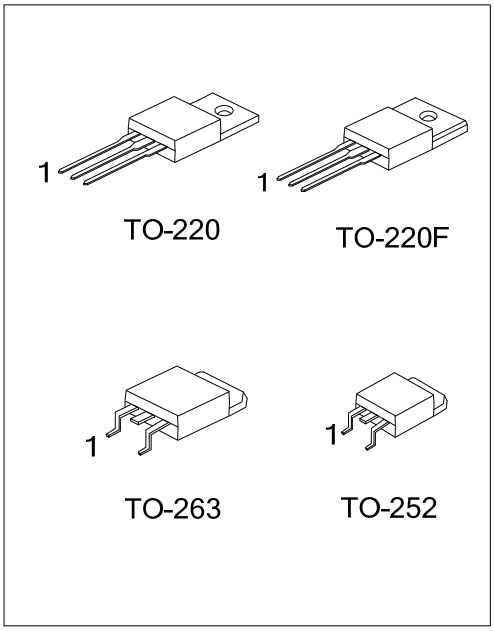
UF9640

Power MOSFET

11 Amps, 200 Volts
P-CHANNEL POWER MOSFET



■ DESCRIPTION

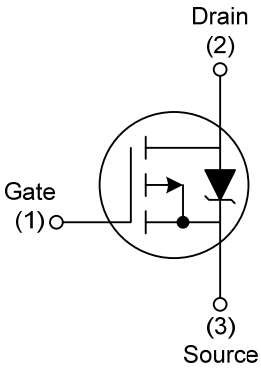
The **UF9640** is a P-channel Power MOSFET that developed by UTC's advanced technlogy. The device has an advantage of including fast switching, low on-resistance, ruggedized device design and low cost-effectiveness.

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



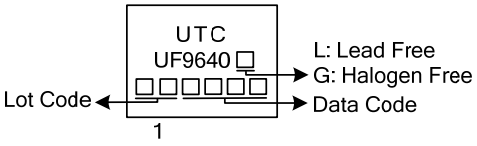
■ ORDERING INFORMATION

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-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

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

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Gate to Source Voltage		V_{GSS}	±20	V
Avalanche Current (Note 1)		I_{AR}	-11	A
Drain Current	Continuous	I_D	-11	A
	Pulsed (Note 1)	I_{DM}	-44	A
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	700	mJ
	Repetitive (Note 1)	E_{AR}	13	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	-5.0	V/ns
Power Dissipation	TO-220/TO-263	P_D	73	W
	TO-220F		38	
	TO-252		48	
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-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 TO-263	θ_{JA}	62.5	°C/W
	TO-252		110	
Junction-to-Case	TO-220/TO-263	θ_{JC}	1.71	°C/W
	TO-220F		3.31	
	TO-252		2.6	

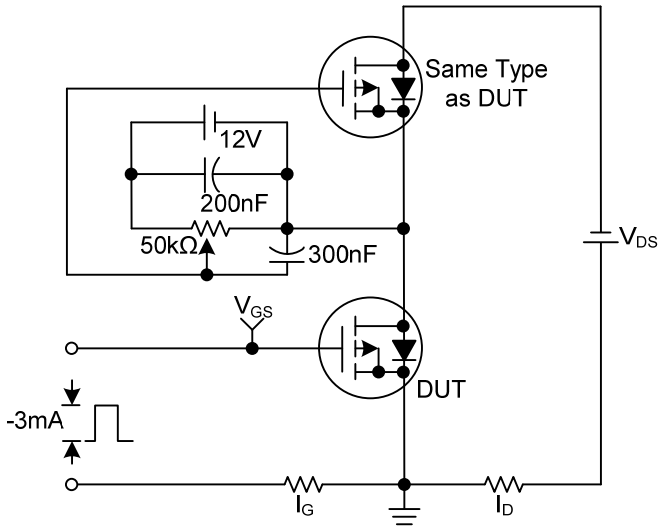
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	V_{GS}=0V, I_D=-250μA	-200			V
Breakdown Voltage Temp. Coefficient		$\Delta V_{(BR)DSS}/\Delta T_J$	I_D=-1mA, Referenced to 25°C		-0.20		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=-200V, V_{GS}=0V			-100	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V			+100	nA
	Reverse		V_{GS}=-20V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=-250μA	-2.0		-4.0	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=-10V, I_D=-6.6A (Note 4)			0.50	Ω
Forward Transconductance		g_{FS}	V_{DS}=-50V, I_D=-6.6A (Note 4)	4.1			S
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{DS}=-25V,V_{GS}=0V,f=1.0MHz		1200		pF
Output Capacitance		C_{OSS}			370		pF
Reverse Transfer Capacitance		C_{RSS}			81		pF
Internal Source Inductance		L_S			7.5		nH
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=-160V, V_{GS}=-10V, I_D=-11A (Note4)			44	nC
Gate-Source Charge		Q_{GS}				7.1	nC
Gate-Drain Charge		Q_{GD}				27	nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=-100V,I_D=-11A,R_G=9.1Ω, R_D=8.6Ω (Note 4)		14		ns
Turn-ON Rise Time		t_R			43		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			39		ns
Turn-OFF Fall Time		t_F			38		ns
Internal Drain Inductance		L_D	Between lead, 6mm (0.25in.) from package and center of die contact		4.5		nH
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				-11	A
Maximum Body-Diode Pulsed Current		I_{SM}				-44	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S =-11A, V_{GS}=0V, T_J=25°C			-5.0	V
Body Diode Reverse Recovery Time		t_{RR}	I_F=-11A, T_J=25°C dI/dt=100A/μs (Note 4)		250	300	ns
Body Diode Reverse Recovery Charge		Q_{RR}			2.9	3.6	μC
Forward Turn-On Time		t_{ON}	Intrinsic turn-on time is neglegibal (turn-on is dominated by L_S+L_D)				

