



1N65

Power MOSFET

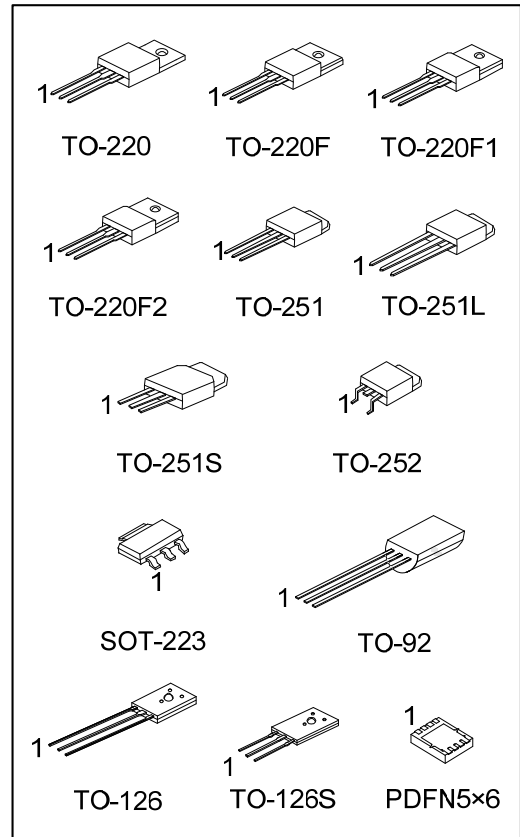
1.2A, 650V N-CHANNEL POWER MOSFET

DESCRIPTION

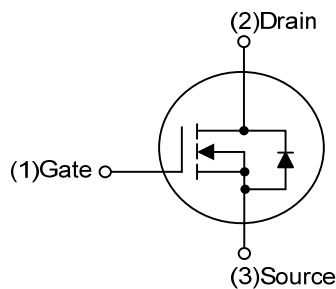
The UTC **1N65** is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in the high speed switching applications of power supplies,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

FEATURES

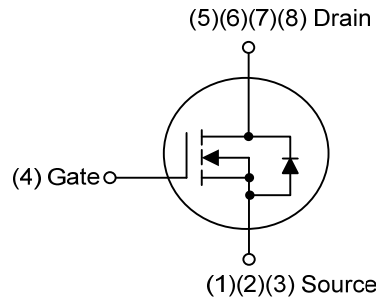
- * $R_{DS(ON)} \leq 12.5 \Omega @ V_{GS}=10V, I_D=0.6A$
- * Ultra Low gate charge (typical 5.0 nC)
- * Low reverse transfer capacitance (C_{RSS} = typical 3.0 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness



SYMBOL



SOT-223/TO-220/TO-220F/TO-220F1
 TO-220F2/TO-251/TO-251L/TO-251S
 TO-252/TO-126/TO-126S/TO-92



PDFN5x6

ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
1N65L-AA3-R	1N65G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	Tape Reel
1N65L-TA3-T	1N65G-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
1N65L-TF1-T	1N65G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
1N65L-TF2-T	1N65G-TF2-T	TO-220F2	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-TMA-T	1N65G-TMA-T	TO-251L	G	D	S	-	-	-	-	-	Tube
1N65L-TMS-T	1N65G-TMS-T	TO-251S	G	D	S	-	-	-	-	-	Tube
1N65L-TN3-R	1N65G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
1N65L-T60-K	1N65G-T60-K	TO-126	G	D	S	-	-	-	-	-	Bulk
1N65L-T6S-K	1N65G-T6S-K	TO-126S	G	D	S	-	-	-	-	-	Tube
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-P5060-R	1N65G-P5060-R	PDFN5×6	S	S	S	G	D	D	D	D	Tape Reel

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

1N65G-AA3-R

(1) Packing Type
(2) Package Type
(3) Green Package

(1) R: Tape Reel, B: Tape Box, K: Bulk, T: Tube
 (2) AA3: SOT-223, TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TM3: TO-251, TMA: TO-251L, TMS: TO-251S, TN3: TO-252, T60: TO-126, T6S: TO-126S, T92: TO-92
 P5060: PDFN5×6
 (3) G: Halogen Free and Lead Free, L: Lead Free

