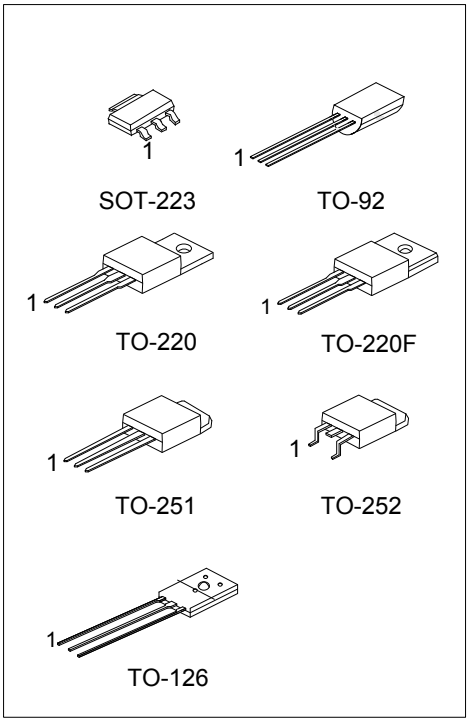
1.2A, 650V N-CHANNEL POWER MOSFET



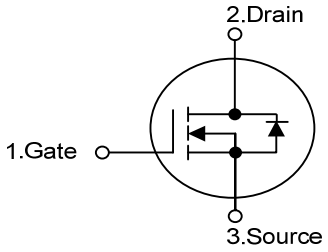
■ DESCRIPTION

The UTC **1N65** is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in the high speed switching applications of power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

* $R_{DS(ON)}$ =12.5Ω@V_{GS} = 10V.
* Ultra Low gate charge (typical 5.0nC)
* Low reverse transfer capacitance (C_{RSS} = typical 3.0 pF)
* Fast switching capability
* Avalanche energy specified
* Improved dv/dt capability, high ruggedness

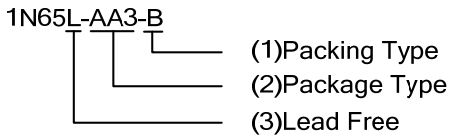
■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N65L-AA3-R	1N65G-AA3-R	SOT-223	G	D	S	Tape Reel
1N65L-T92-B	1N65G-T92-B	TO-92	G	D	S	Tape Box
1N65L-T92-K	1N65G-T92-K	TO-92	G	D	S	Bulk
1N65L-T92- R	1N65G-T92- R	TO-92	G	D	S	Tape Reel
1N65L-TA3-T	1N65G-TA3-T	TO-220	G	D	S	Tube
1N65L-TF3-T	1N65G-TF3-T	TO-220F	G	D	S	Tube
1N65L-TM3-T	1N65G-TM3-T	TO-251	G	D	S	Tube
1N65L-TN3-R	1N65G-TN3-R	TO-252	G	D	S	Tape Reel
1N65L-TN3-T	1N65G-TN3-T	TO-252	G	D	S	Tube
1N65L-T60-K	1N65G-T60-K	TO-126	G	D	S	Bulk

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



(1) B: Tape Box, K: Bulk, T: Tube, R: Tape Reel
(2) AA3: SOT-223, T92: TO-92, TA3: TO-220, TF3: TO-220F, TM3: TO-251, TN3: TO-252 T60: TO-126
(3) G: Halogen Free, L: Lead Free

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■ ABSOLUTE MAXIMUM RATINGS (T_C = 25℃, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage		V_{GSS}	±30	V
Avalanche Current (Note 2)		I_{AR}	1.2	A
Continuous Drain Current		I_D	1.2	A
Pulsed Drain Current (Note 2)		I_{DM}	4.8	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	50	mJ
	Repetitive (Note 2)	E_{AR}	4.0	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	SOT-223	P_D	1	W
	TO-251/ TO-252		28	W
	TO-220		40	W
	TO-220F		21	W
	TO-92(T_A=25℃)		1	W
	TO-126		12.5	W
Junction Temperature		T_J	+150	℃
Operating Temperature		T_{OPR}	-55 ~ +150	℃
Storage Temperature		T_{STG}	-55 ~ +150	℃

