



## USG10R015H

Preliminary

Power MOSFET

### N-CHANNEL SGT ENHANCEMENT POWER MOSFET

#### DESCRIPTION

The UTC **USG10R015H** 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 **USG10R015H** applies to primary side switch, synchronous rectifier, Motor Drives, etc.

#### FEATURES

##### \* TOLL-8A

$R_{DS(ON)} \leq 1.5 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=80\text{A}$

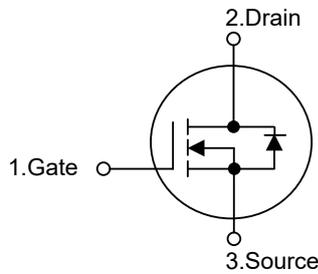
##### TO-247/TOLT-16A

$R_{DS(ON)}$  to be determined

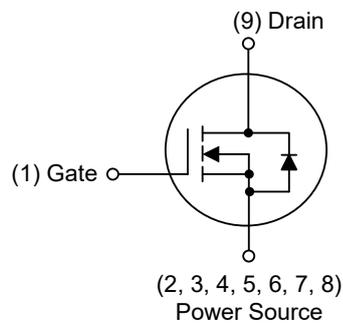
\* High Cell Density Trench Technology

\* High Power and Current Handling Capability

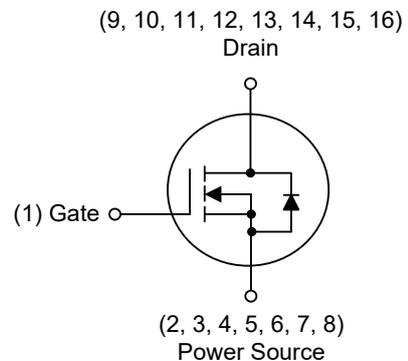
#### SYMBOL



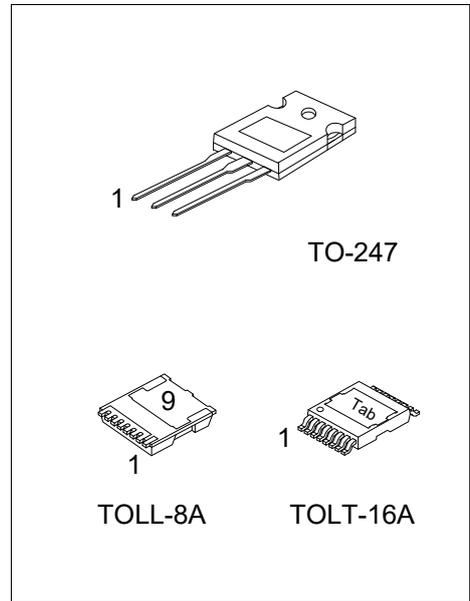
TO-247



TOLL-8A



TOLT-16A



### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment							Packing		
Lead Free	Halogen Free		1	2	3	4	5	6	7		8	9
USG10R015HL-T47-T	USG10R015HG-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
USG10R015HL-T8A-R	USG10R015HG-T8A-R	TOLL-8A	G	S	S	S	S	S	S	S	D	Tape Reel
USG10R015HL-TPA-R	USG10R015HG-TPA-R	TOLT-16A	refet to PIN CONFIGURATION							Tape Reel		

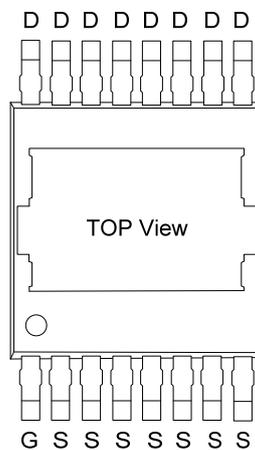
Note: Pin Assignment: G: Gate D: Drain S: Source

<p>USG10R015HG-T47-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel (2) T47: TO-247, P5060: PDFN5×6, TPA: TOLT-16A (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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### MARKING

