



**USG10R100M**

Preliminary

**Power MOSFET**

**N-CHANNEL SGT  
ENHANCEMENT POWER  
MOSFET**

■ DESCRIPTION

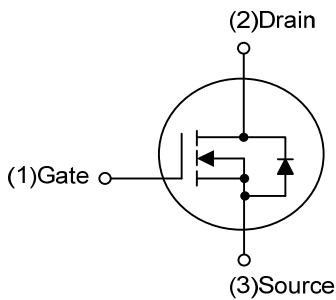
The UTC **USG10R100M** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with high switching speed and low gate charge, etc.

The UTC **USG10R100M** applies to primary side switch, synchronous rectifier, Motor Drives, etc.

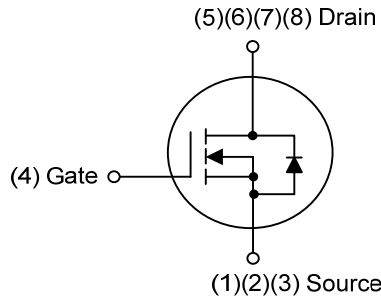
■ FEATURES

- \*  $R_{DS(ON)} \leq 10\text{ m}\Omega$  @  $V_{GS}=10\text{V}$ ,  $I_D=30\text{A}$
- $R_{DS(ON)} \leq 14\text{ m}\Omega$  @  $V_{GS}=4.5\text{V}$ ,  $I_D=30\text{A}$
- \* High Cell Density Trench Technology
- \* High Power and Current Handling Capability

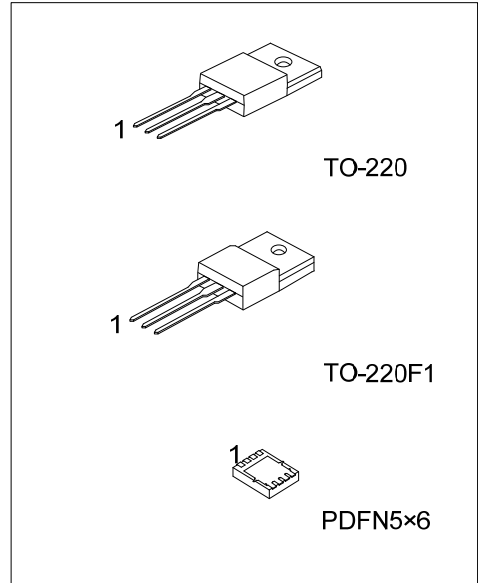
■ SYMBOL



TO-220 / TO-220F1



PDFN5x6



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
USG10R100ML-TA3-T	USG10R100MG-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
USG10R100ML-TF1-T	USG10R100MG-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tape Reel
USG10R100ML-P5060-R	USG10R100MG-P5060-R	PDFN5x6	S	S	S	G	D	D	D	D	Tape Reel

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

<p>USG10R100MG-TA3-T</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> </ul>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF1: TO-220F1, P5060: PDFN5x6</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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### MARKING

TO-220 / TO-220F1	PDFN5×6
<p data-bbox="375 369 550 398">UTC</p> <p data-bbox="375 403 550 432">USG10R100M</p> <p data-bbox="375 436 550 465">□□ □□□□</p> <p data-bbox="375 470 550 499">1</p> <p data-bbox="582 392 742 421">L: Lead Free</p> <p data-bbox="582 425 742 454">G: Halogen Free</p> <p data-bbox="582 459 694 488">Date Code</p> <p data-bbox="231 459 343 488">Lot Code</p>	<p data-bbox="1005 369 1149 398">UTC USG</p> <p data-bbox="1005 403 1149 432">10R100M</p> <p data-bbox="1005 436 1149 465">• □□□□□□</p> <p data-bbox="869 459 981 488">Lot Code</p> <p data-bbox="1189 459 1300 488">Date Code</p>

■ 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		$V_{GSS}$	$\pm 20$	V
Drain Current	Continuous	$I_D$	60	A
	Pulsed (Note 2)	$I_{DM}$	120	A
Single Pulsed Avalanche Energy (Note 3)		$E_{AS}$	31	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.7	V/ns
Power Dissipation	TO-220	$P_D$	90	W
	TO-220F1		30	W
	PDFN5x6		32	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. Repetitive Rating: Pulse width limited by maximum junction temperature.

3.  $L = 0.1\text{mH}$ ,  $I_{AS} = 24.8\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , 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	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	PDFN5x6		65 (Note)	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	1.38	$^\circ\text{C}/\text{W}$
	TO-220F1		4.16	$^\circ\text{C}/\text{W}$
	PDFN5x6		3.9 (Note)	$^\circ\text{C}/\text{W}$