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 = 60mH, I_{AS} = 1A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
4. I_{SD} ≤ 1.2A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

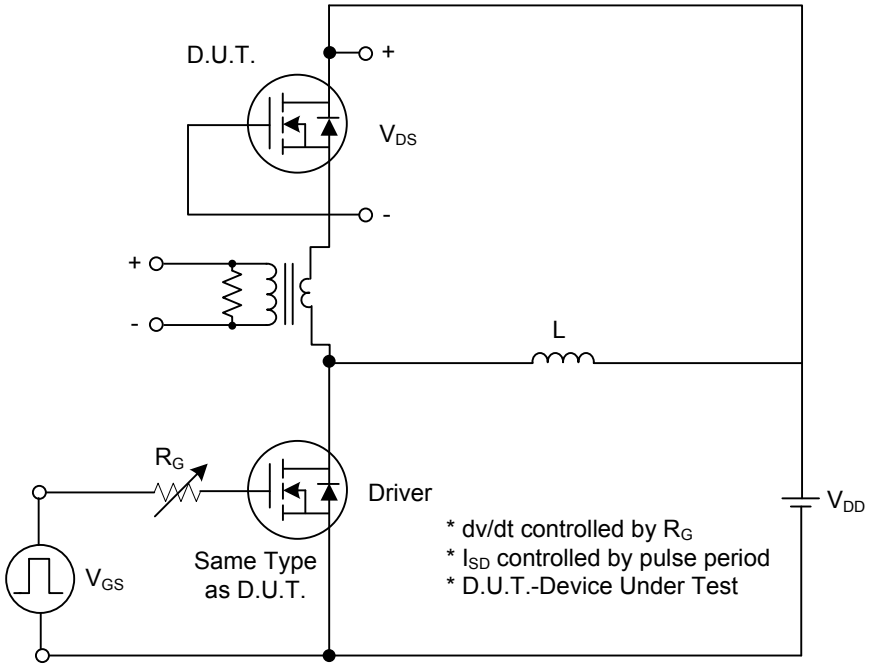
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	℃/W
	TO-251/ TO-252		110	
	TO-220/ TO-220F		62.5	
	TO-92		140	
	TO-126		132	
Junction to Case	SOT-223	θ_{Jc}	14	℃/W
	TO-251/ TO-252		4.53	
	TO-220		3.13	
	TO-220F		5.95	
	TO-126		10	

■ ELECTRICAL CHARACTERISTICS (T_C=25℃, unless otherwise specified.)

