance				200	pF

SWITCHING

$t_{d(on)}$	Turn-on time	$V_{DD} = 210 \text{ V}$	$I_D = 7.0 \text{ A}$	35	ns
t_r	Rise time	$R_l = 4.7 \Omega$		50	ns
$t_{d(off)}$	Turn-off delay time	(see test circuit)		150	ns
t_f	Fall time			70	ns
Q_g	Total Gate Charge	$V_{GS} = 10 \text{ V}$ $V_{DS} = \text{Max Rating} \times 0.8$ (see test circuit)	$I_D = 13 \text{ A}$	120	nC

ELECTRICAL CHARACTERISTICS (Continued)

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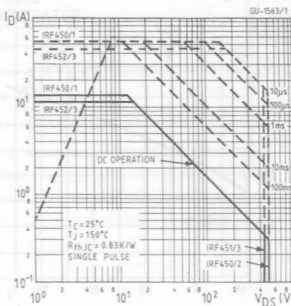
SOURCE DRAIN DIODE

I_{SD}	Source-drain current			13	A
$I_{SDM}^{(*)}$	Source-drain current (pulsed)			52	A
V_{SD}^{**}	Forward on voltage	$I_{SD} = 13\text{ A}$	$V_{GS} = 0$	1.4	V
t_{rr}	Reverse recovery time	$T_J = 150^\circ\text{C}$		1300	ns
Q_{rr}	Reverse recovered charge	$I_{SD} = 13\text{ A}$	$di/dt = 100\text{ A}/\mu\text{s}$	7.4	μC

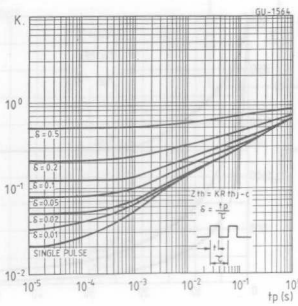
** Pulsed: Pulse duration $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 1.5\%$