TO-247	TOLL-8A
<p>UTC USG10R015H</p> <p>Lot Code ←</p> <p>→ L: Lead Free → G: Halogen Free → Date Code</p> <p>1</p>	<p>UTC</p> <p>USG10R015H</p> <p>Lot Code ←</p> <p>→ L: Lead Free → G: Halogen Free → Date Code</p> <p>1</p>
TOLT-16A	-
<p>UTC USG</p> <p>Tab</p> <p>(TOP View)</p> <p>10R015H</p> <p>Lot Code ←</p> <p>→ L: Lead Free → G: Halogen Free → Date Code</p> <p>1</p>	-

### TOLT-16A PIN CONFIGURATION



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	$I_D$	200	A
	Pulsed (Note 2)	$I_{DM}$	400	A
Single Pulsed Avalanche Energy (Note 3)		$E_{AS}$	70	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.1	V/ns
Power Dissipation	TO-247	$P_D$	270	W
	TOLL-8A		400	W
	TOLT-16A		500	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.  $L = 0.1\text{mH}$ ,  $I_{AS} = 37\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , 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-247	$\theta_{JA}$	50	$^\circ\text{C}/\text{W}$
	TOLL-8A		35	$^\circ\text{C}/\text{W}$
	TOLT-16A		45	$^\circ\text{C}/\text{W}$
Junction to Case	TO-247	$\theta_{JC}$	0.46	$^\circ\text{C}/\text{W}$
	TOLL-8A		0.31 (Note)	$^\circ\text{C}/\text{W}$
	TOLT-16A		0.25	$^\circ\text{C}/\text{W}$

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

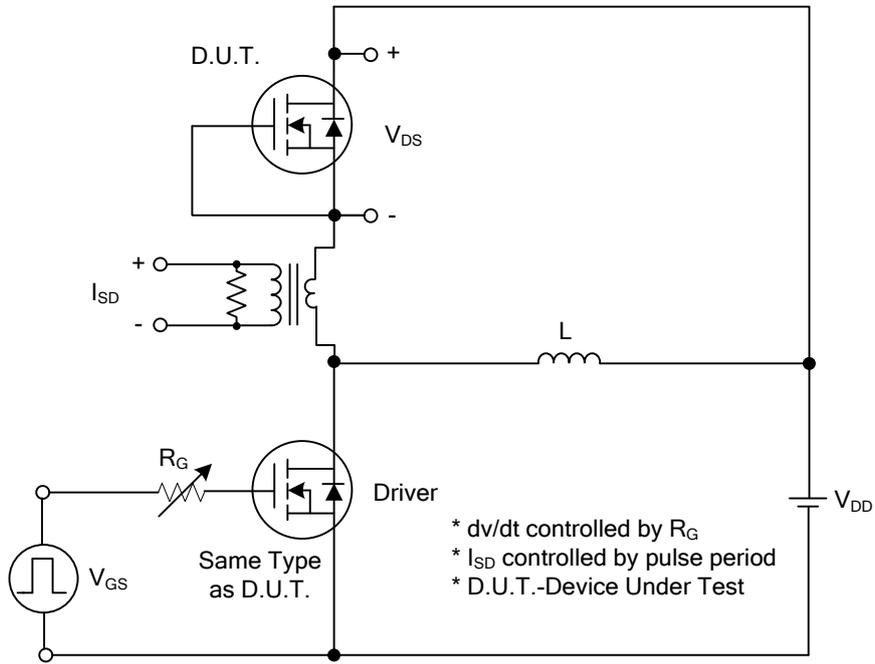
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

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	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	TO-247	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=80\text{A}$		TBD	$\text{m}\Omega$
	TOLL-8A				1.5	$\text{m}\Omega$
	TOLT-16A				TBD	$\text{m}\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1.0\text{MHz}$		15.0		nF
Output Capacitance	$C_{OSS}$			6138		pF
Reverse Transfer Capacitance	$C_{RSS}$			3570		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=80\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=200\text{A}$		251		nC
Gate to Source Charge	$Q_{GS}$			127		nC
Gate to Drain Charge	$Q_{GD}$			58		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=50\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=200\text{A}$ , $R_G=3\Omega$		77		ns
Rise Time	$t_R$			52		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			43		ns
Fall-Time	$t_F$			50		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				200	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_{SD}=200\text{A}$			1.5	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_S=30\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		274		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			1126		nC