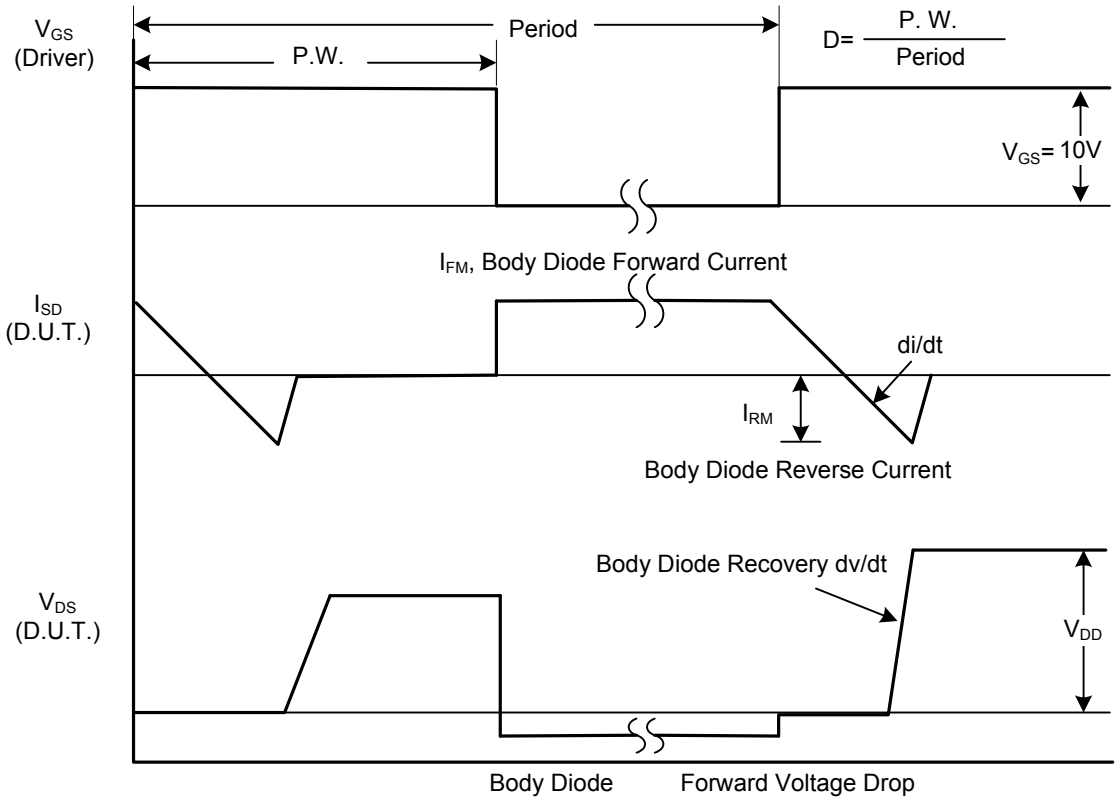
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=30V, V_{DS}=0V			100	nA
	Reverse		V_{GS}=-30V, V_{DS}=0V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D=250μA		0.4		V/℃
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=0.6A		9.5	12.5	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1MHz		120	150	pF
Output Capacitance		C_{OSS}			20	25	pF
Reverse Transfer Capacitance		C_{RSS}			3.0	4.0	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	V_{DD}=325V, I_D=1.2A, R_G=50Ω (Note 2,3)		5	20	ns
Turn-On Rise Time		t_R			25	60	ns
Turn-Off Delay Time		$t_{D(OFF)}$			7	25	ns
Turn-Off Fall Time		t_F			25	60	ns
Total Gate Charge		Q_G	V_{DS}=520V, V_{GS}=10V, I_D=1.2A (Note 2,3)		5.0	6.0	nC
Gate-Source Charge		Q_{GS}			1.0		nC
Gate-Drain Charge		Q_{GD}			2.6		nC
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_S =1.2A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				1.2	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				4.8	A
Reverse Recovery Time		t_{rr}	V_{GS}=0V, I_S=1.2A dI$_F$/dt=100A/μs (Note 1)		160		ns
Reverse Recovery Charge		Q_{RR}			0.3		μC

Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Pulse Test: Pulse Width ≤300μs, Duty Cycle≤2%
3. Essentially Independent of Operating Temperature

