



# UF9640

Power MOSFET

## 11 Amps, 200 Volts P-CHANNEL POWER MOSFET

### DESCRIPTION

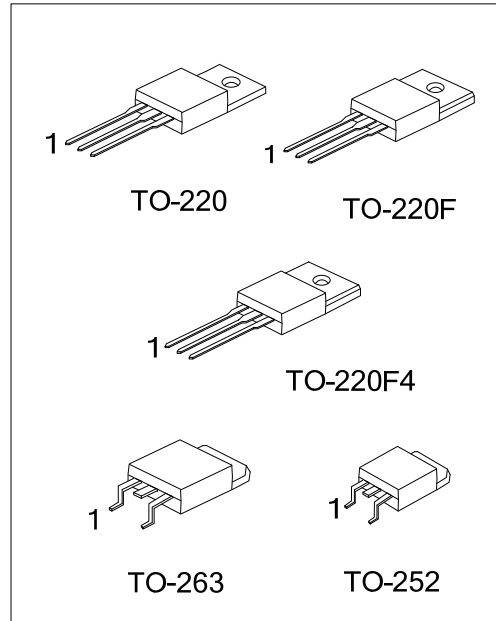
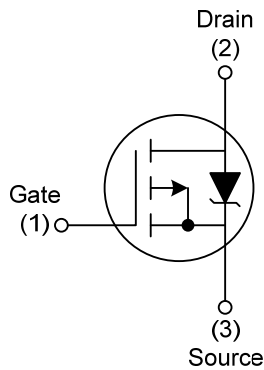
The **UF9640** is a P-channel Power MOSFET that developed by UTC's advanced technology. The device has an advantage of including fast switching, low on-resistance, ruggedized device design and low cost-effectiveness.

This type of package is generally applied in applications in the commercial-industrial field especially suitable for the power consumption at approximately 50W. Because of its low package cost and low thermal resistance, this package is widely applied in the industry field.

### FEATURES

- \* Fast switching speed
- \* P-channel MOSFET
- \* Repetitive avalanche rated
- \* Simple drive requirements
- \* Ease of paralleling

### SYMBOL



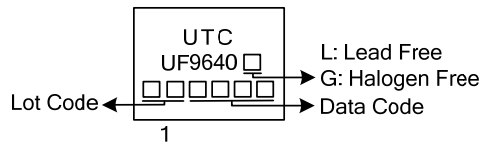
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UF9640L-TA3-T	UF9640G-TA3 -T	TO-220	G	D	S	Tube
UF9640L-TF3-T	UF9640G-TF3 -T	TO-220F	G	D	S	Tube
UF9640L-TF34-T	UF9640G-TF34-T	TO-220F4	G	D	S	Tube
UF9640L-TN3-R	UF9640G-TN3 -R	TO-252	G	D	S	Tape Reel
UF9640L-TQ2-T	UF9640G-TQ2 -T	TO-263	G	D	S	Tube
UF9640L-TQ2-R	UF9640G-TQ2 -R	TO-263	G	D	S	Tape Reel

Note: Pin Assignment: G: Gate D: Drain S: Source

<p>UF9640L-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF34: TO-220F4 TN3: TO-252, TQ2: TO-263</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Gate to Source Voltage		V <sub>GSS</sub>	±20	V
Avalanche Current (Note 1)		I <sub>AR</sub>	-11	A
Drain Current	Continuous	I <sub>D</sub>	-11	A
	Pulsed (Note 1)	I <sub>DM</sub>	-44	A
Avalanche Energy	Single Pulsed (Note 2)	E <sub>AS</sub>	700	mJ
	Repetitive (Note 1)	E <sub>AR</sub>	13	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	-5.0	V/ns
Power Dissipation	TO-220/TO-263	P <sub>D</sub>	73	W
	TO-220F/TO-220F4		38	
	TO-252		48	
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature		T <sub>STG</sub>	-55 ~ +150	°C

