

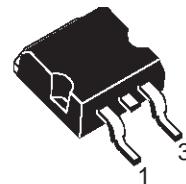
**IRF640S****N - CHANNEL 200V - 0.150Ω - 18A TO-263
MESH OVERLAY™ MOSFET**

TYPE	V _{DSS}	R _{D(on)}	I _D
IRF640S	200 V	< 0.18 Ω	18 A

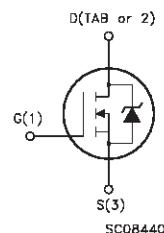
- TYPICAL R_{D(on)} = 0.150 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

DESCRIPTION

This power MOSFET is designed using the company's consolidated strip layout-based MESH OVERLAY™ process. This technology matches and improves the performances compared with standard parts from various sources.

**D²PAK
TO-263
(suffix "T4")****APPLICATIONS**

- HIGH CURRENT SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- DC/DC CONVERTERS FOR TELECOM,
INDUSTRIAL, AND LIGHTING EQUIPMENT.

INTERNAL SCHEMATIC DIAGRAM**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	200	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	200	V
V _{GS}	Gate-source Voltage	± 20	V
I _D	Drain Current (continuous) at T _c = 25 °C	18	A
I _D	Drain Current (continuous) at T _c = 100 °C	11	A
I _{DM(•)}	Drain Current (pulsed)	72	A
P _{tot}	Total Dissipation at T _c = 25 °C	125	W
	Derating Factor	1.0	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	5	V/ns
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

(1) I_{SD} ≤ 18A, di/dt ≤ 300 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

IRF640S

THERMAL DATA

			3.12	
R _{thj-case}	Thermal Resistance Junction-case	Max	1.0	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	62.5	°C/W
R _{thc-sink}	Thermal Resistance Case-sink	Typ	0.5	°C/W
T _I	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)	18	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	280	mJ

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA V _{GS} = 0	200			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating T _c = 125 °C			1 10	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} I _D = 250 μA	2	3	4	V
R _{D(on)}	Static Drain-source On Resistance	V _{GS} = 10 V I _D = 9 A		0.15	0.18	Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} × R _{D(on)max} V _{GS} = 10 V	18			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{D(on)max} I _D = 9 A	3	4		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		1200 200 60	1560 260 80	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 100 \text{ V}$ $I_D = 9 \text{ A}$ $R_G = 4.7 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 3)		13 27	17 35	ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 160 \text{ V}$ $I_D = 18 \text{ A}$ $V_{GS} = 10 \text{ V}$		55 10 21	72	nC nC nC

SWITCHING OFF

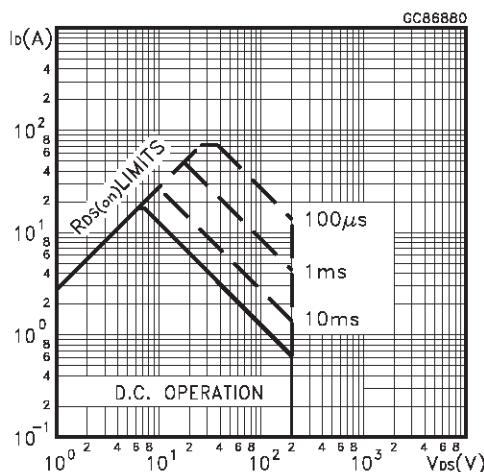
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(V_{off})}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 160 \text{ V}$ $I_D = 18 \text{ A}$ $R_G = 4.7 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		21 25 50	27 32 65	ns ns ns

SOURCE DRAIN DIODE

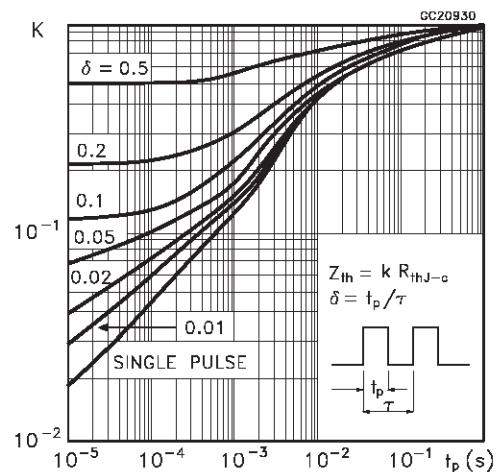
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				18 72	A A
$V_{SD} (\ast)$	Forward On Voltage	$I_{SD} = 18 \text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 18 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 50 \text{ V}$ $T_j = 150 \text{ }^\circ\text{C}$ (see test circuit, figure 5)		240 1.8 15		ns μC A

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %(\bullet) Pulse width limited by safe operating area

