



20N65-HCQ

Preliminary

Power MOSFET

20A, 650V N-CHANNEL POWER MOSFET

DESCRIPTION

The UTC **20N65-HCQ** is a N-channel enhancement MOSFET using UTC's advanced technology to provide the customers with perfect $R_{DS(ON)}$, high switching speed, high current capacity and low gate charge.

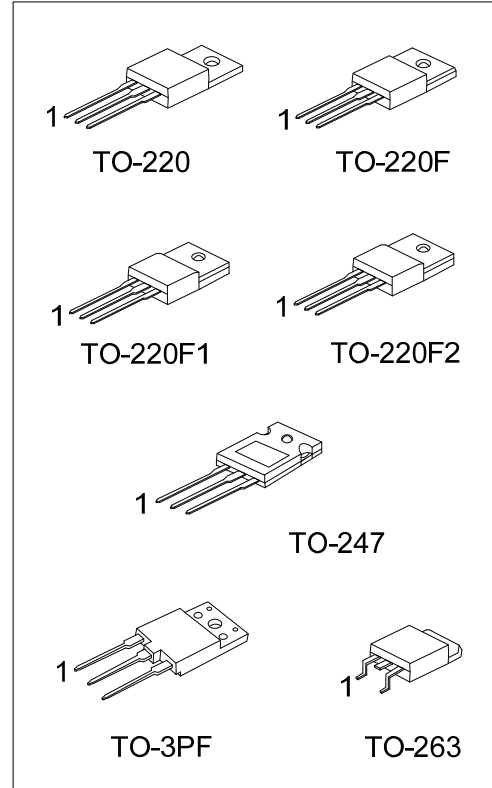
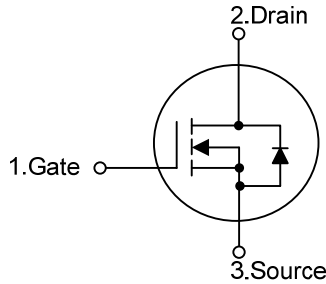
The UTC **20N65-HCQ** is universally applied in low voltage such as automotive, high efficiency switching for AC/DC converters and DC motor control, etc.

FEATURES

* $R_{DS(ON)} \leq 0.5 \Omega$ @ $V_{GS}=10V$, $I_D=10A$

* High Switching Speed

SYMBOL



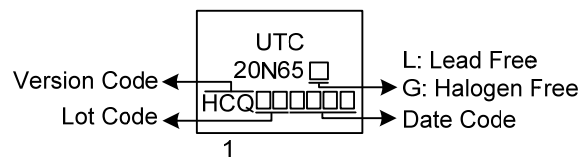
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20N65L-HCQ-TA3-T	20N65G-HCQ-TA3-T	TO-220	G	D	S	Tube
20N65L-HCQ-TF1-T	20N65G-HCQ-TF1-T	TO-220F1	G	D	S	Tube
20N65L-HCQ-TF2-T	20N65G-HCQ-TF2-T	TO-220F2	G	D	S	Tube
20N65L-HCQ-TQ2-T	20N65G-HCQ-TQ2-T	TO-263	G	D	S	Tube
20N65L-HCQ-TQ2-R	20N65G-HCQ-TQ2-R	TO-263	G	D	S	Tape Reel
20N65L-HCQ-T3F-T	20N65G-HCQ-T3F-T	TO-3PF	G	D	S	Tube
20N65L-HCQ-T47-T	20N65G-HCQ-T47-T	TO-247	G	D	S	Tube

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

20N65G-HCQ-TA3-T (1)Packing Type (2)Package Type (3)Version Code (4)Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TQ2: TO-263, T3F: TO-3PF, T47: TO-247 (3) Version HCQ (4) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING



■ **ABSOLUTE MAXIMUM RATINGS** (unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	± 30	V
Continuous Drain Current	Continuous	I_D	20	A
	Pulsed	I_{DM}	40	A
Single Pulsed Avalanche Energy		E_{AS}	303.8	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.6	V/ns
Power Dissipation	TO-220	P_D	240	W
	TO-220F1		45	W
	TO-220F2			
	TO-247		250	W
	TO-263		240	W
	TO-3PF		65	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. $L = 30\text{mH}$, $I_{AS} = 4.5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 20\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-220F1			
	TO-220F2			
	TO-263			
	TO-247		40	$^{\circ}\text{C}/\text{W}$
	TO-3PF		50	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	0.52	$^{\circ}\text{C}/\text{W}$
	TO-263		2.77	$^{\circ}\text{C}/\text{W}$
	TO-220F1			
	TO-220F2		0.5	$^{\circ}\text{C}/\text{W}$
	TO-247			
	TO-3PF		1.92	$^{\circ}\text{C}/\text{W}$

