



20N40

Preliminary

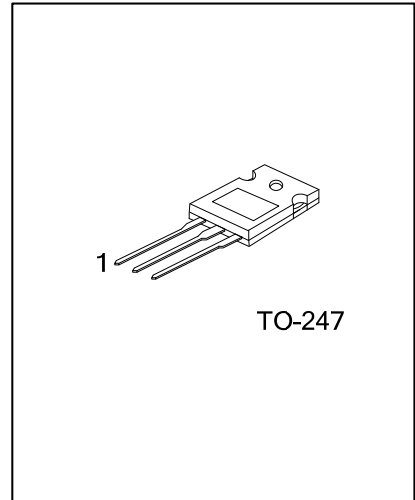
Power MOSFET

**400V, 23A N-CHANNEL
POWER MOSFET**

■ DESCRIPTION

The UTC **20N40** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

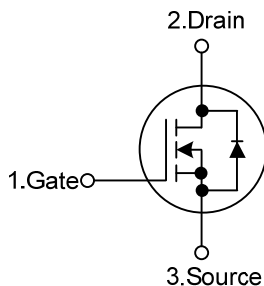
The UTC **20N40** is generally applied in high efficiency switch mode power supplies.



■ FEATURES

- * $R_{DS(ON)}=0.2\Omega @ V_{GS}=10V, I_D=11.5A$
- * Low Gate Charge (Typical 46nC)
- * Low C_{RSS} (Typical 25pF)
- * High Switching Speed

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20N40L-T47-T	20N40G-T47-T	TO-247	G	D	S	Tube

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

<p>20N40L-T47-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Free</p>	<p>(1) T: Tube</p> <p>(2) T47: TO-247</p> <p>(3) G: Halogen Free, L: Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		V_{DSS}	400	V	
Gate-Source Voltage		V_{GSS}	± 30	V	
Drain Current	Continuous	I_D	$T_C=25^\circ\text{C}$	23	A
			$T_C=100^\circ\text{C}$	13.8	A
	Pulsed (Note 2)		I_{DM}	92	A
Avalanche Current (Note 2)		I_{AR}	23	A	
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	1190	mJ	
	Repetitive (Note 2)	E_{AR}	23.5	mJ	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns	
Power Dissipation ($T_C=25^\circ\text{C}$)		P_D	235	W	
Derate above 25°C			1.8	W/ $^\circ\text{C}$	
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. $L = 4.5\text{mH}$, $I_{AS} = 23\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 23\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	40	$^\circ\text{C}/\text{W}$
Junction to Case	θ_{JC}	0.53	$^\circ\text{C}/\text{W}$

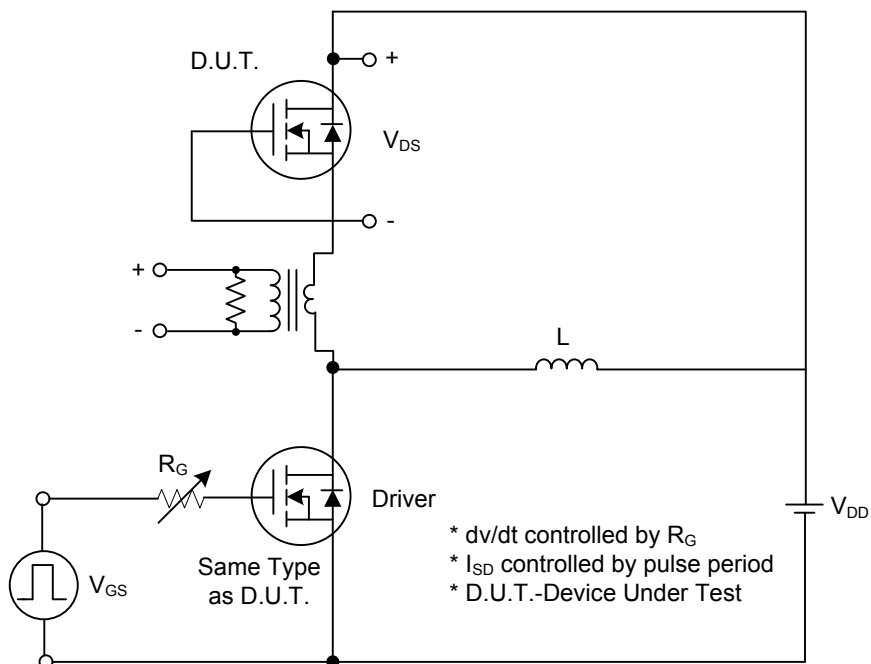
■ ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0V$	400			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C, $I_D=250\mu A$		0.5		V/°C
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=400V, V_{GS}=0V$			10	μA
Gate- Source Leakage Current	Forward	$V_{GS}=+30V, V_{DS}=0V$			+100	nA
	Reverse	$V_{GS}=-30V, V_{DS}=0V$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=11.5A$		0.15	0.2	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$		2280	3030	pF
Output Capacitance	C_{OSS}			370	490	pF
Reverse Transfer Capacitance	C_{RSS}			25	38	pF
SWITCHING PARAMETERS						
Total Gate Charge at 10V	$Q_{G(TOT)}$	$V_{DS}=320V, I_D=23A$ (Note 1, 2)		46	60	nC
Gate to Source Charge	Q_{GS}			13		nC
Gate to Drain Charge	Q_{GD}			18		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DS}=200V, I_D=23A, R_G=25\Omega$ (Note 1, 2)		40	90	ns
Rise Time	t_R			92	195	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			120	250	ns
Fall-Time	t_F			75	160	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				23	A
Maximum Body-Diode Pulsed Current	I_{SM}				92	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_{SD}=23A, V_{GS}=0V$			1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$I_{SD}=23A, V_{GS}=0V,$		110		ns
Body Diode Reverse Recovery Charge	Q_{RR}	$dI_F/dt=100A/\mu s$ (Note 1)		0.3		μC

