



USG04R022M

Preliminary

POWER MOSFET

80A, 40V N-CHANNEL SGT ENHANCEMENT POWER MOSFET

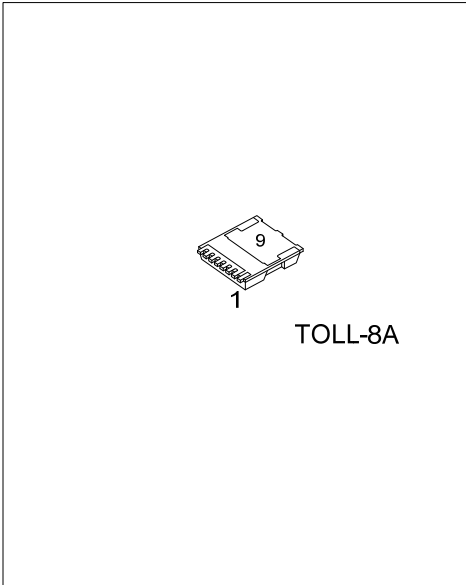
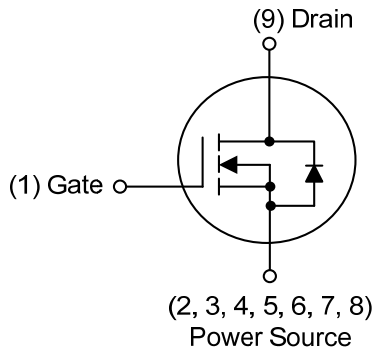
DESCRIPTION

The UTC **USG04R022M** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with low $R_{DS(ON)}$ characteristic by high cell density trench technology.

FEATURES

- * $R_{DS(ON)} \leq 2.2 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=20\text{A}$
- * $R_{DS(ON)} \leq 3.2 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=20\text{A}$
- * Extremely low on-resistance $R_{DS(ON)}$
- * Excellent Low Ciss

SYMBOL



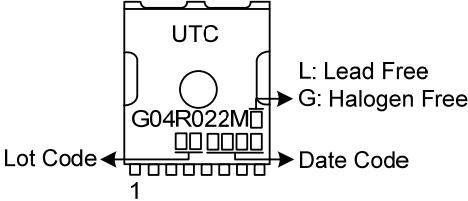
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment									Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9	
USG04R022ML-T8A-R	USG04R022MG-T8A-R	TOLL-8A	G	S	S	S	S	S	S	S	S	Tape Reel

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

USG04R022MG-T8A-R	(1)Packing Type	(1) R: Tape Reel
	(2)Package Type	(2) T8A: TOLL-8A
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

MARKING



■ ABSOLUTE MAXIMUM RATING ($T_C=25^\circ\text{C}$ unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DSS}	40	V
Gate-Source Voltage	V_{GSS}	± 20	V
Drain Current	DC	I_D	80
	Pulsed (Note 2)	I_{DM}	160
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	331
Peak Diode Recovery dv/dt (Note 4)	dv/dt	0.71	V/ns
Power Dissipation	P_D	400	W
Junction Temperature	T_J	+150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 ~ +150	$^\circ\text{C}$

- Notes: 1. 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.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $L = 0.1\text{mH}$, $I_{AS} = 57.5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	40	$^\circ\text{C}/\text{W}$
Junction to Case	θ_{JC}	0.313	$^\circ\text{C}/\text{W}$