Safe Operating Area

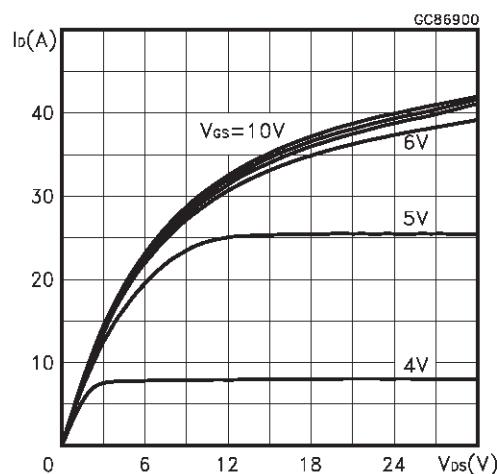


Thermal Impedance

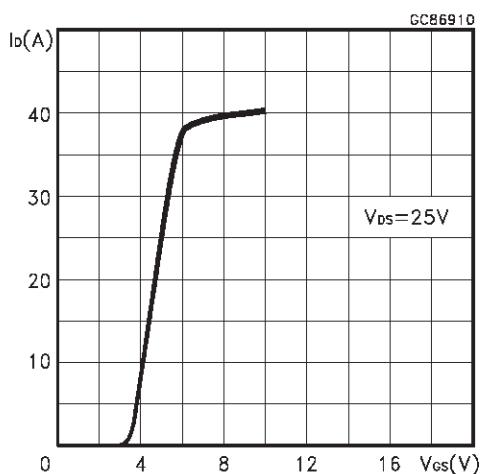


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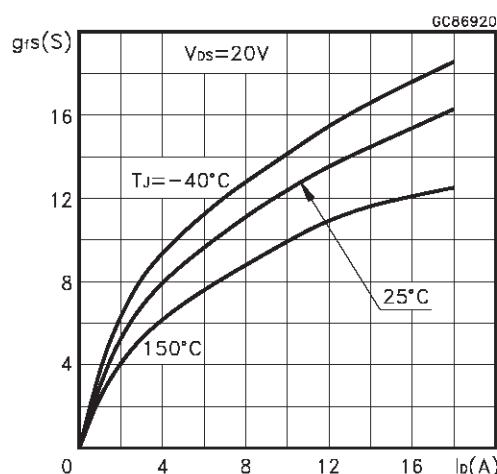
Output Characteristics