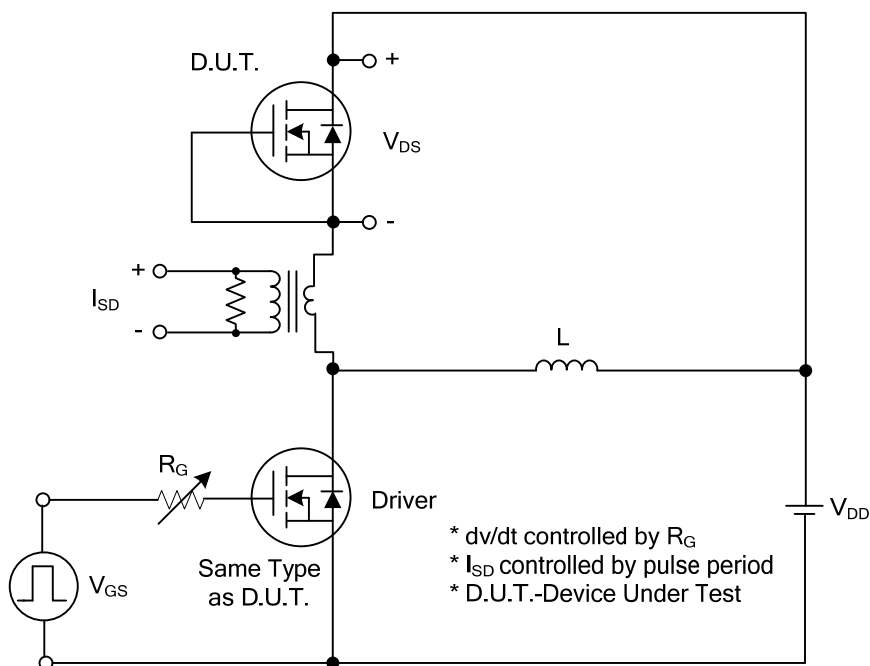
■ ELECTRICAL CHARACTERISTICS

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	650			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	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 =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =10A			0.5	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		3002		pF
Output Capacitance		C _{OSS}			252		pF
Reverse Transfer Capacitance		C _{RSS}			17		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =520V, V _{GS} =10V, I _D =20A I _G =1mA (Note 1, 2)		68		nC
Gate to Source Charge		Q _{GS}			23		nC
Gate to Drain Charge		Q _{GD}			20		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =20A, R _G =25Ω (Note 1, 2)		41		ns
Rise Time		t _R			24		ns
Turn-OFF Delay Time		t _{D(OFF)}			165		ns
Fall-Time		t _F			50		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				20	A
Maximum Body-Diode Pulsed Current		I _{SM}				40	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =20A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =20A, V _{GS} =0V, dI _F /dt=100A/μs		516		ns
Reverse Recovery Charge		Q _{rr}	(Note 1)		20.2		μC

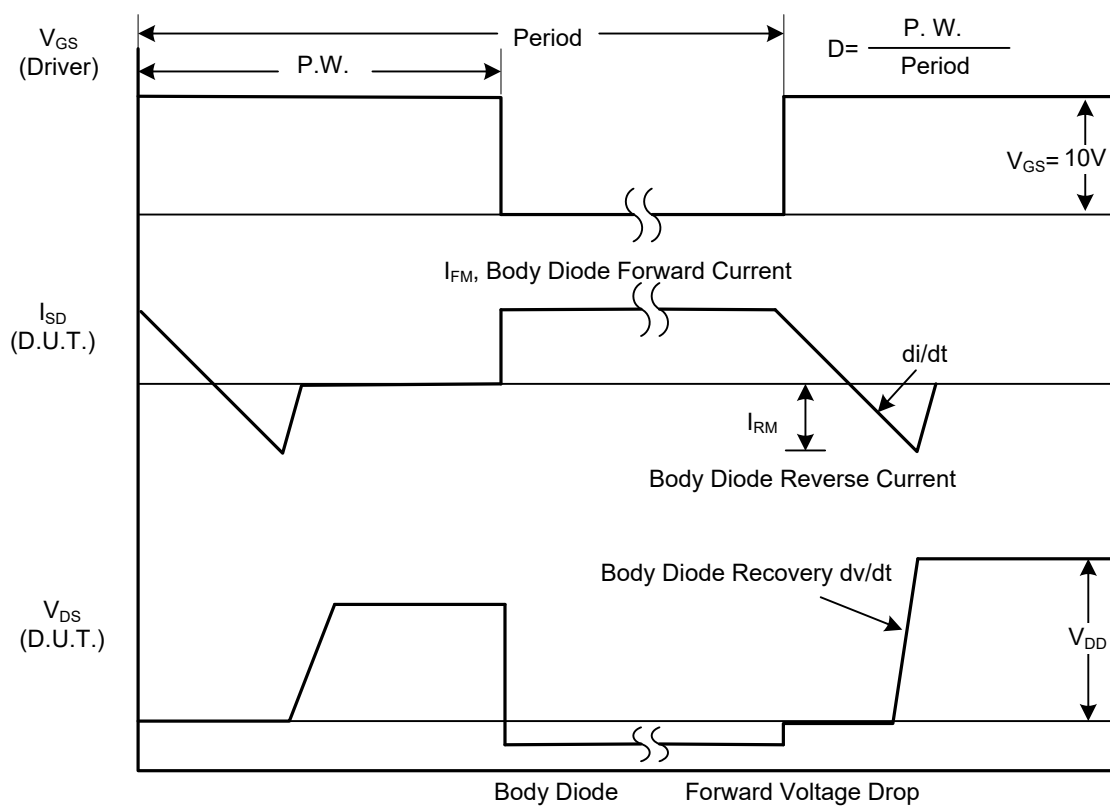
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