Notes: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER		SYMBOL	PATINGS	UNIT
Junction-to-Ambient	TO-220/TO-220F	θ <sub>JA</sub>	62.5	°C/W
	TO-220F4/TO-263			
	TO-252			
Junction-to-Case	TO-220/TO-263	θ <sub>JC</sub>	1.71	°C/W
	TO-220F/TO-220F4		3.31	
	TO-252		2.6	

■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-200			V
Breakdown Voltage Temp. Coefficient	ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =-1mA, Referenced to 25°C		-0.20		V/°C
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =-200V, V <sub>GS</sub> =0V			-100	μA
Gate-Source Leakage Current	Forward	V <sub>GS</sub> =+20V			+100	nA
	Reverse	V <sub>GS</sub> =-20V			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-2.0		-4.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-6.6A (Note 4)			0.50	Ω
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-50V, I <sub>D</sub> =-6.6A (Note 4)	4.1			S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =-25V, V <sub>GS</sub> =0V, f=1.0MHz		1200		pF
Output Capacitance	C <sub>OSS</sub>			370		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			81		pF
Internal Source Inductance	L <sub>S</sub>			7.5		nH
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =-160V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-11A (Note4)			44	nC
Gate-Source Charge	Q <sub>GS</sub>				7.1	nC
Gate-Drain Charge	Q <sub>GD</sub>				27	nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =-100V, I <sub>D</sub> =-11A, R <sub>G</sub> =9.1Ω, R <sub>D</sub> =8.6Ω (Note 4)		14		ns
Turn-ON Rise Time	t <sub>R</sub>			43		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			39		ns
Turn-OFF Fall Time	t <sub>F</sub>			38		ns
Internal Drain Inductance	L <sub>D</sub>	Between lead, 6mm (0.25in.) from package and center of die contact		4.5		nH
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				-11	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				-44	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =-11A, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C			-5.0	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =-11A, T <sub>J</sub> =25°C		250	300	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	di/dt=100A/μs (Note 4)		2.9	3.6	μC
Forward Turn-On Time	t <sub>ON</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

Notes: 1. Repetitive Rating : Pulse width limited by maximum junction temperature

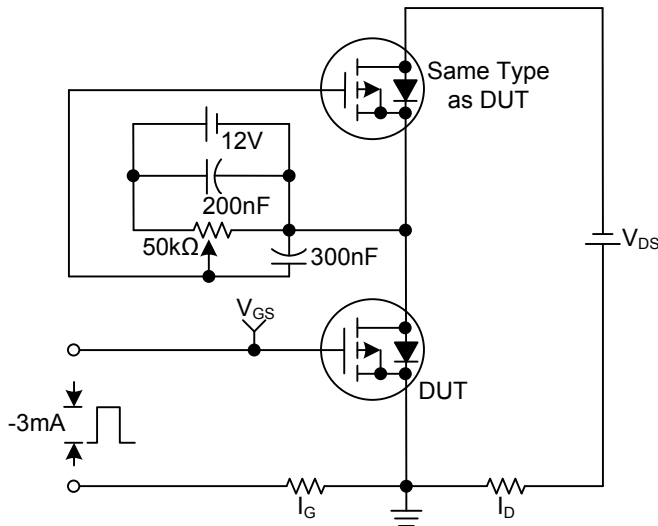
2. V<sub>DD</sub>=-50V, Starting T<sub>J</sub>=25°C, L=8.7mH, R<sub>G</sub>=25Ω, I<sub>AS</sub>=-11A

3. I<sub>SD</sub> ≤ -11A, di/dt ≤ 150A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub>=150°C

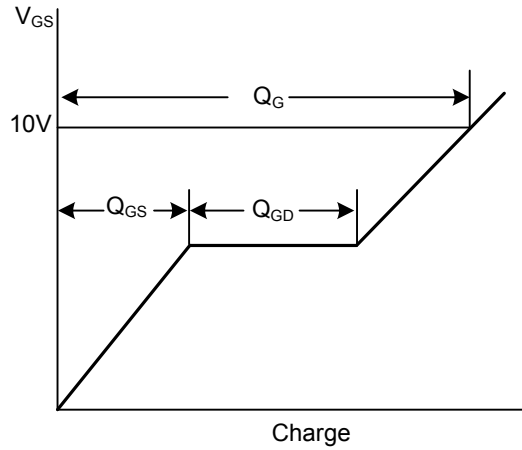
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