MARKING

SOT-223	TO-220 / TO-220F / TO-220F1 / TO-220F2 TO-251 / TO-251L / TO-251S / TO-252
TO-126 / TO-26S	TO-92
PDFN5×6	-
	-

■ 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}	± 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	8	W
	TO-220		40	W
	TO-220F/TO-220F1 TO-220F2		21	W
	TO-251/TO-251L TO-251S/TO-252		28	W
	TO-126/TO-126S		12.5	W
	TO-92 ($T_A=25^\circ\text{C}$)		1	W
	PDFN5x6		14	W
Junction Temperature		T_J	+150	$^\circ\text{C}$
Operating Temperature		T_{OPR}	-55 ~ +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. $L = 60\text{mH}$, $I_{AS} = 1\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 1.2\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	$^\circ\text{C}/\text{W}$
	TO-220/TO-220F TO-220F1/TO-220F2		62.5	
	TO-251/TO-251L TO-251S/TO-252		4.53	
	TO-126/TO-126S		132	
	TO-92		140	
	PDFN5x6		75 (Note)	
	Junction to Case		SOT-223	
TO-220		3.13		
TO-220F/TO-220F1 TO-220F2		5.95		
TO-251/TO-251L TO-251S/TO-252		4.53		
TO-126/TO-126S		10		
TO-92 ($T_A=25^\circ\text{C}$)		80		
PDFN5x6		8.9 (Note)		

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

■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

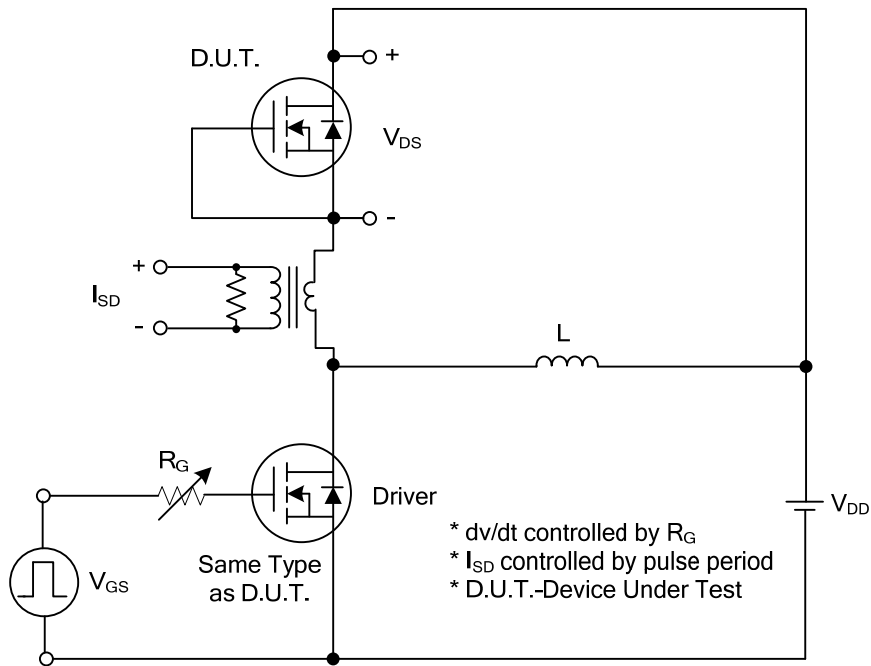
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	650			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}			100	nA
	Reverse				-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA		0.4		V/°C
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						
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
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
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				1.2	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				4.8	A
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =1.2A			1.4	V
Reverse Recovery Time	t _{rr}	V _{GS} =0V, I _S =1.2A		160		ns
Reverse Recovery Charge	Q _{rr}	dI _F /dt=100A/μs (Note 1)		0.3		μC

Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

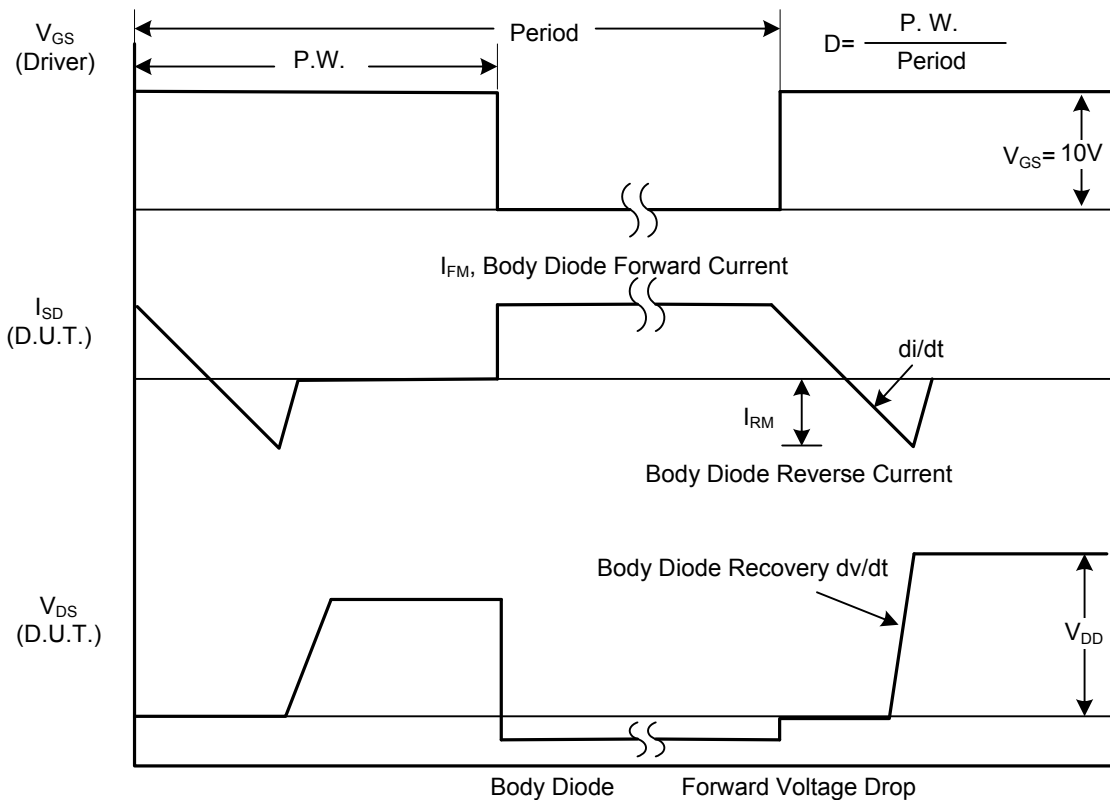
2. Pulse Test: Pulse Width ≤300μs, Duty Cycle≤2%