■ TEST CIRCUITS AND WAVEFORMS

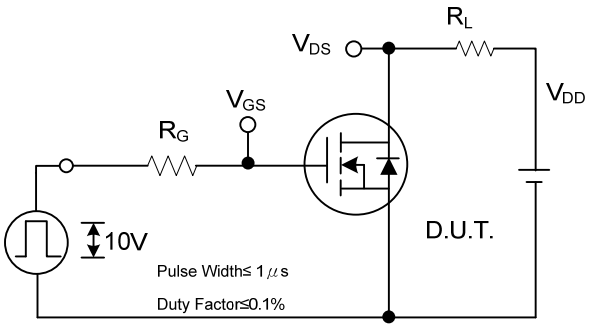


Peak Diode Recovery dv/dt Test Circuit

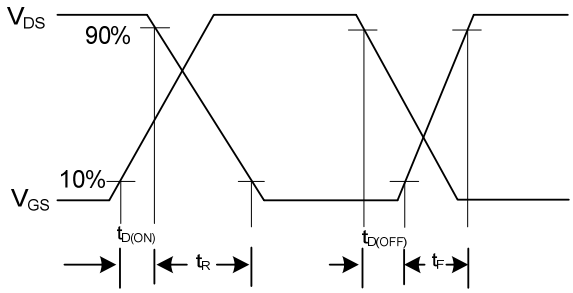


Peak Diode Recovery dv/dt Waveforms

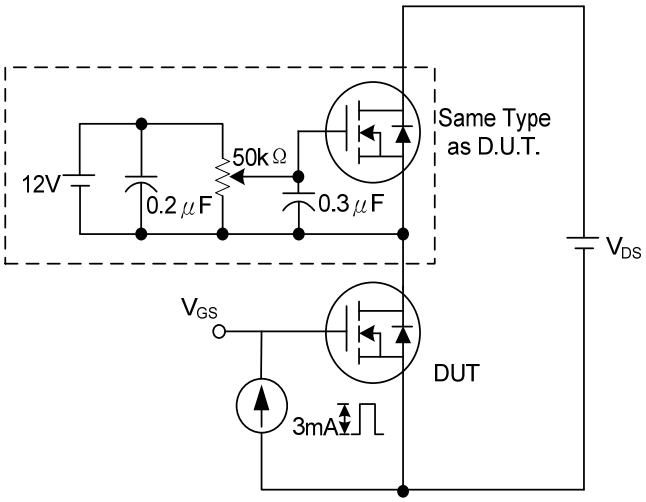
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