## ■ TEST CIRCUITS AND WAVEFORMS

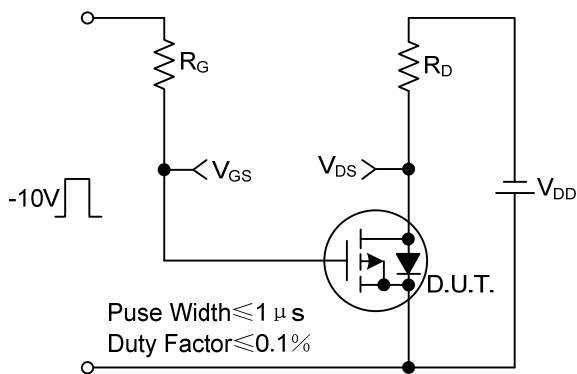
Gate Charge Test Circuit



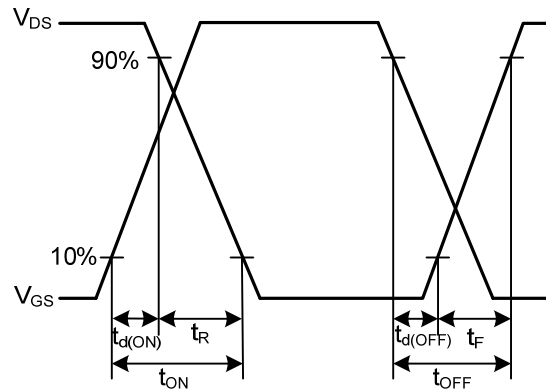
Gate Charge Waveforms



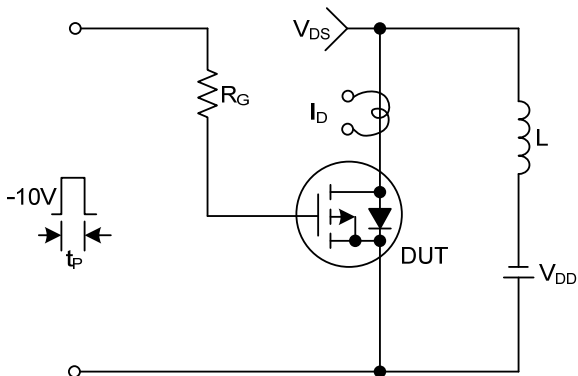
Resistive Switching Test Circuit



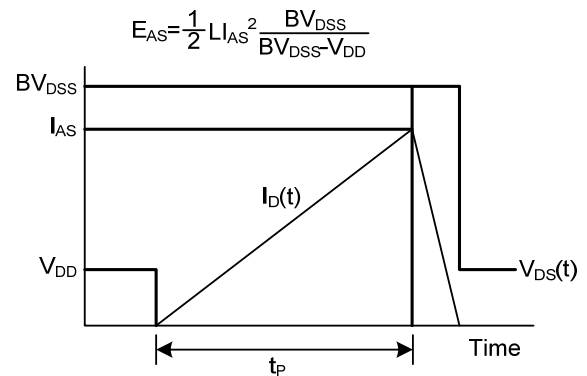
Resistive Switching Waveforms



