



USG120N10

Preliminary

POWER MOSFET

120A, 100V N-CHANNEL POWER MOSFET

DESCRIPTION

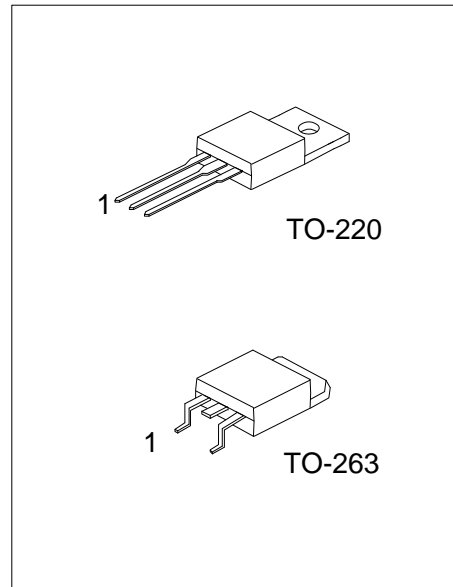
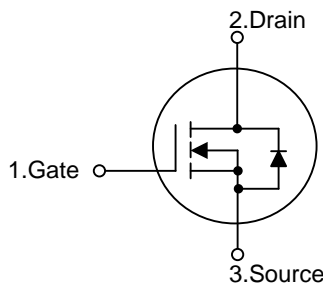
The UTC **USG120N10** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with low $R_{DS(ON)}$ characteristic by high cell density trench technology.

The UTC **USG120N10** is suitable for high efficiency synchronous rectification in SMPS, UPS, hard switched and high frequency circuits.

FEATURES

- * $R_{DS(ON)} \leq 4.5 \text{ m}\Omega @ V_{GS}=10V, I_D=20A$
- $R_{DS(ON)} \leq 6.5 \text{ m}\Omega @ V_{GS}=6.0V, I_D=20A$
- * High Switching Speed

SYMBOL



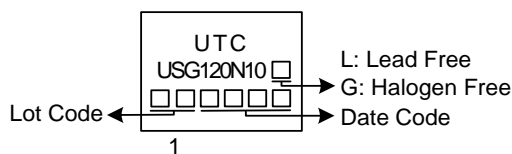
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
USG120N10L-TA3-T	USG120N10G-TA3-T	TO-220	G	D	S	Tube
USG120N10L-TQ2-T	USG120N10G-TQ2-T	TO-263	G	D	S	Tube
USG120N10L-TQ2-R	USG120N10G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>USG120N10G-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TQ2: TO-263</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



■ ABSOLUTE MAXIMUM RATING ($T_C=25^\circ\text{C}$, 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	120	A
	Pulsed (Note 2)	I_{DM}	260	A
Single Pulsed Avalanche Energy (Note 3)	E_{AS}	35	mJ	
Peak Diode Recovery dv/dt (Note 4)	dv/dt	3.5	V/ns	
Power Dissipation	P_D	115	W	
Junction Temperature	T_J	+150	$^\circ\text{C}$	
Storage Temperature Range	T_{STG}	-20 ~ +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. $L=0.1\text{mH}$, $I_{AS}=42\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

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

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	θ_{JC}	1.39 (Note)	$^\circ\text{C}/\text{W}$