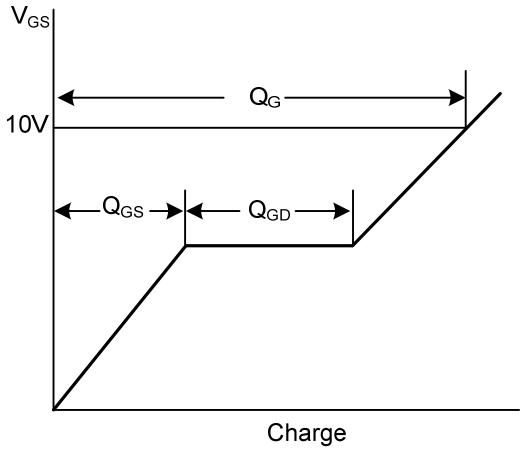
Notes: 1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. V_{DD}=-50V, Starting T_J=25°C, L=8.7mH, R_G=25Ω, I_{AS}=-11A
3. I_{SD} ≤-11A, di/dt ≤150A/μs, V_{DD} ≤BV_{DSS}, Starting T_J=150°C
4. Pulse Test : Pulse width≤300μs, Duty cycle≤2%

■ TEST CIRCUITS AND WAVEFORMS

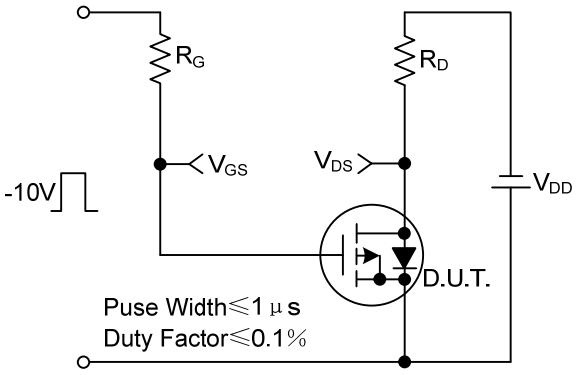
Gate Charge Test Circuit



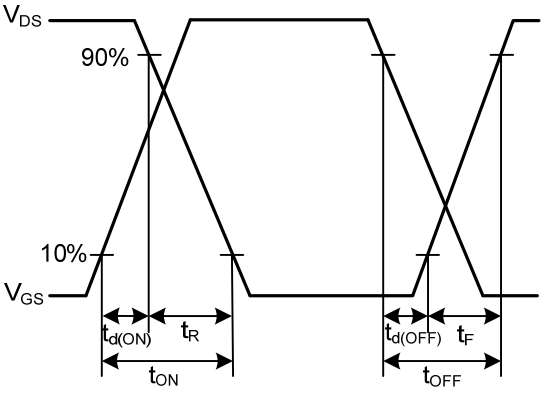
Gate Charge Waveforms



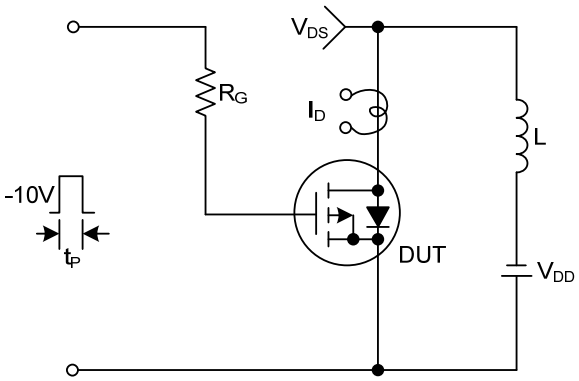
Resistive Switching Test Circuit



Resistive Switching Waveforms

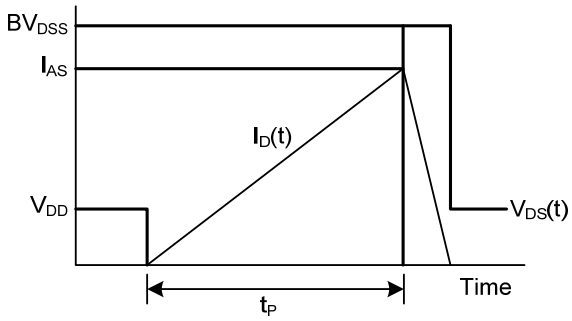