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

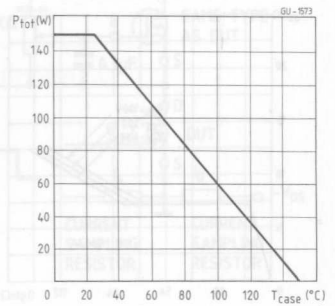
Safe operating areas



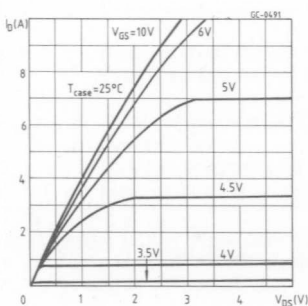
Thermal impedance



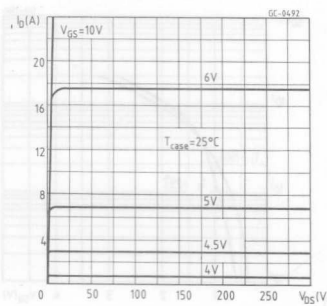
Derating curve



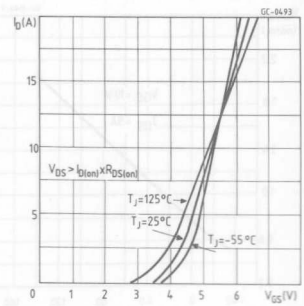
Output characteristics



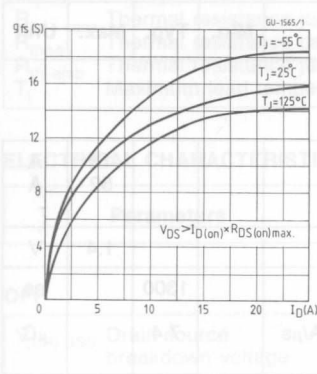
Output characteristics



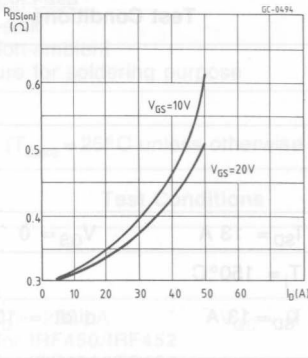
Transfer characteristics



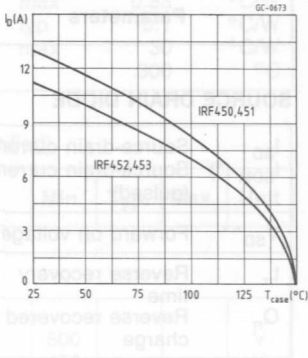
Transconductance



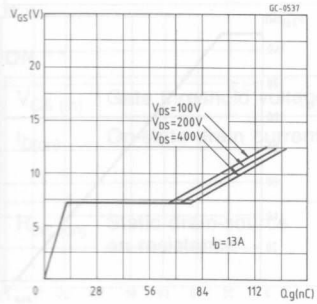
Static drain-source on resistance



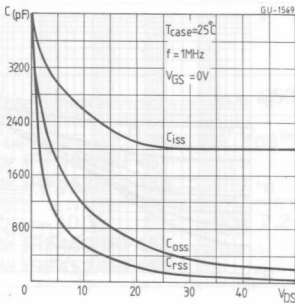
Maximum drain current vs temperature



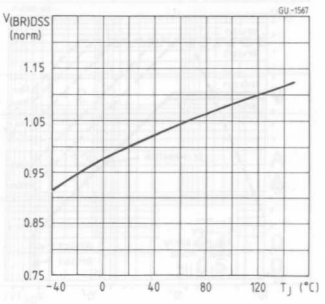
Gate charge vs gate-source voltage



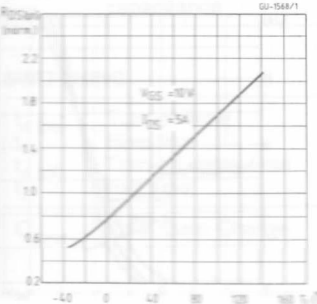
Capacitance variation



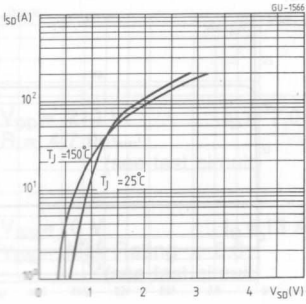
Normalized breakdown voltage vs temperature



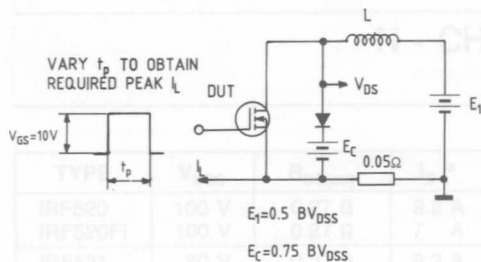
Normalized on resistance vs temperature



Source-drain diode forward characteristics

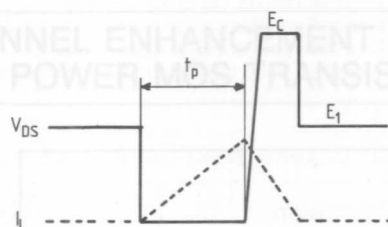


Clamped inductive test circuit



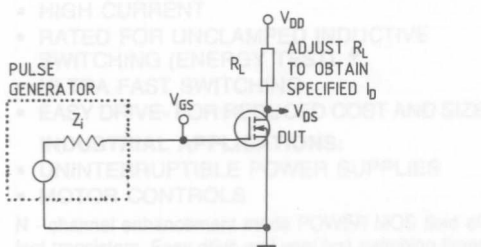
SC-0242

Clamped inductive waveforms



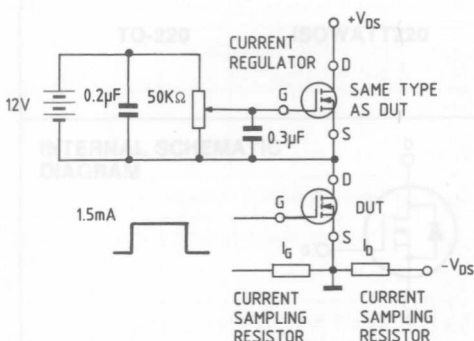
SC-0243

Switching times test circuit



SC-0246

Gate charge test circuit



ABSOLUTE MAXIMUM RATINGS

		IRF	IRF	IRF	IRF
		450	451	452	453
		100V	80V	100V	80V
V_{GS}	Gate-source voltage ($R_{DS(on)} = 20\Omega$)	100	80	100	80
V_{DS}	Drain-source voltage ($I_D = 0$)	100	80	100	80
V_{GS}	Gate-source voltage ($R_{DS(on)} = 20\Omega$)	100	80	100	80
I_{DS}	Drain current (pulsed)	97	57	52	32
I_D	Drain current (cont.) at $T_J = 25^\circ C$	120	821	822	523
I_D	Drain current (cont.) at $T_J = 100^\circ C$	9.2	9.2	8.6	6
I_D	Drain current (cont.) at $T_J = 25^\circ C$	8.5	8.5	8.6	6
I_D	Drain current (cont.) at $T_J = 100^\circ C$	8.5	8.5	8.6	6
P_{tot}	Total dissipation at $T_J = 25^\circ C$	7	7	6	6
F_{th}	Damping factor	4	4	3.5	3.5
T_{stg}	Storage temperature	-55 to 150	-55 to 150	-55 to 150	-55 to 150
T_J	Max. operating junction temperature	150	150	150	150

* $T_J = 25^\circ C$ to $125^\circ C$

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

* See note on ISOWATT220 on this document

* Introduced in 1995 week 44