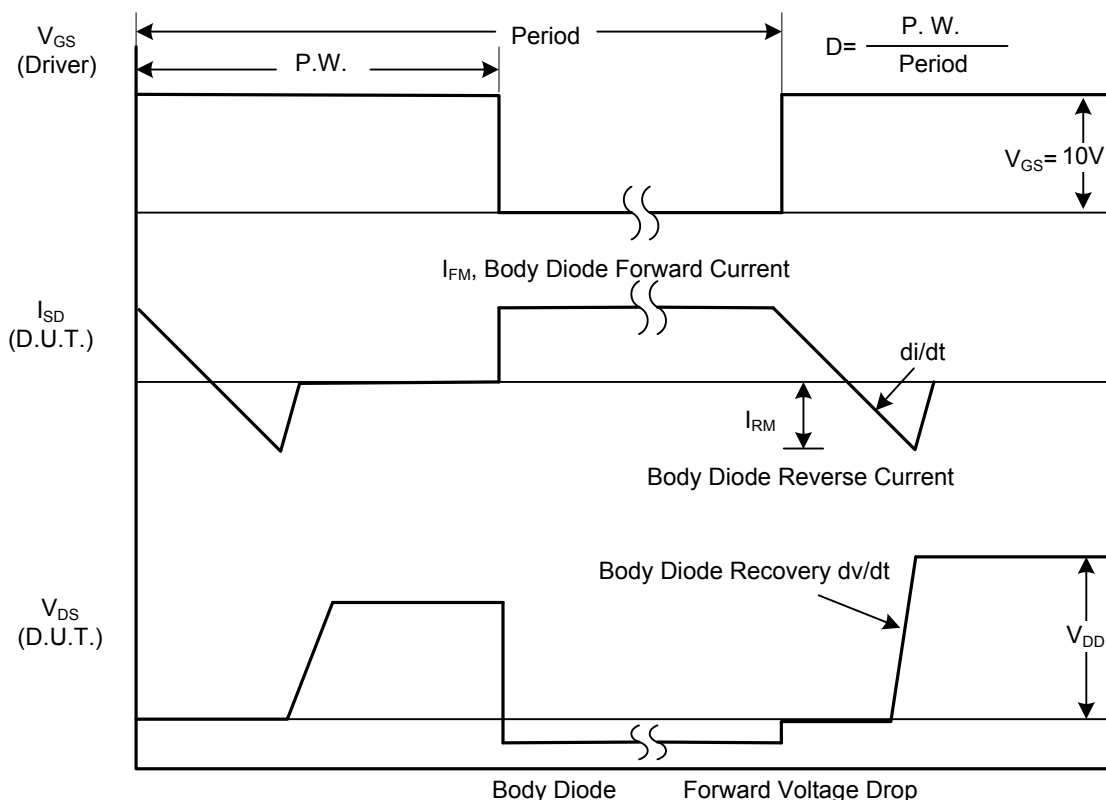
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially Independent of Operating Temperature Typical Characteristics

