



USG10R050M

Preliminary

Power MOSFET

N-CHANNEL POWER MOSFET

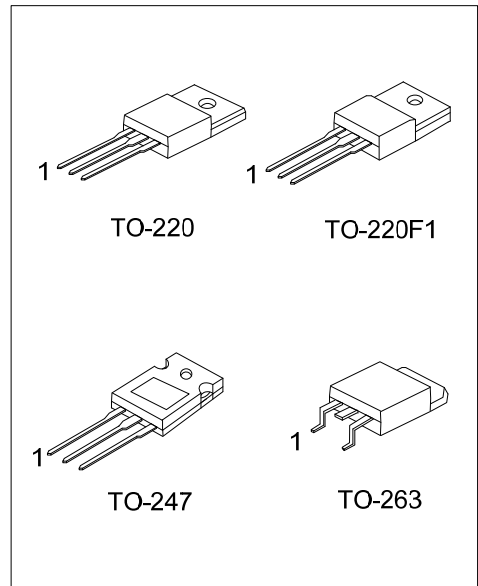
DESCRIPTION

The UTC **USG10R050M** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with high switching speed and low gate charge, etc.

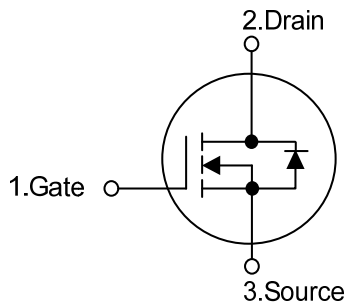
The UTC **USG10R050M** applies to primary side switch, synchronous rectifier, Motor Drives, etc.

FEATURES

- * $R_{DS(ON)} \leq 5.0 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=30\text{A}$
- $R_{DS(ON)} \leq 6.0 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=20\text{A}$
- * High Cell Density Trench Technology
- * High Power and Current Handling Capability



SYMBOL



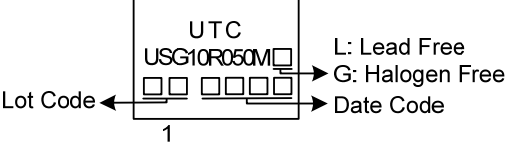
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
USG10R050ML-TA3-T	USG10R050MG-TA3-T	TO-220	G	D	S	Tube
USG10R050ML-TF1-T	USG10R050MG-TF1-T	TO-220F1	G	D	S	Tube
USG10R050ML-T47-T	USG10R050MG-T47-T	TO-247	G	D	S	Tube
USG10R050ML-TQ2-T	USG10R050MG-TQ2-T	TO-263	G	D	S	Tube
USG10R050ML-TQ2-R	USG10R050MG-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>USG10R050MG-TA3-T</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, T47: TO-247, TQ2: TO-263 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



■ ABSOLUTE MAXIMUM RATINGS ($T_c=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	100	V
Gate-Source Voltage		V_{GSS}	± 20	V
Drain Current	Continuous	I_D	135	A
	Pulsed (Note 2)	I_{DM}	270	A
Single Pulsed Avalanche Energy (Note 3)		E_{AS}	22.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.9	V/ns
Power Dissipation	TO-220/TO-263	P_D	145	W
	TO-220F1		48	W
	TO-247		210	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Storage Temperature		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. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

3. $L = 0.1\text{mH}$, $I_{AS} = 21.2\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, $T_J \leq T_{JMAX}$, $T_J = 25^\circ\text{C}$.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F1	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-263			
	TO-247			
Junction to Case	TO-220/TO-263	θ_{JC}	0.86	$^\circ\text{C}/\text{W}$
	TO-220F1		2.6	$^\circ\text{C}/\text{W}$
	TO-247		0.59	$^\circ\text{C}/\text{W}$