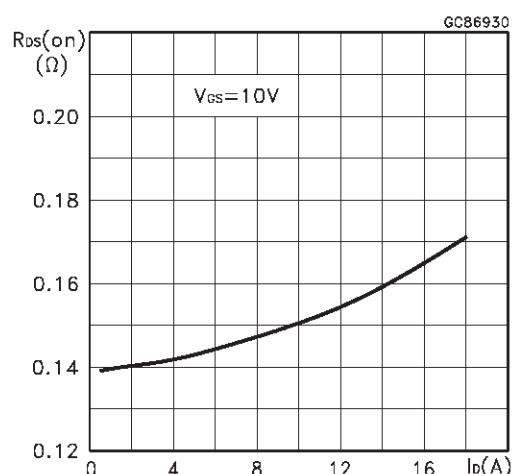
Transfer Characteristics



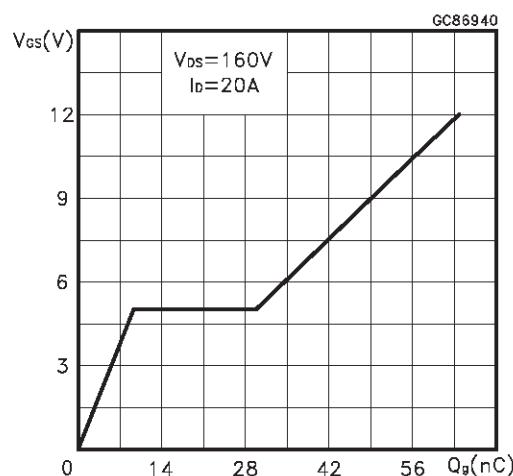
Transconductance



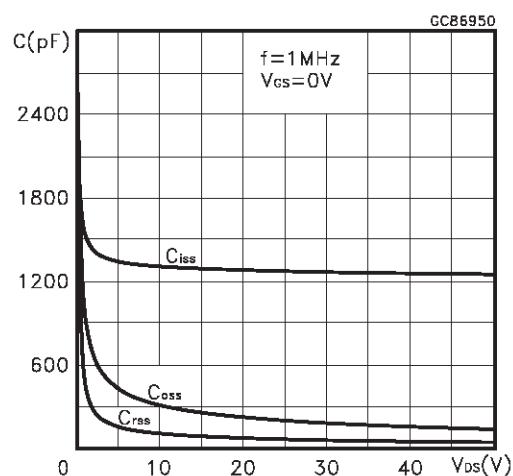
Static Drain-source On Resistance



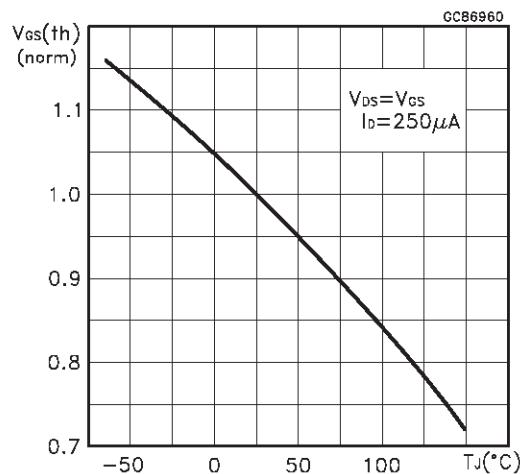
Gate Charge vs Gate-source Voltage



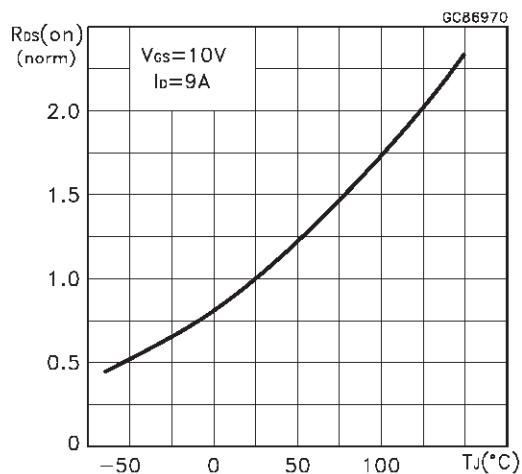
Capacitance Variations



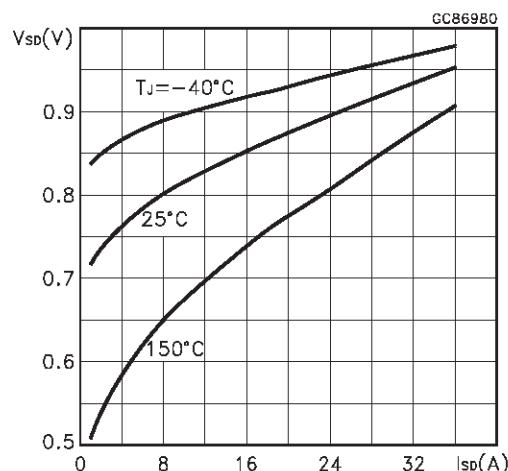
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