■ TEST CIRCUITS AND WAVEFORMS

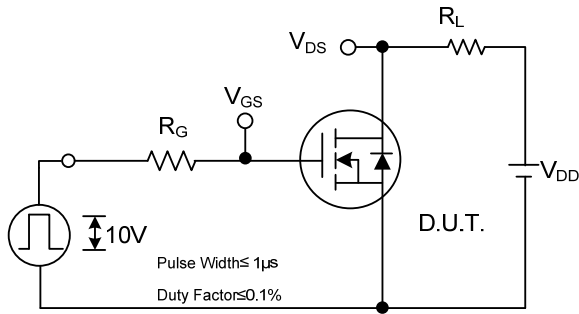


Peak Diode Recovery dv/dt Test Circuit

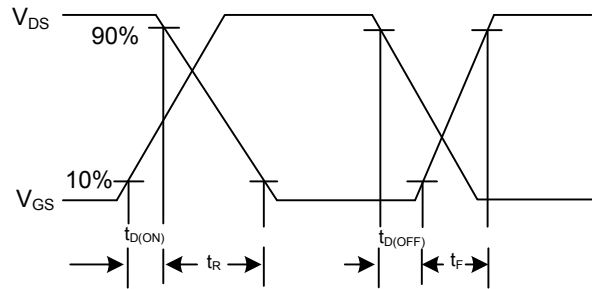


Peak Diode Recovery dv/dt Waveforms

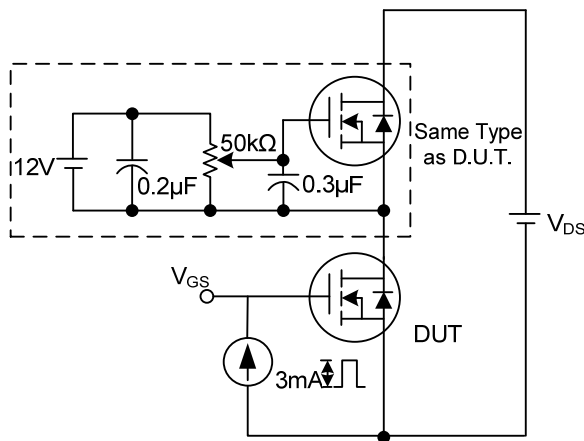
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



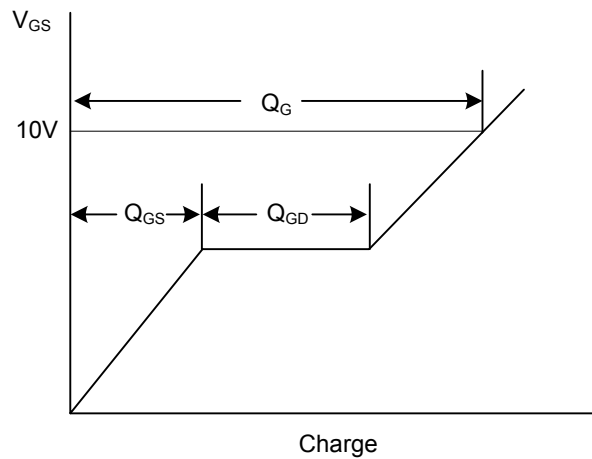
Switching Test Circuit



Switching Waveforms

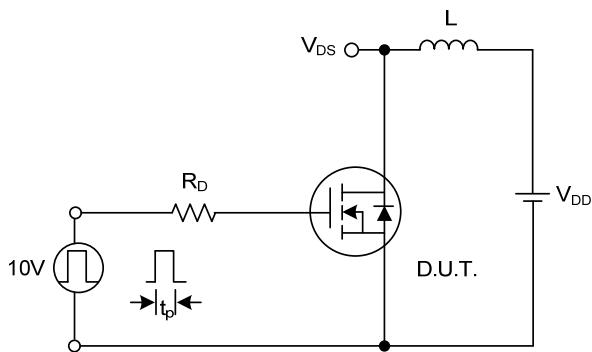


Gate Charge Test Circuit

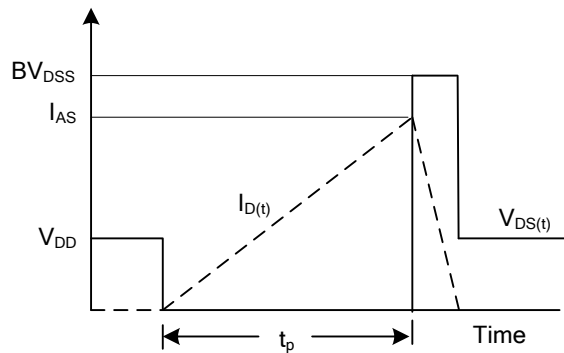


Charge

Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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