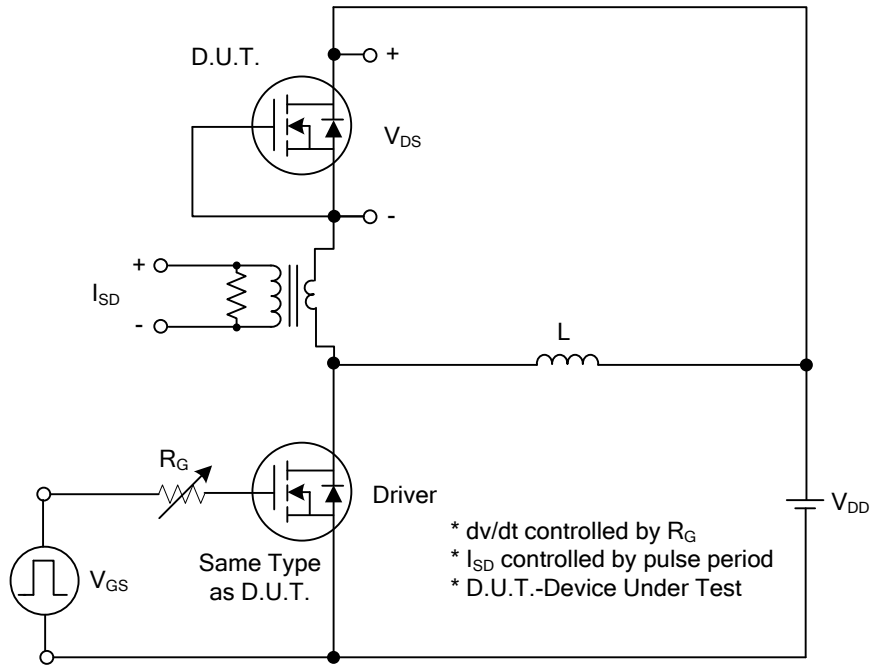
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	100			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =100V, V _{GS} =0V			1	μA
Gate-Source Leakage Current	Forward	V _{GS} =+20V, V _{DS} =0V			+100	nA
	Reverse	V _{GS} =-20V, V _{DS} =0V			-100	nA
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 =30A		3.5	5.0	mΩ
		V _{GS} =4.5V, I _D =20A		4.0	6.0	mΩ
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		5582		pF
Output Capacitance	C _{OSS}			2570		pF
Reverse Transfer Capacitance	C _{RSS}			343		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q _G	V _{DS} =80V, V _{GS} =10V, I _D =80A		186		nC
Gate to Source Charge	Q _{GS}			15		nC
Gate to Drain Charge	Q _{GD}			84		nC
Turn-ON Delay Time	t _{D(ON)}	V _{DD} =50V, V _{GS} =10V, I _D =80A, R _G =3Ω		14		ns
Rise Time	t _R			24		ns
Turn-OFF Delay Time	t _{D(OFF)}			106		ns
Fall-Time	t _F			50		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				135	A
Maximum Body-Diode Pulsed Current	I _{SM}				270	A
Drain-Source Diode Forward Voltage	V _{SD}	I _{SD} =135A			1.4	V
Body Diode Reverse Recovery Time	t _{rr}	I _S =30A, dI/dt=100A/μs		256		ns
Body Diode Reverse Recovery Charge	Q _{rr}				860	

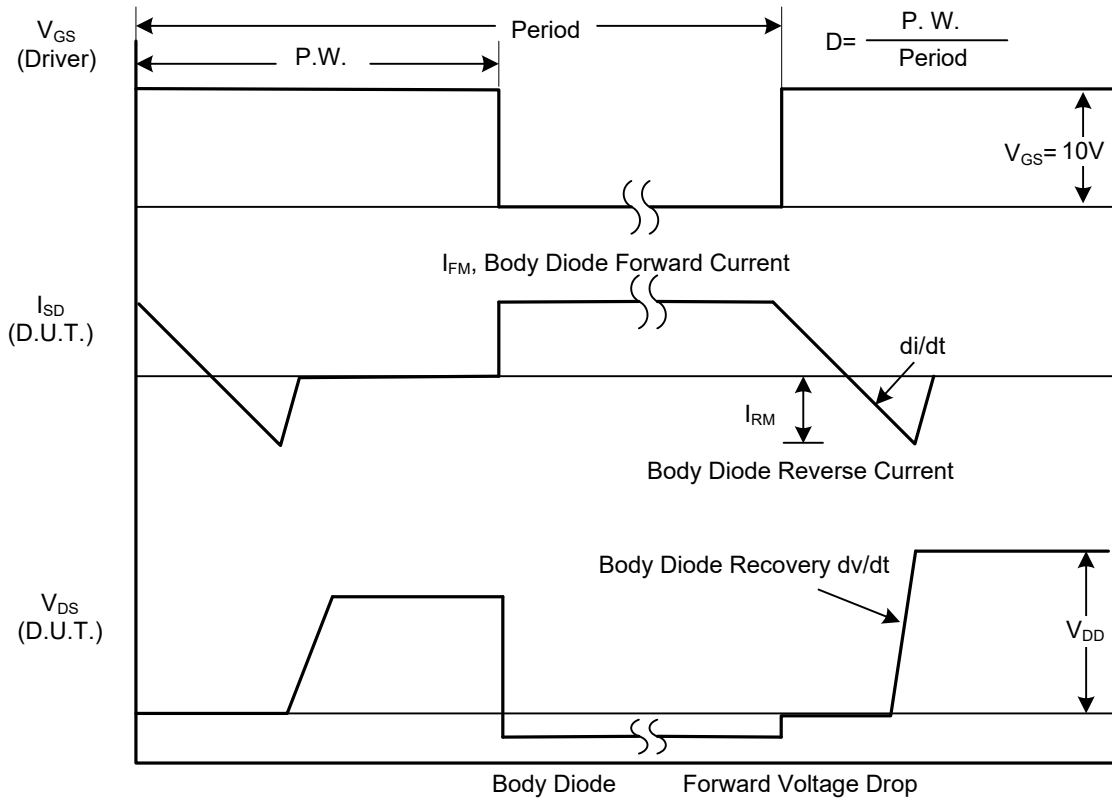
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