Unclamped Inductive Switching Test Circuit



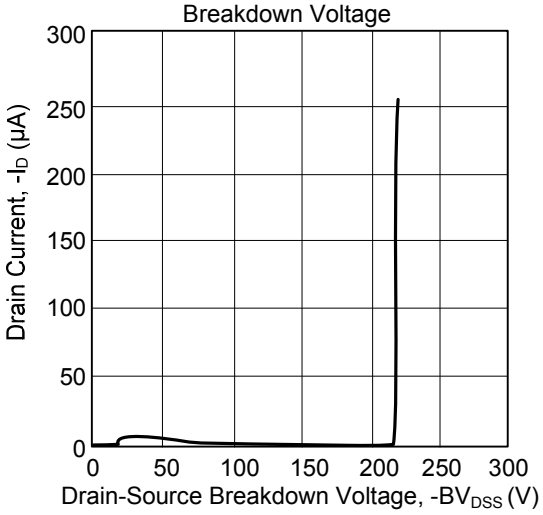
Unclamped Inductive Switching Waveforms

$$E_{AS}=\frac{1}{2}LI_{AS}^{2}\frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$

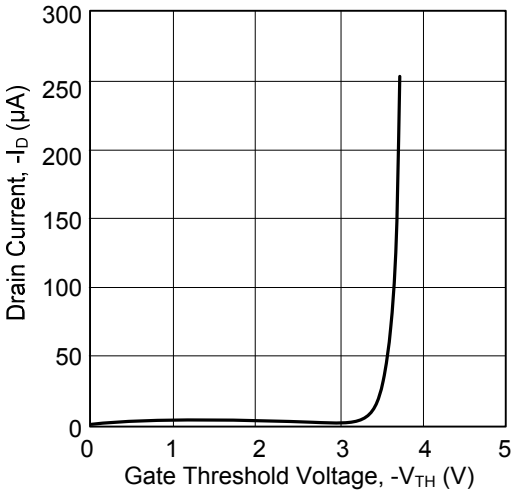


■ TYPICAL CHARACTERISTICS

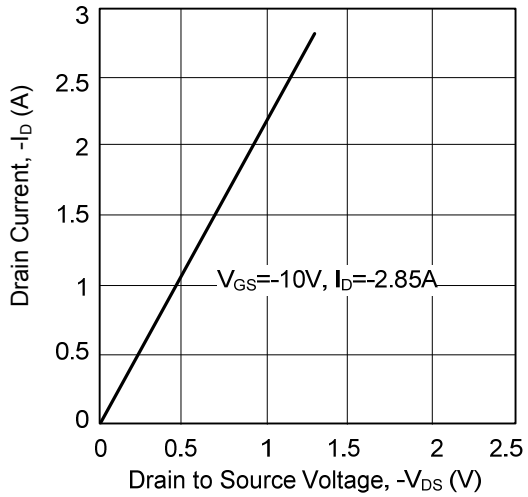
Drain Current vs. Drain-Source Breakdown Voltage



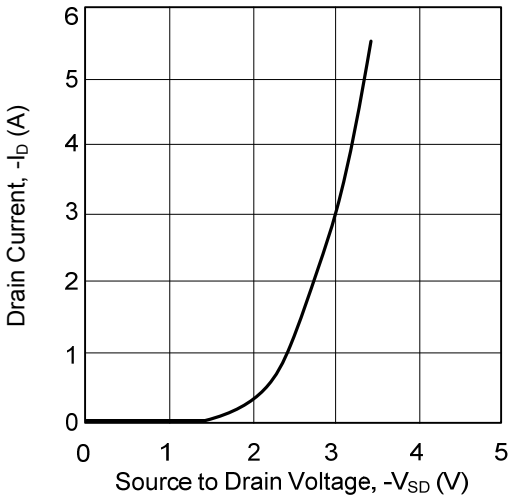
Drain Current vs. Gate Threshold Voltage



Drain-Source On-State Resistance Characteristics



Drain Current vs. Source to Drain Voltage



Maximum Safe Operating Area