



## 10NL65

Preliminary

Power MOSFET

### 10A, 650V N-CHANNEL POWER MOSFET

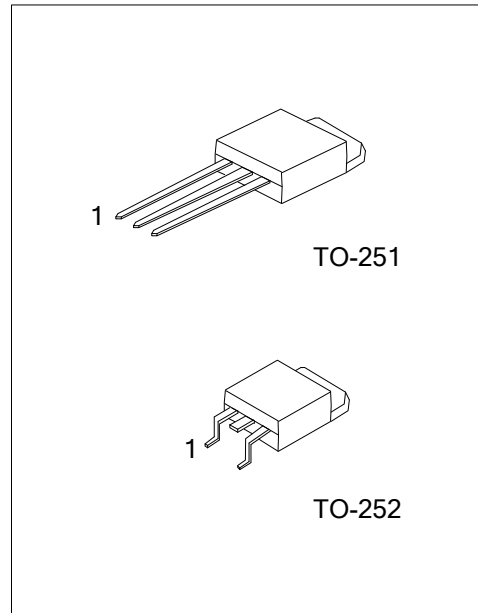
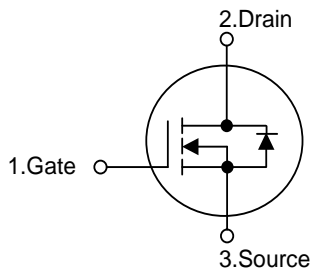
#### DESCRIPTION

The UTC 10NL65 is a high voltage and high current power MOSFET, designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

#### FEATURES

- \*  $R_{DS(ON)} \leq 1.0 \Omega @ V_{GS}=10V, I_D=5.0A$
- \* Fast switching
- \* 100% avalanche tested
- \* Improved dv/dt capability

#### SYMBOL



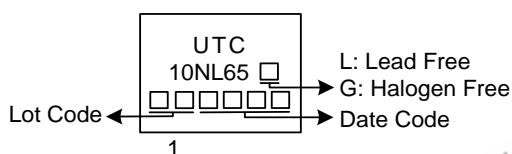
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10NL65L-TM3-T	10NL65G-TM3-T	TO-251	G	D	S	Tube
10NL65L-TN3-R	10NL65G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>10NL65G-TM3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TM3: TO-251, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



■ **ABSOLUTE MAXIMUM RATINGS** ( $T_C = 25^\circ\text{C}$  unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	650	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	10	A
	Pulsed (Note 2)	$I_{DM}$	20	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	265	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.8	V/ns
Power Dissipation		$P_D$	55	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.  $L = 100\text{mH}$ ,  $I_{AS} = 2.3\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$  Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 10\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	110	$^\circ\text{C}/\text{W}$
Junction to Case		$\theta_{JC}$	2.27 (Note)	$^\circ\text{C}/\text{W}$

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

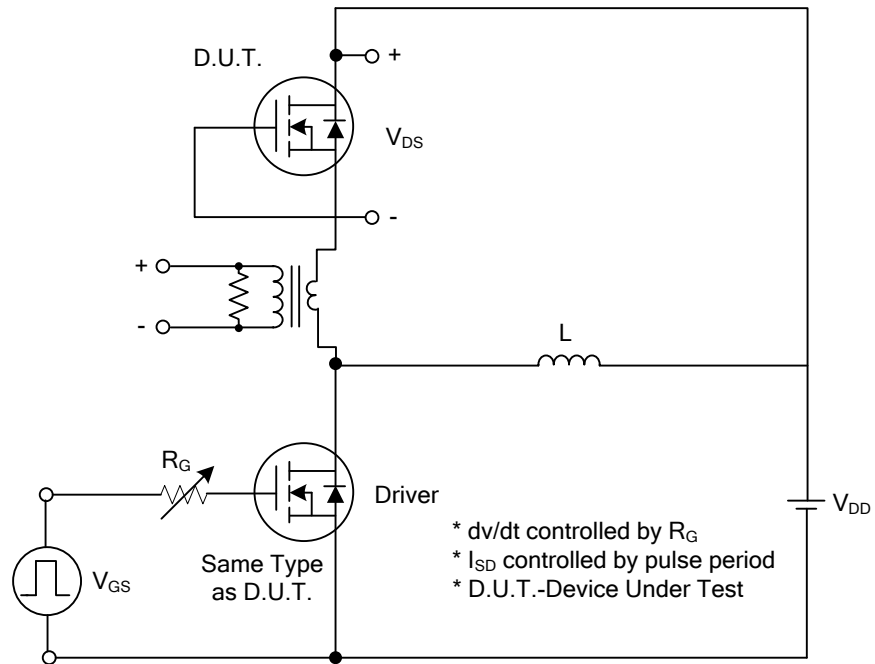
■ **ELECTRICAL CHARACTERISTICS** ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			10	$\mu A$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse					
		$V_{GS}=-30V, V_{DS}=0V$			-100	nA
<b>ON CHARACTERISTICS</b>						
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.0A$			1	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{ MHz}$		606		pF
Output Capacitance	$C_{OSS}$			301		pF
Reverse Transfer Capacitance	$C_{RSS}$			40		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=560V, V_{GS}=10V, I_D=10A$ $I_G=1\text{ mA}$ (Note1, 2)		22		nC
Gate-Source Charge	$Q_{GS}$			4.3		nC
Gate-Drain Charge	$Q_{GD}$			5.5		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DS}=100V, V_{GS}=10V, I_D=10A,$ $R_G=25\Omega$ (Note1, 2)		8.7		ns
Turn-On Rise Time	$t_R$			18		ns
Turn-Off Delay Time	$t_{D(OFF)}$			73		ns
Turn-Off Fall Time	$t_F$			41		ns
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				10	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				20	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=10A$			1.4	V
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_S=10A,$ $di_F/dt=100A/\mu s$ (Note1)		320		ns
Reverse Recovery Charge	$Q_{rr}$			8		$\mu C$