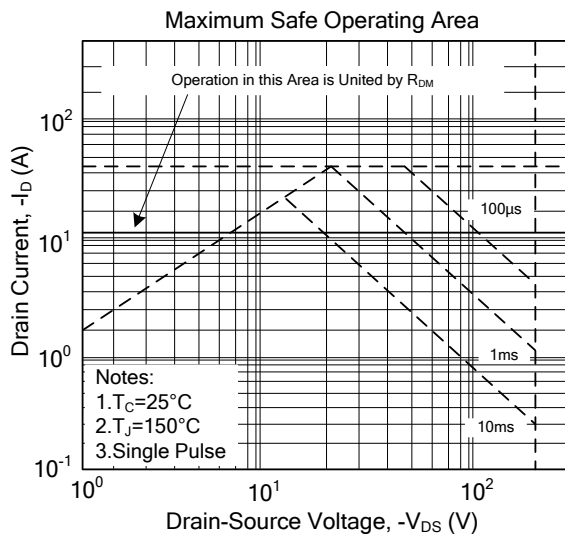
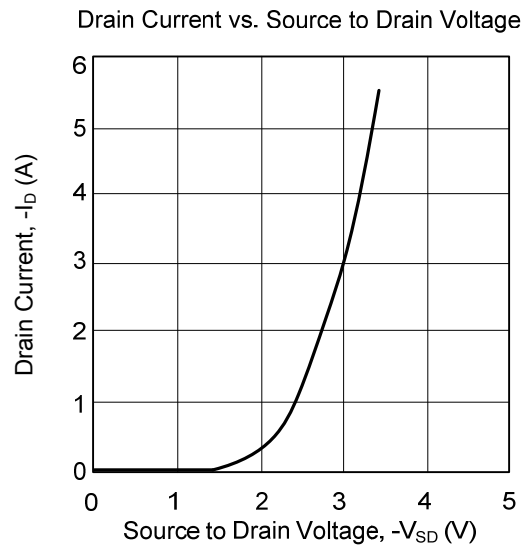
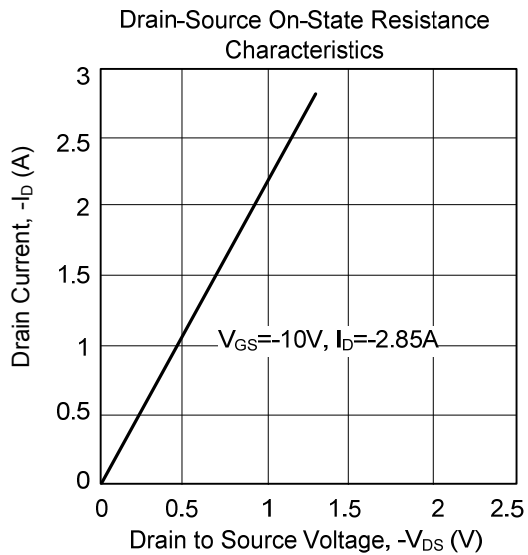
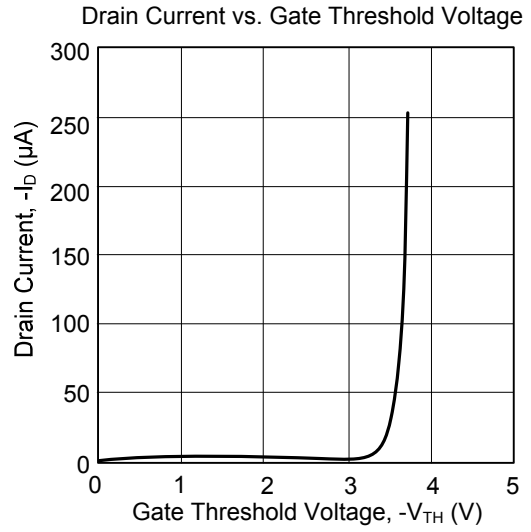
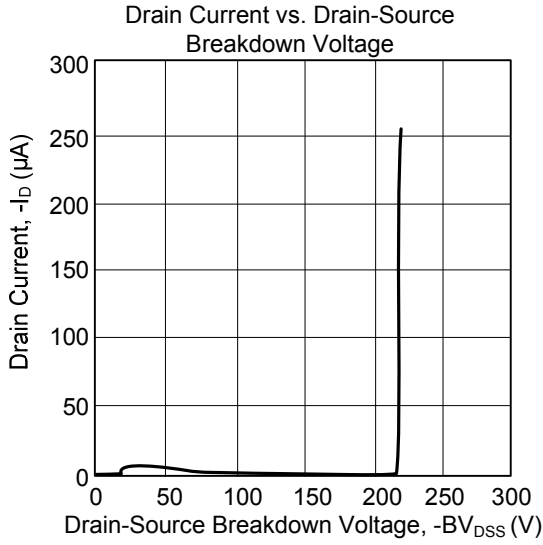
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



## ■ TYPICAL CHARACTERISTICS



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