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

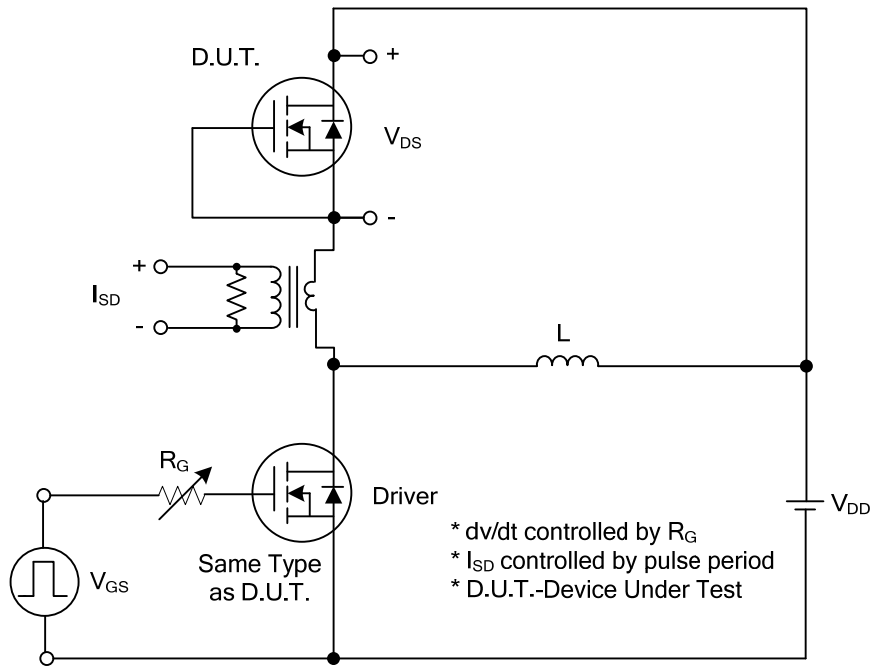
■ ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	40			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V			1	μA
Gate-Source Leakage Current	Forward	I _{GSS} V _{GS} =+20V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-20V, V _{DS} =0V			-100
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D =250μA	1.0		2.5	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} = 10V, I _D =20A		1.8	2.2	mΩ
		V _{GS} = 4.5V, I _D =20A			3.2	mΩ
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		6204		pF
Output Capacitance	C _{OSS}			1610		pF
Reverse Transfer Capacitance	C _{RSS}			28.8		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q _G	V _{DS} =20V, V _{GS} =10V, I _D =20A (Note 1, 2)		147		nC
Gate to Source Charge	Q _{GS}			22		nC
Gate to Drain Charge	Q _{GD}			25		nC
Turn-ON Delay Time	t _{D(ON)}	V _{DD} =20V, V _{GS} =10V, I _D =20A, R _G =3Ω (Note 1, 2)		11		ns
Rise Time	t _R			18		ns
Turn-OFF Delay Time	t _{D(OFF)}			101		ns
Fall-Time	t _F			58		ns
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				80	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				160	A
Diode Forward Voltage	V _{SD}	I _F =80A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)	t _{rr}	I _S =30A, V _{GS} =0V, dI _F /dt = 100A/μs		94		ns
Reverse Recovery Charge	Q _{rr}				225	

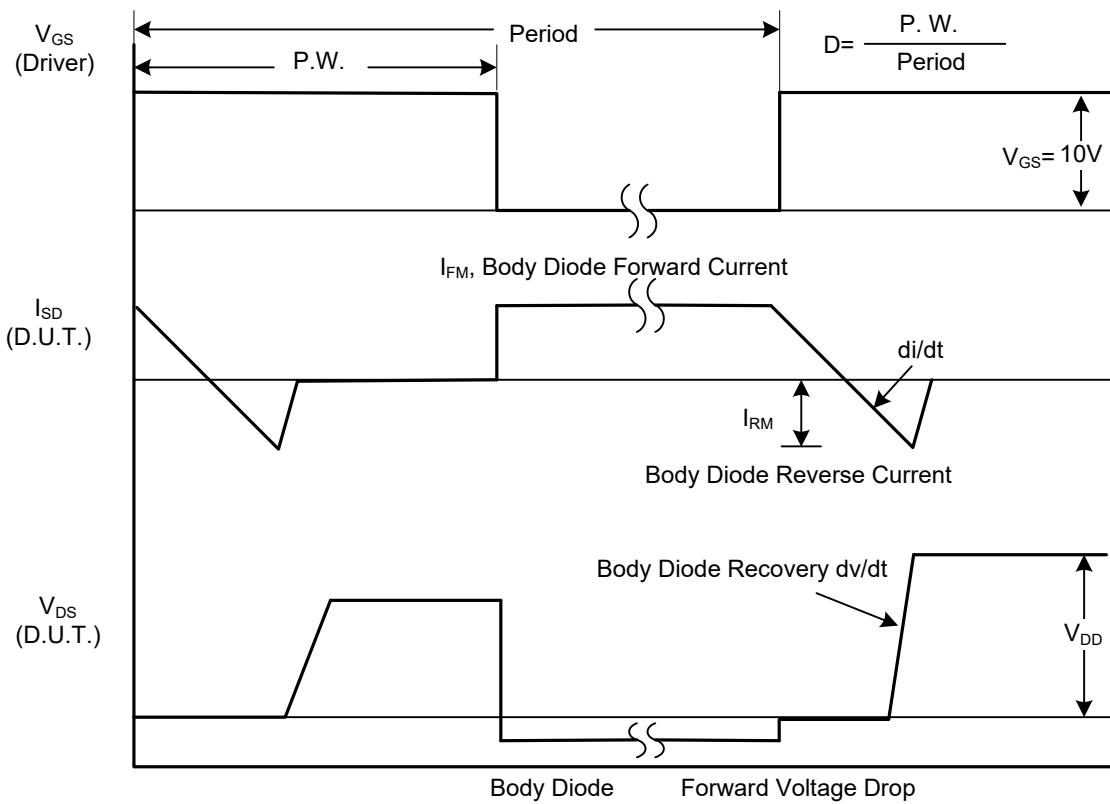
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