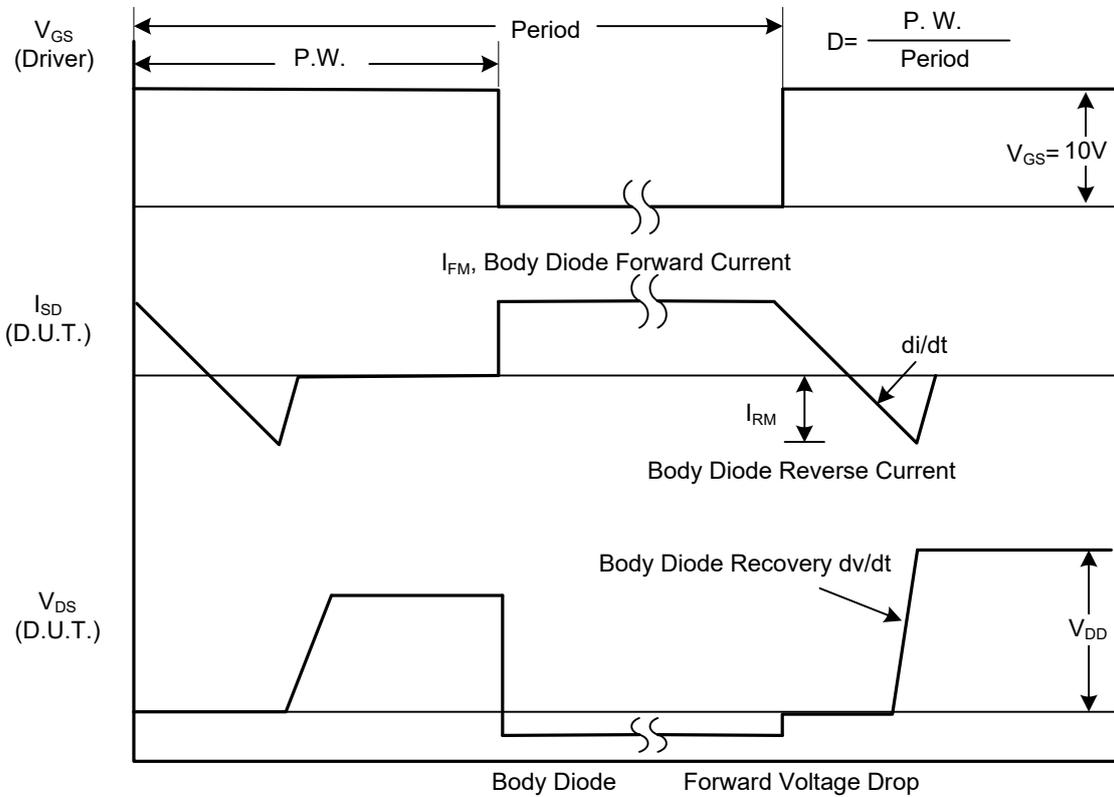
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