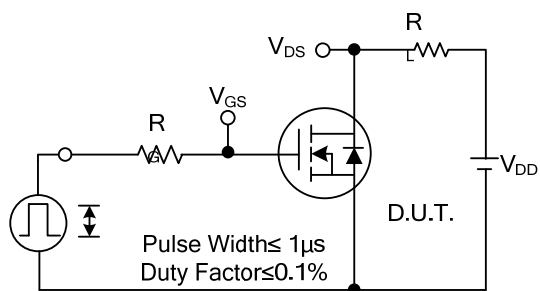


Peak Diode Recovery dv/dt Test Circuit

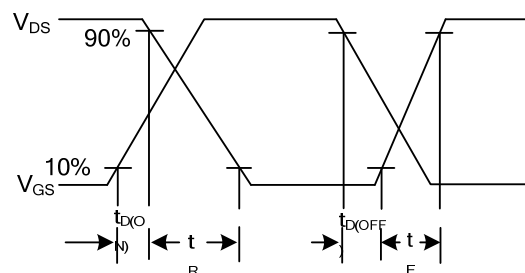


Peak Diode Recovery dv/dt Waveforms

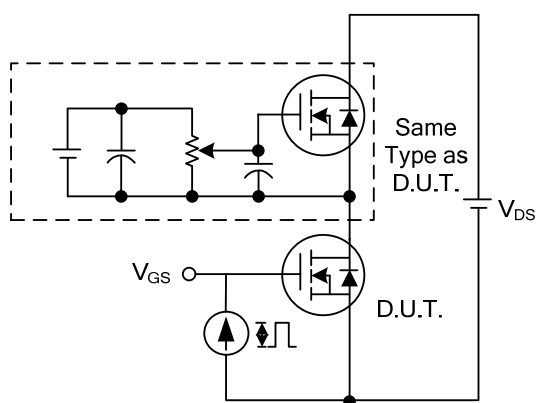
■ TEST CIRCUITS AND WAVEFORMS



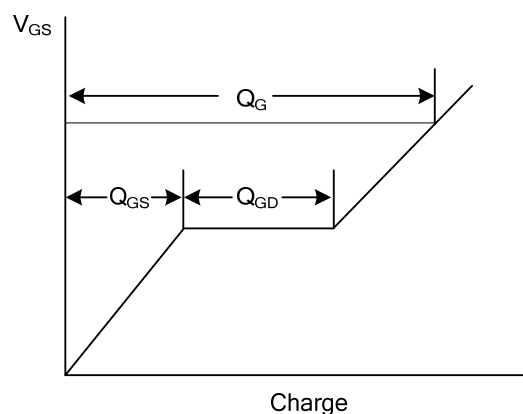
Switching Test Circuit



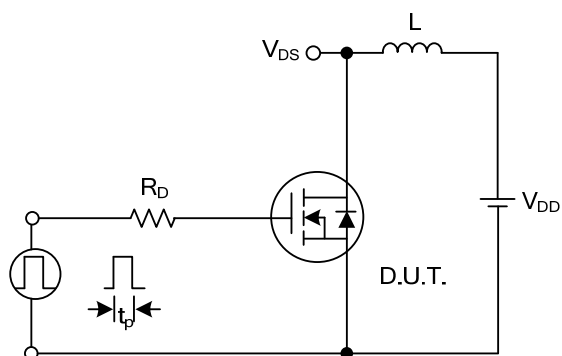
Switching Waveforms



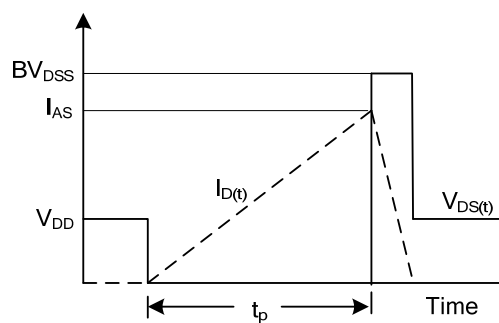
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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