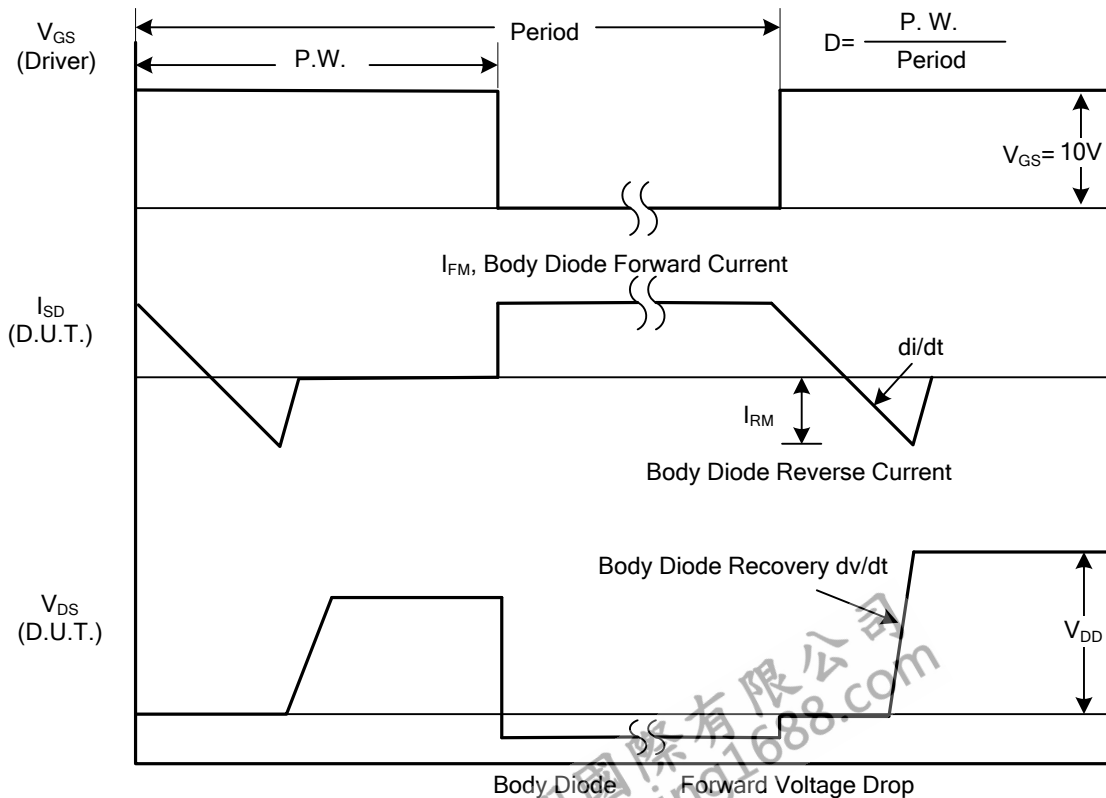
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