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

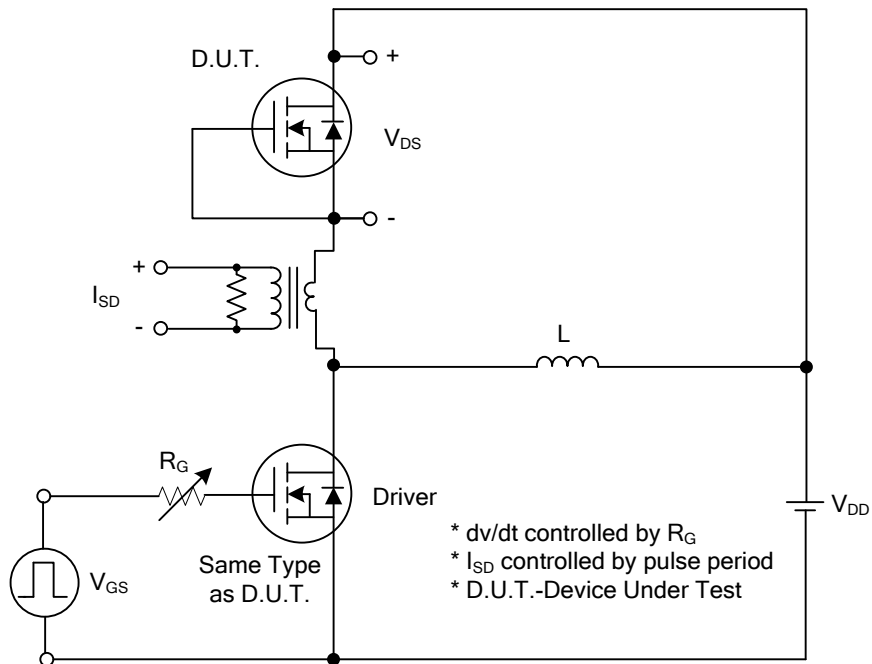
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	100			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=100\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate-Source Leakage Current	Forward	$V_{GS}=+20\text{V}$ , $V_{DS}=0\text{V}$			+100	nA
	Reverse	$V_{GS}=-20\text{V}$ , $V_{DS}=0\text{V}$			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	1.0		2.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=30\text{A}$		8.6	10	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$ , $I_D=30\text{A}$		11.2	14	$\text{m}\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1.0\text{MHz}$		2052		pF
Output Capacitance	$C_{OSS}$			852		pF
Reverse Transfer Capacitance	$C_{RSS}$			107		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=80\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=60\text{A}$		42		nC
Gate to Source Charge	$Q_{GS}$			5.5		nC
Gate to Drain Charge	$Q_{GD}$			17		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=50\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=60\text{A}$ , $R_G=3\Omega$		8.3		ns
Rise Time	$t_R$			17		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			34		ns
Fall-Time	$t_F$			21		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				60	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				120	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_{SD}=60\text{A}$			1.4	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_S=30\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		38		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$				88	

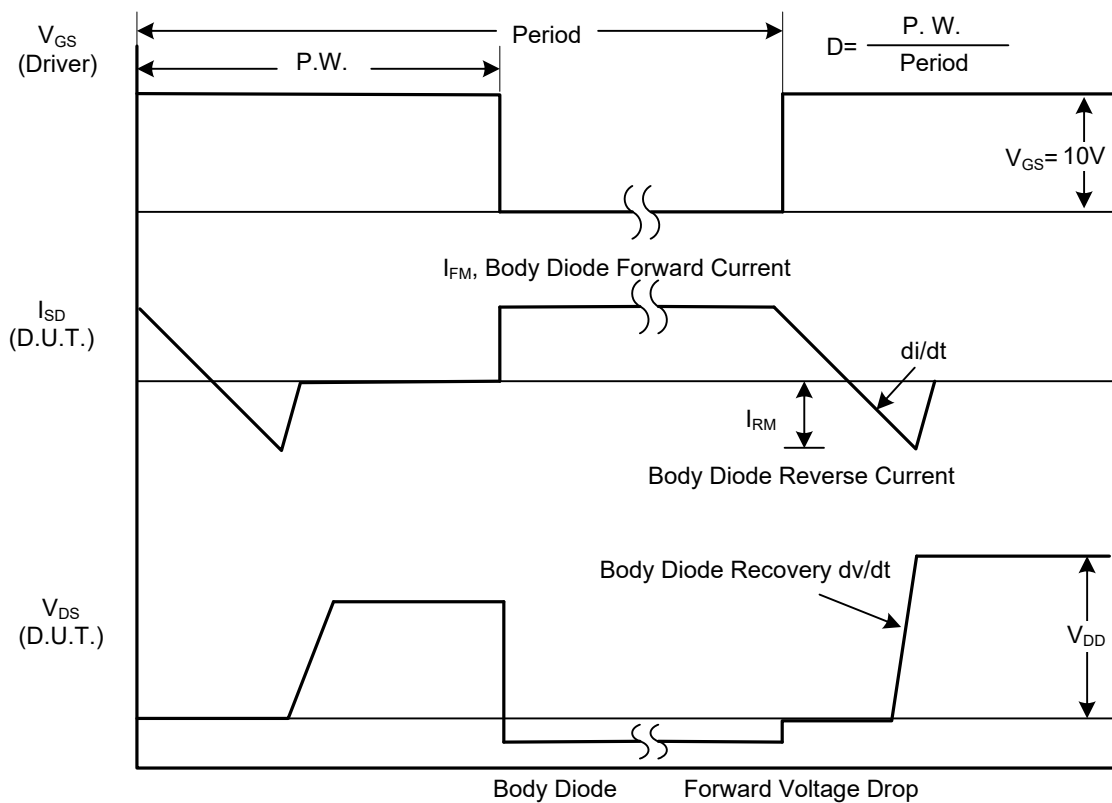
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