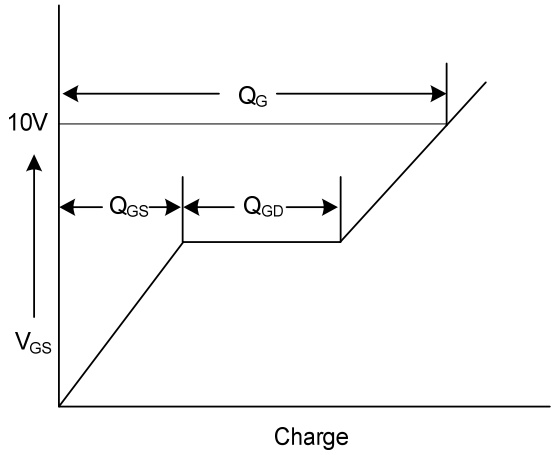
Switching Test Circuit



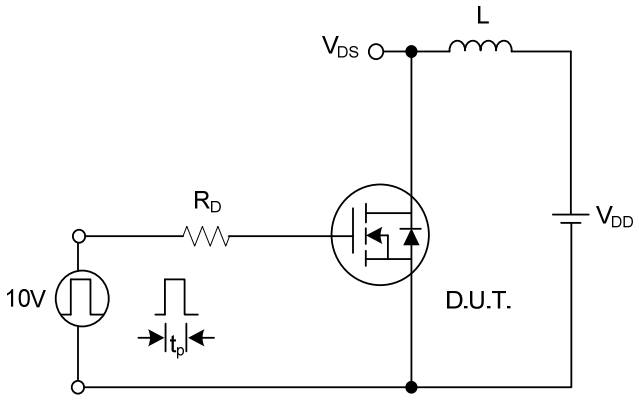
Switching Waveforms



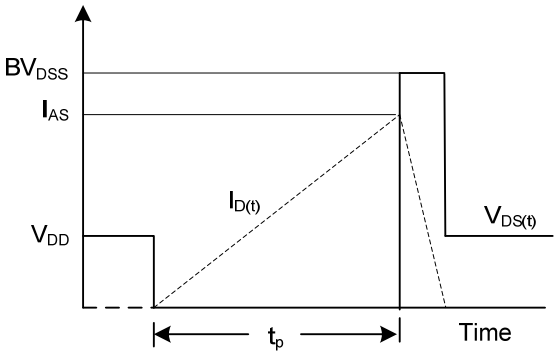
Gate Charge Test Circuit



Gate Charge Waveform



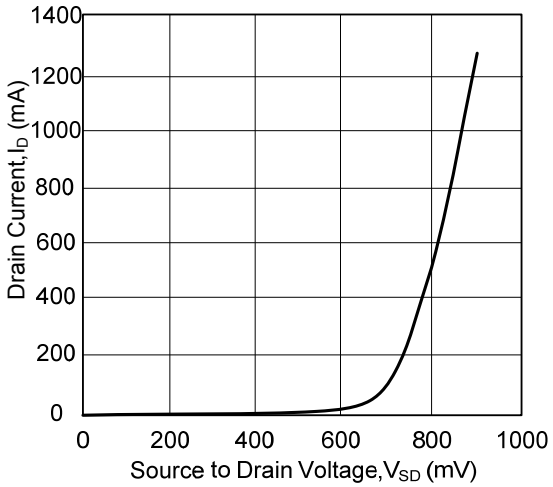
Unclamped Inductive Switching Test Circui



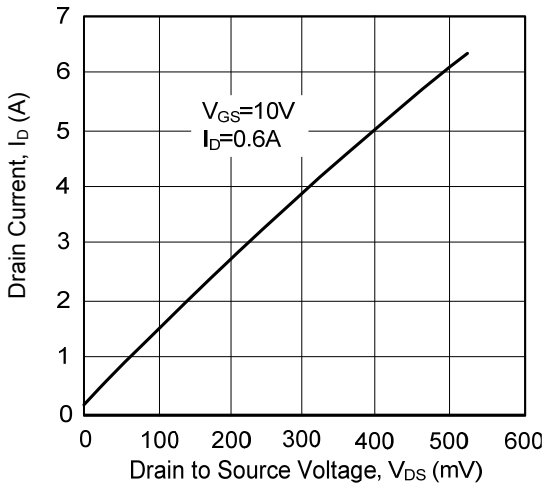
Unclamped Inductive Switching Waveformst

■ TYPICAL CHARACTERISTICS

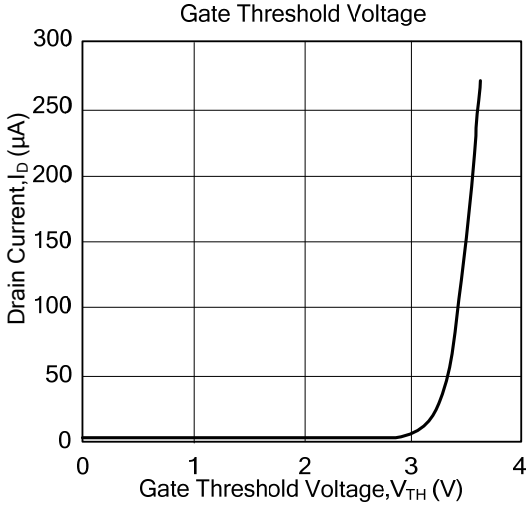
Drain Current vs. Source to Drain Voltage



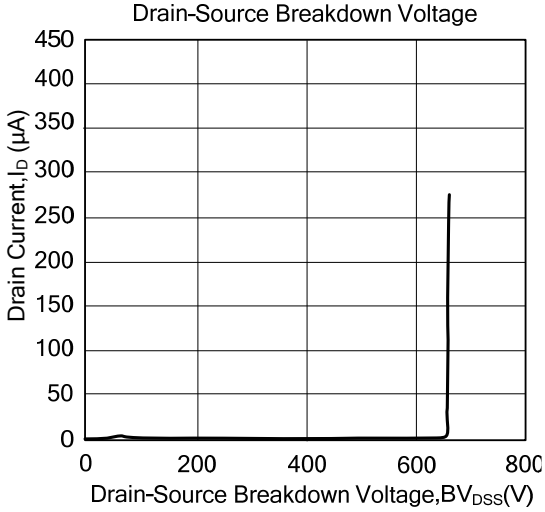
Drain-Source On-State Resistance Characteristics



Drain Current vs. Gate Threshold Voltage



Drain Current vs. Drain-Source Breakdown Voltage



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