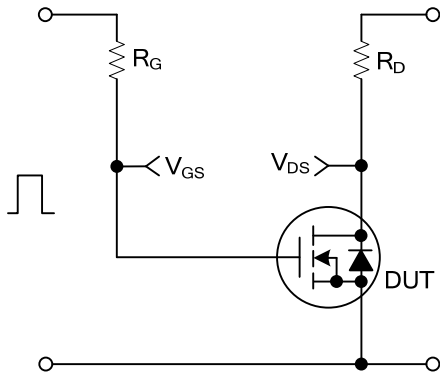


Peak Diode Recovery dv/dt Test Circuit

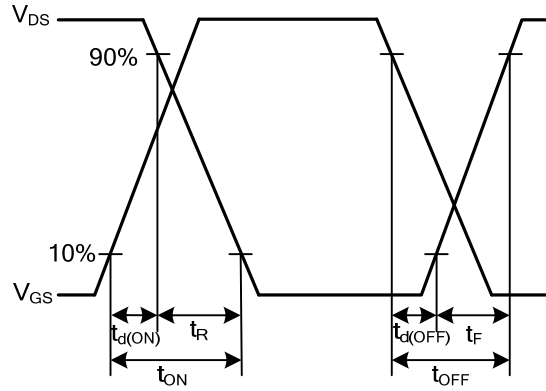


Peak Diode Recovery dv/dt Waveforms

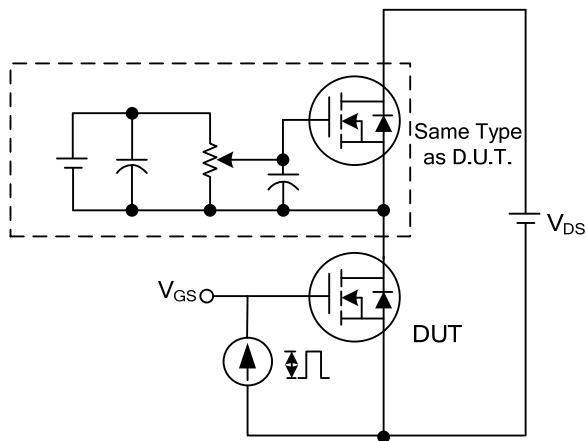
■ TEST CIRCUITS AND WAVEFORMS



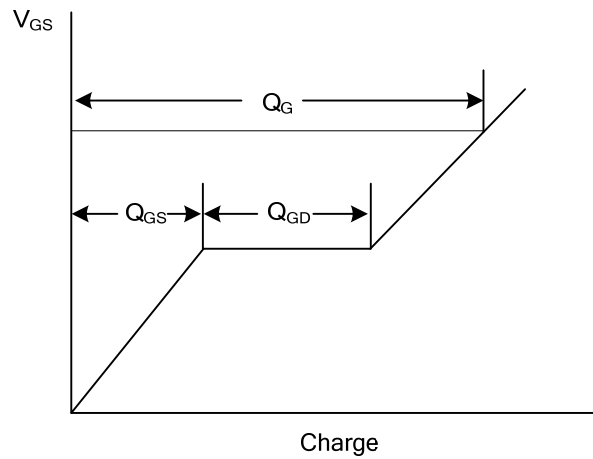
Switching Test Circuit



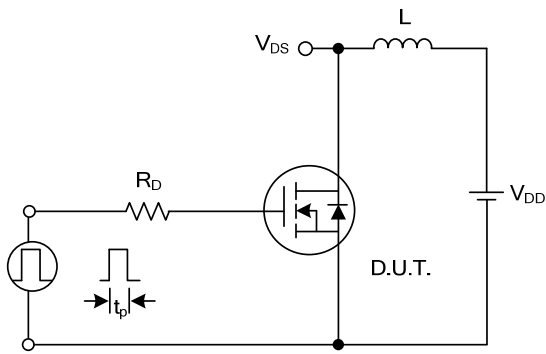
Switching Waveforms



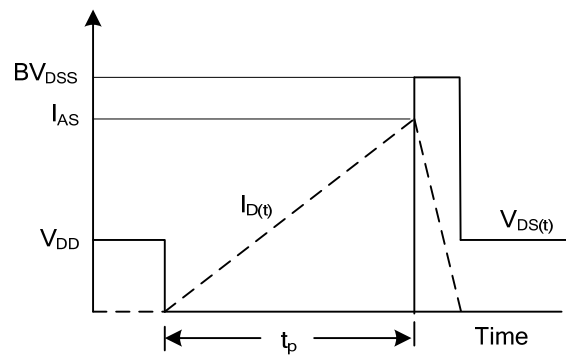
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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