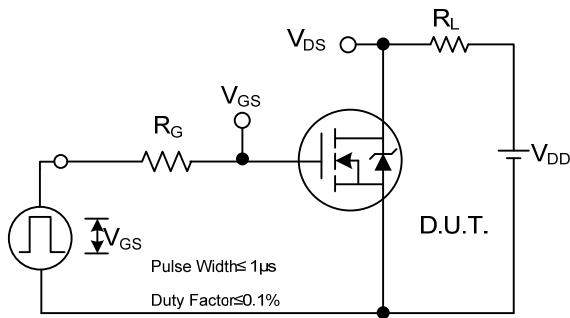


Peak Diode Recovery  $dv/dt$  Test Circuit

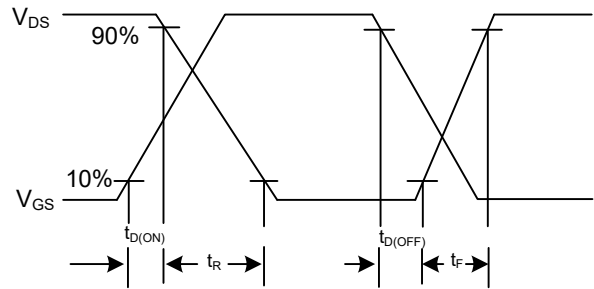


Peak Diode Recovery  $dv/dt$  Waveforms

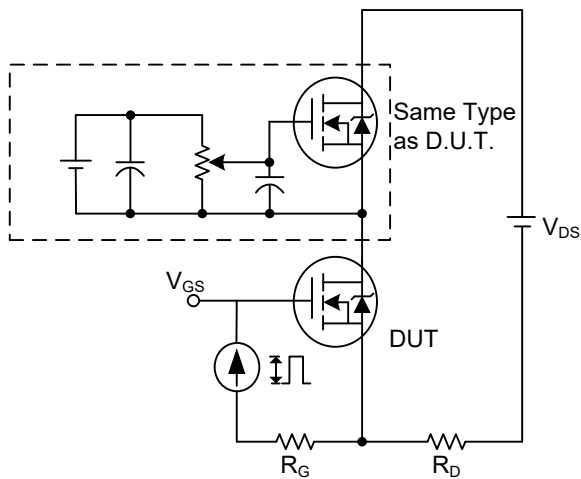
■ TEST CIRCUITS AND WAVEFORMS



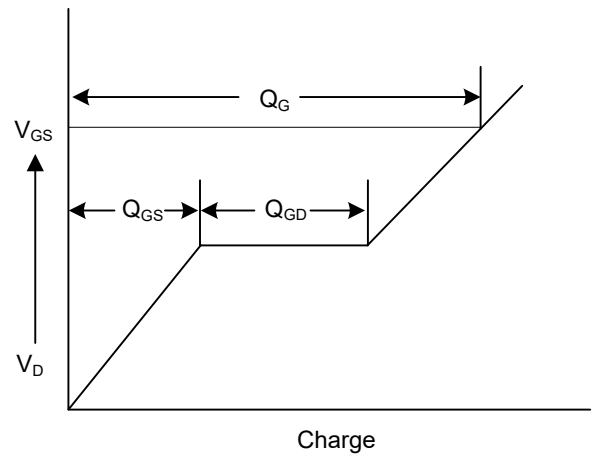
Switching Test Circuit



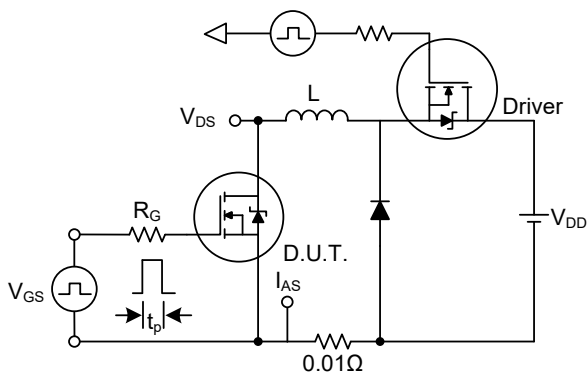
Switching Waveforms



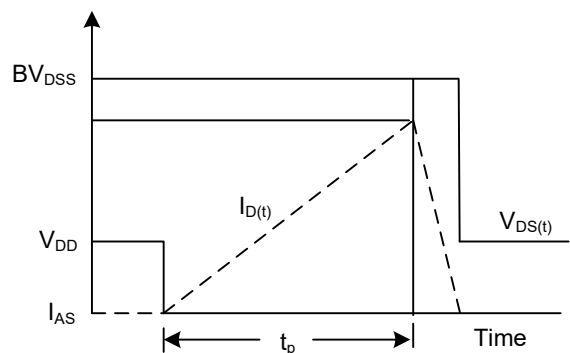
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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