IRF640S

Fig. 1: Unclamped Inductive Load Test Circuit

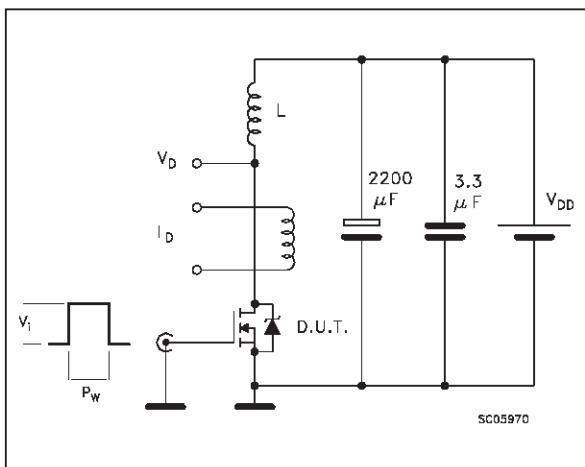


Fig. 1: Unclamped Inductive Waveform

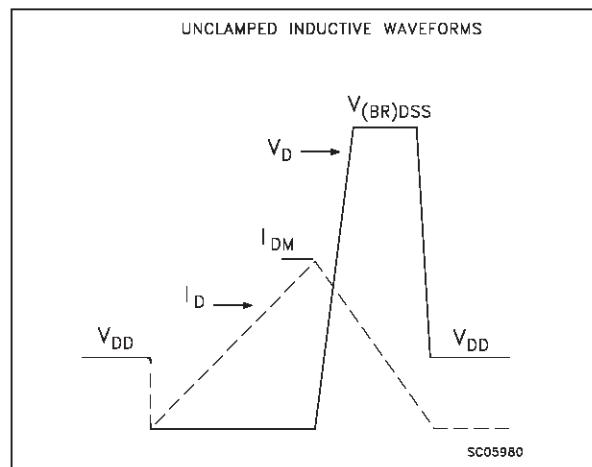


Fig. 3: Switching Times Test Circuits For Resistive Load

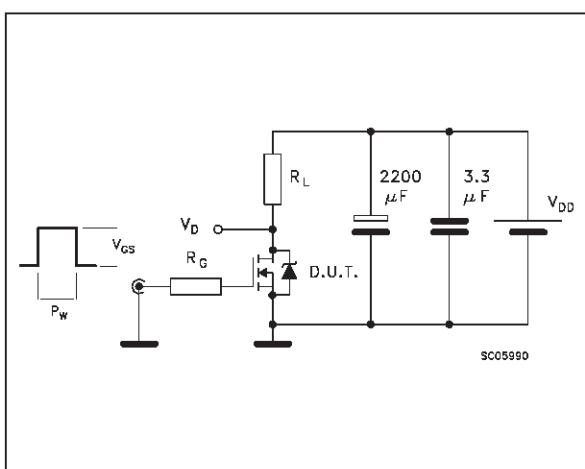


Fig. 4: Gate Charge test Circuit

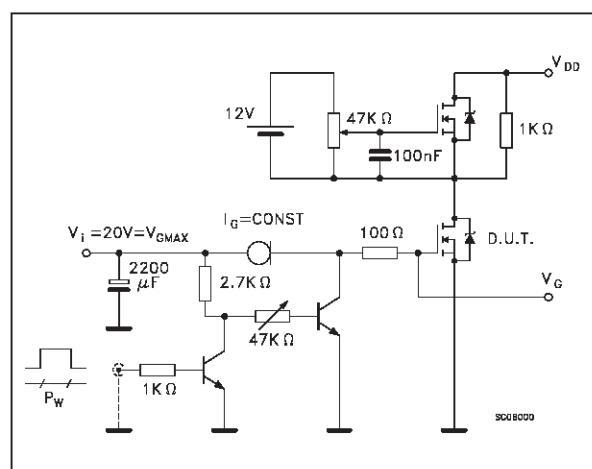
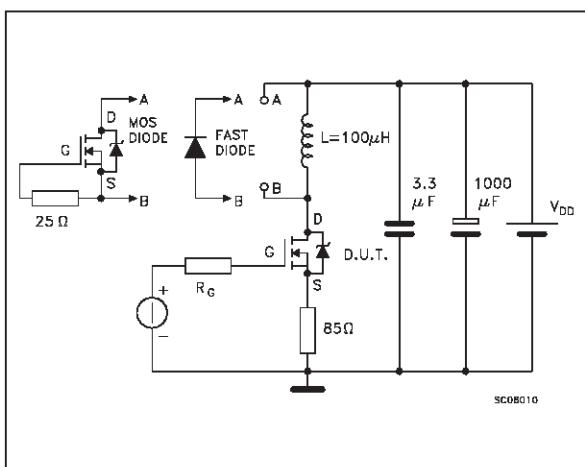
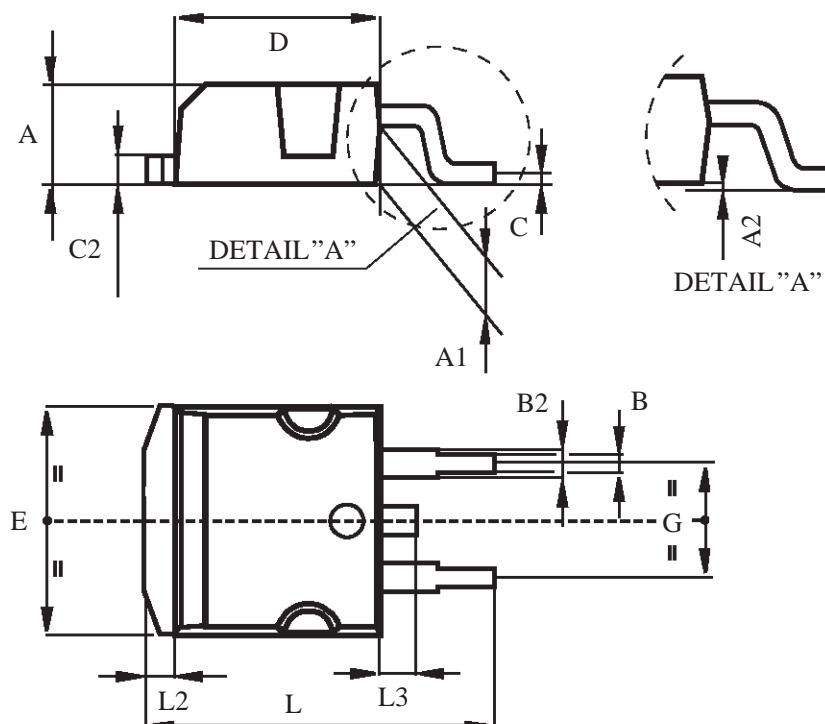


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-263 (D²PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.21		1.36	0.047		0.053
D	8.95		9.35	0.352		0.368
E	10		10.4	0.393		0.409
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068



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