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

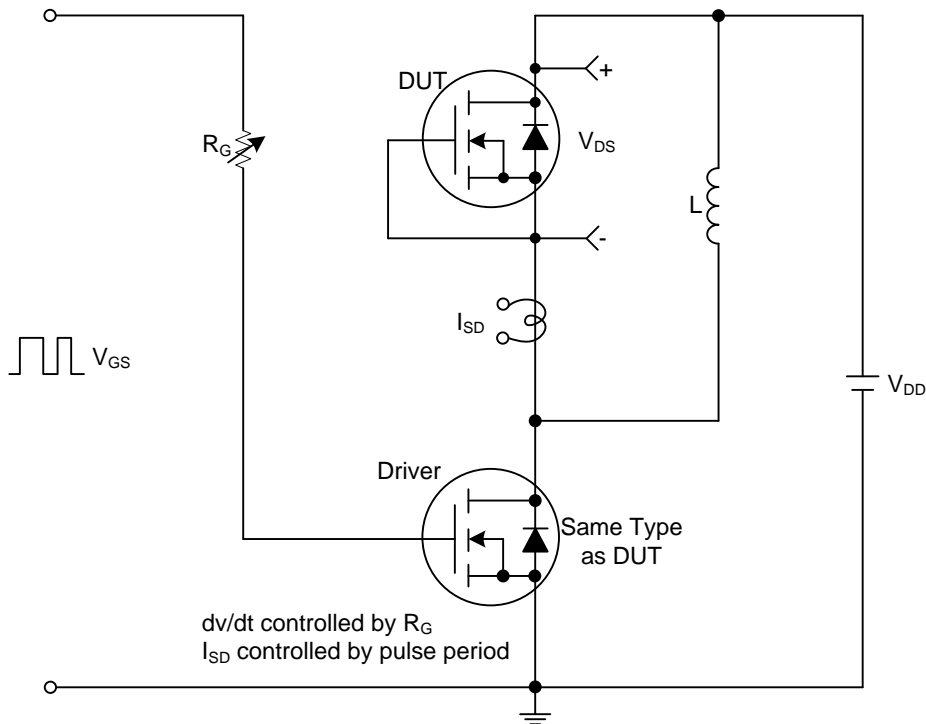
■ ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
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	μA
Gate-Source Leakage Current	Forward	I_{GSS}			+100	nA
	Reverse					
ON CHARACTERISTICS						
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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=20\text{A}$			4.5	m Ω
		$V_{GS}=6.0\text{V}$, $I_D=20\text{A}$			6.5	m Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		4700		pF
Output Capacitance	C_{OSS}			1700		pF
Reverse Transfer Capacitance	C_{RSS}			160		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=50\text{V}$, $V_{GS}=10\text{V}$, $I_D=20\text{A}$, $I_G=1.0\text{mA}$ (Note 1, 2)		78		nC
Gate to Source Charge	Q_{GS}			18		nC
Gate to Drain Charge	Q_{GD}			22		nC
Turn-on Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=50\text{V}$, $V_{GS}=10\text{V}$, $I_D=20\text{A}$, $R_G=3.0\Omega$ (Note 1, 2)		22		ns
Rise Time	t_R			19		ns
Turn-off Delay Time	$t_{D(OFF)}$			46		ns
Fall-Time	t_F			20		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				120	A
Maximum Body-Diode Pulsed Current	I_{SM}				260	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=20\text{A}$, $V_{GS}=0\text{V}$			1.3	V
Reverse Recovery Time (Note 1)	t_{rr}	$I_S=30\text{A}$, $V_{GS}=0\text{V}$, $di/dt = 100\text{A}/\mu\text{s}$		66		nS
Reverse Recovery Charge	Q_{rr}			315		nC

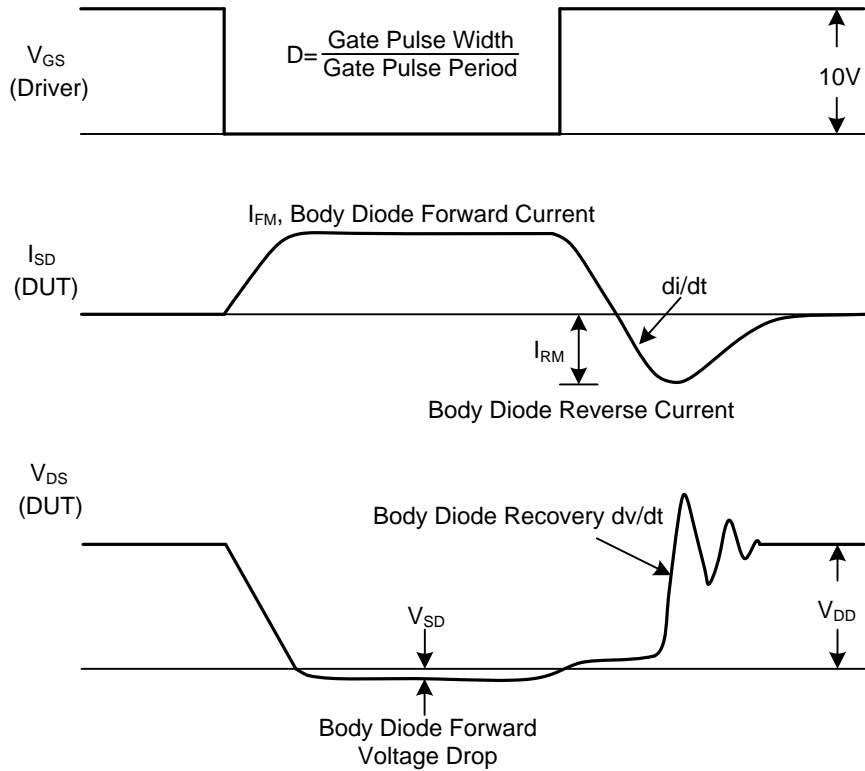
Notes: 1. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS



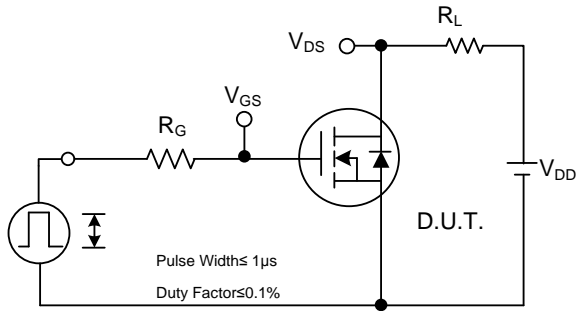
Peak Diode Recovery dv/dt Test Circuit



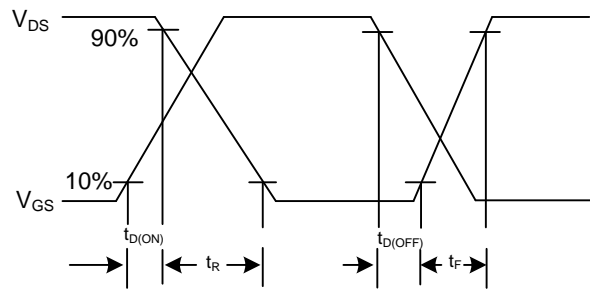
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

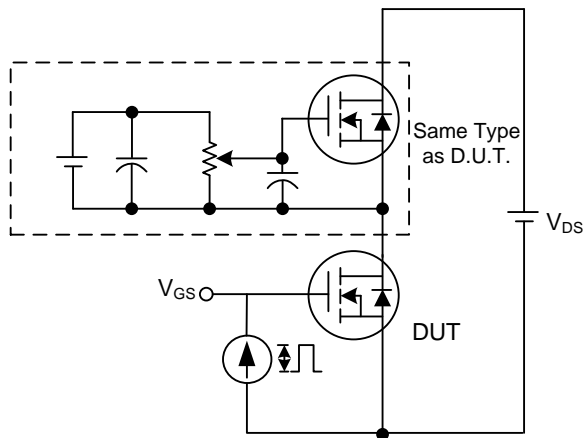
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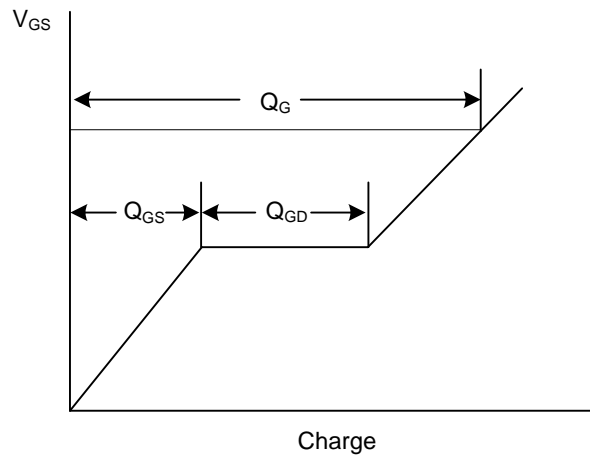
Switching Test Circuit



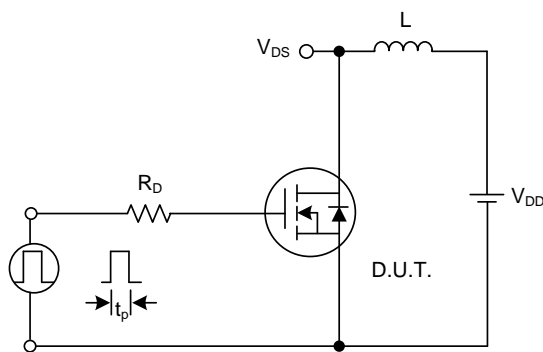
Switching Waveforms



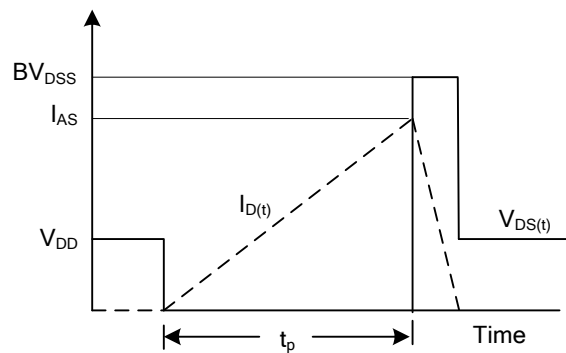
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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