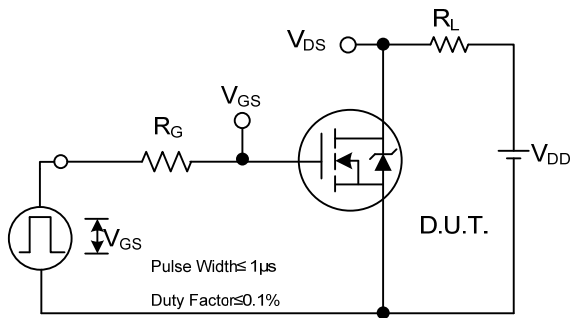


Peak Diode Recovery dv/dt Test Circuit

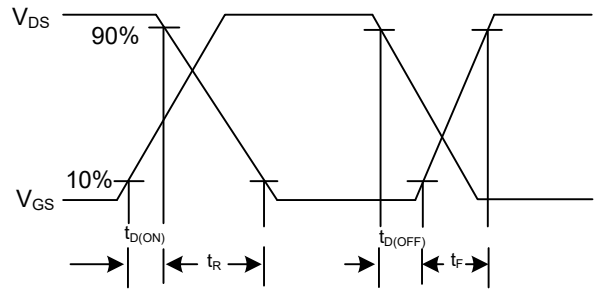


Peak Diode Recovery dv/dt Waveforms

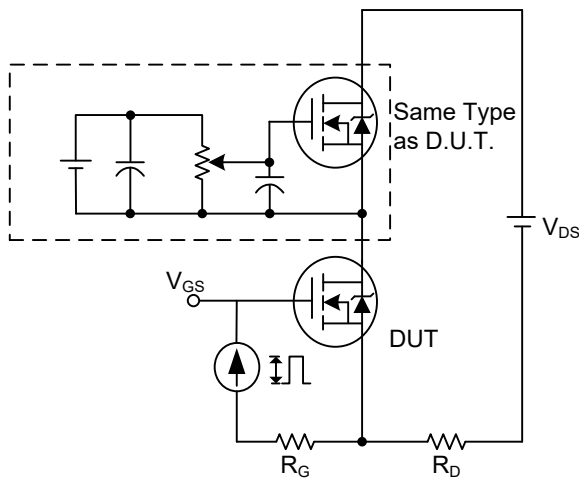
■ TEST CIRCUITS AND WAVEFORMS



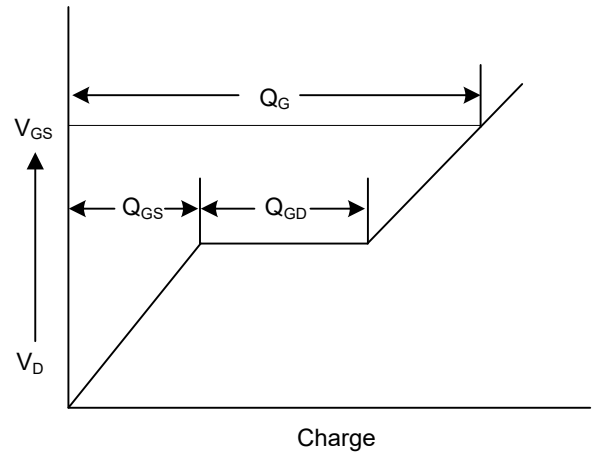
Switching Test Circuit



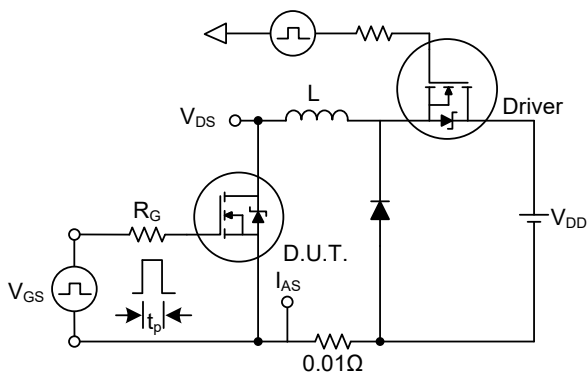
Switching Waveforms



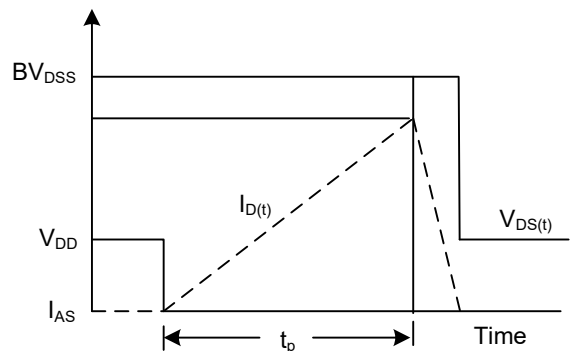
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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