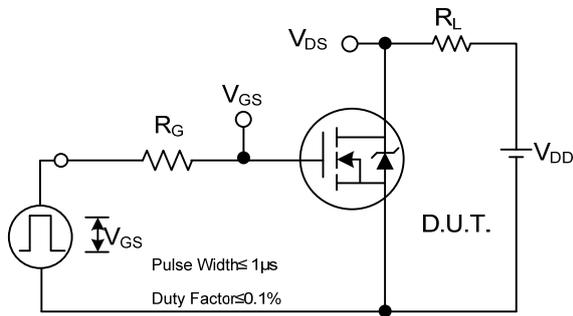


Peak Diode Recovery dv/dt Test Circuit

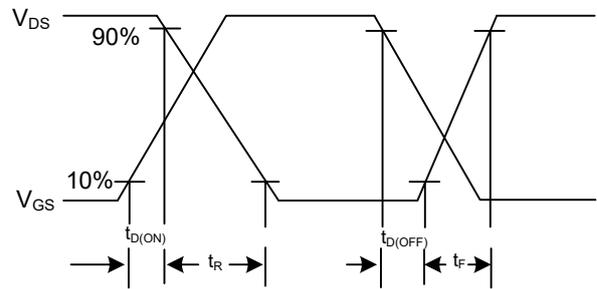


Peak Diode Recovery dv/dt Waveforms

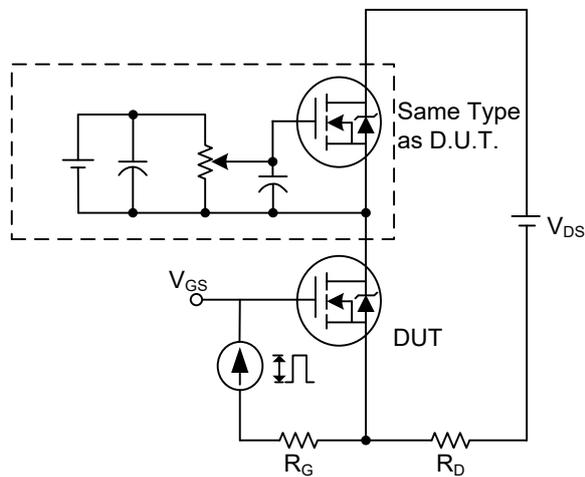
■ TEST CIRCUITS AND WAVEFORMS



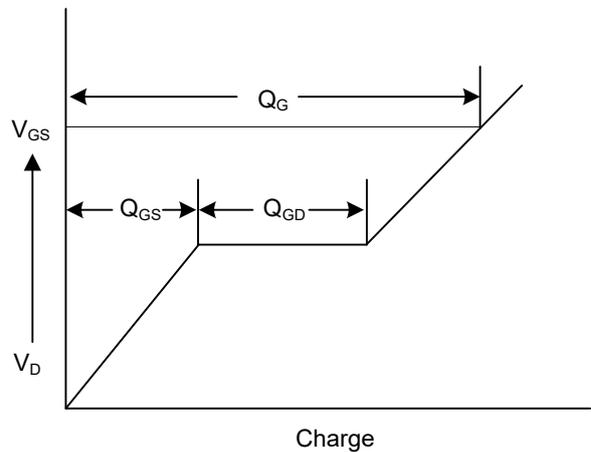
Switching Test Circuit



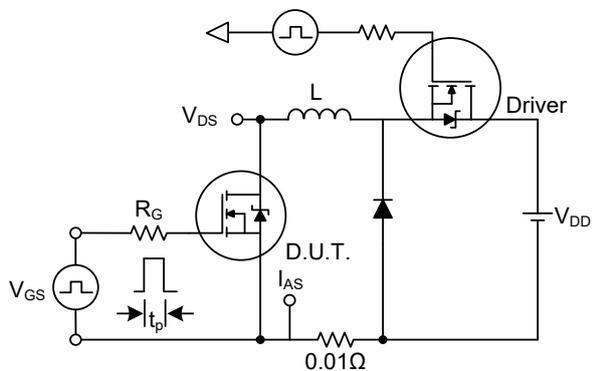
Switching Waveforms



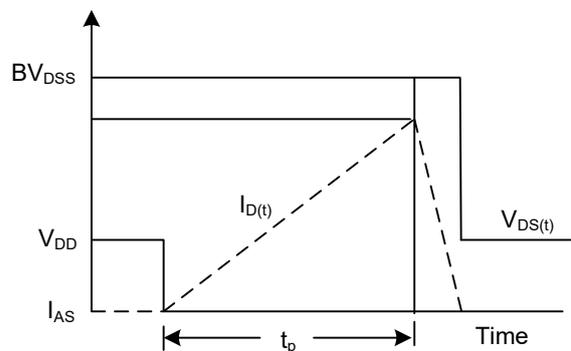
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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