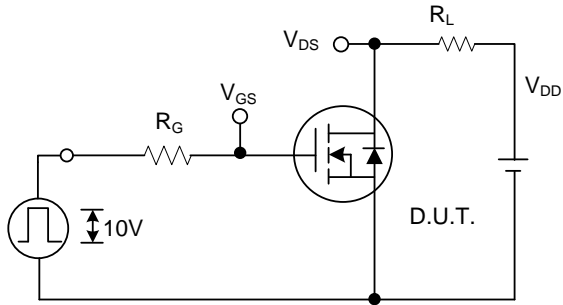


Peak Diode Recovery dv/dt Test Circuit

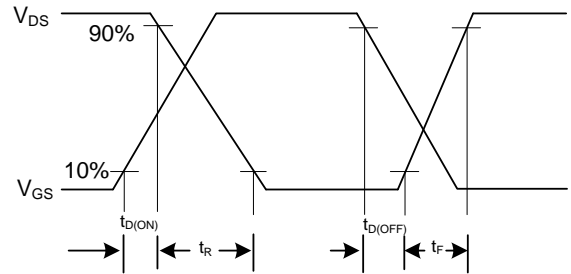


Peak Diode Recovery dv/dt Waveforms

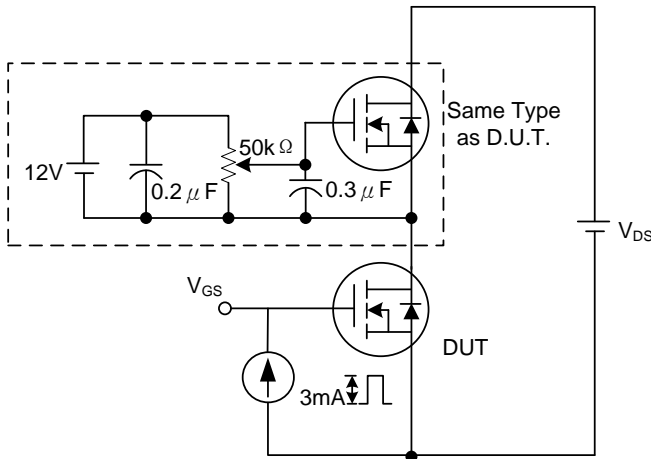
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



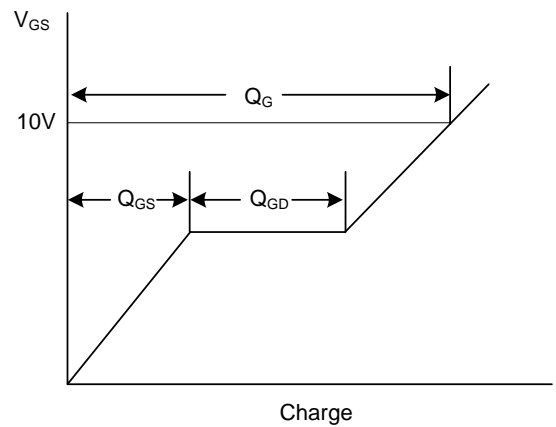
Switching Test Circuit



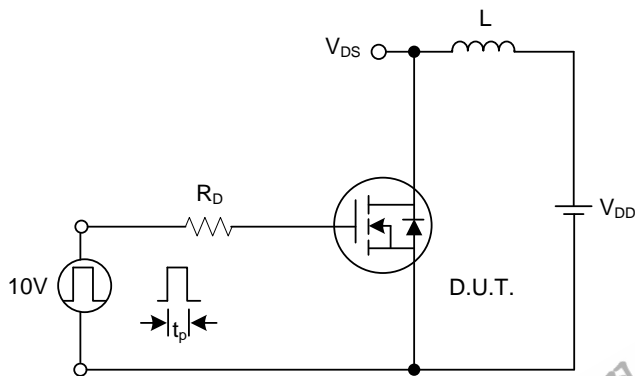
Switching Waveforms



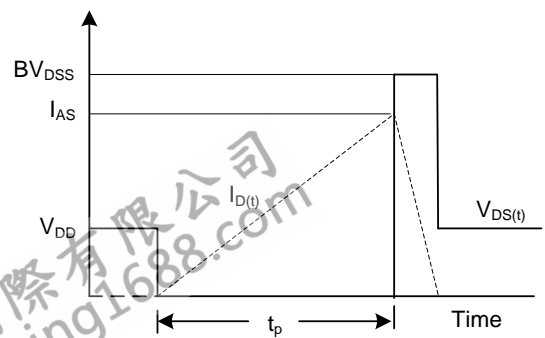
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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