3. Essentially Independent of Operating Temperature

■ TEST CIRCUITS AND WAVEFORMS

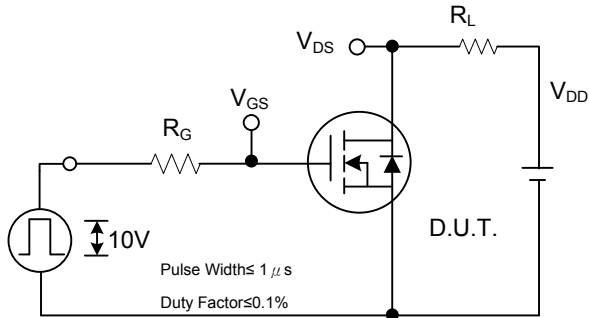


Peak Diode Recovery dv/dt Test Circuit

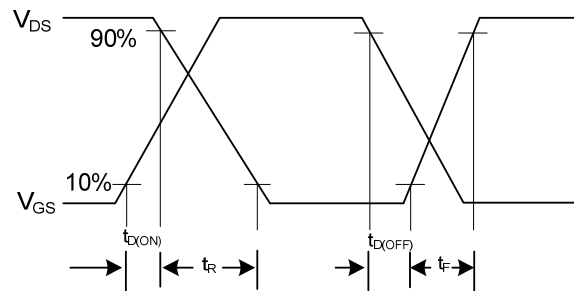


Peak Diode Recovery dv/dt Waveforms

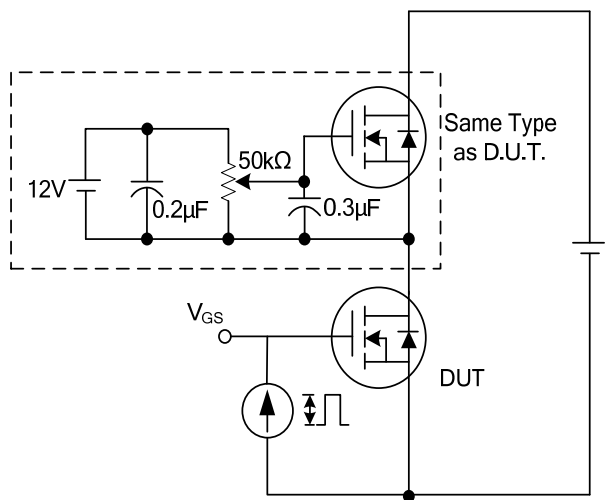
TEST CIRCUITS AND WAVEFORMS



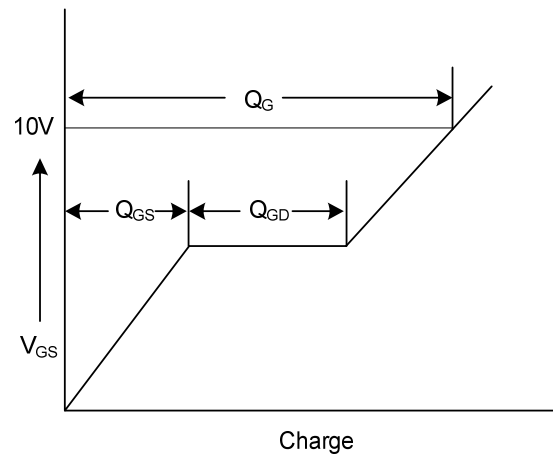
Switching Test Circuit



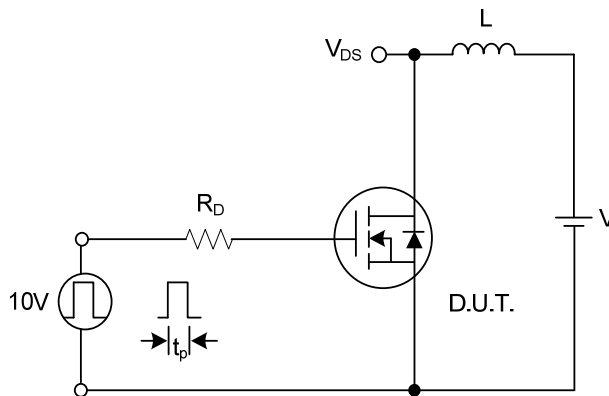
Switching Waveforms



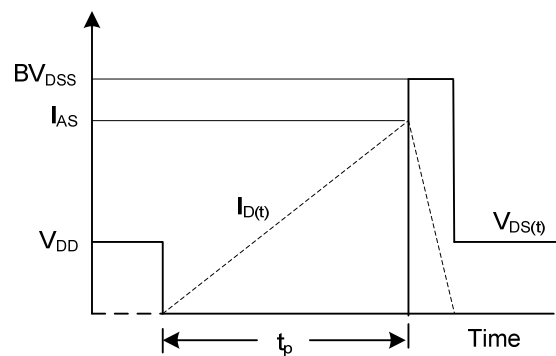
Gate Charge Test Circuit



Gate Charge Waveform

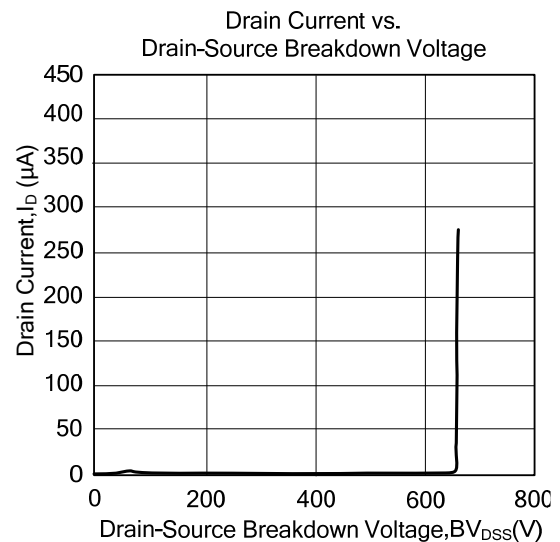
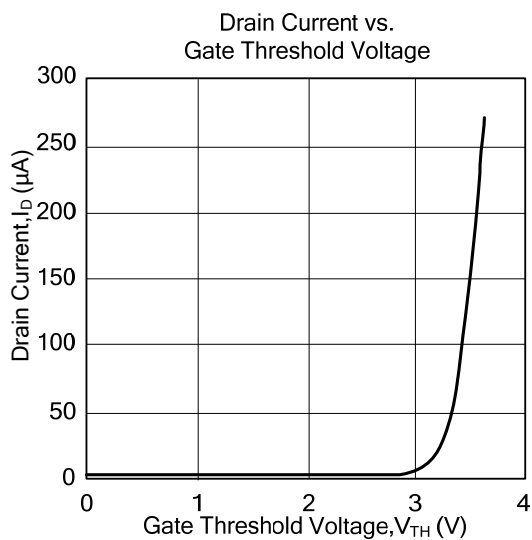
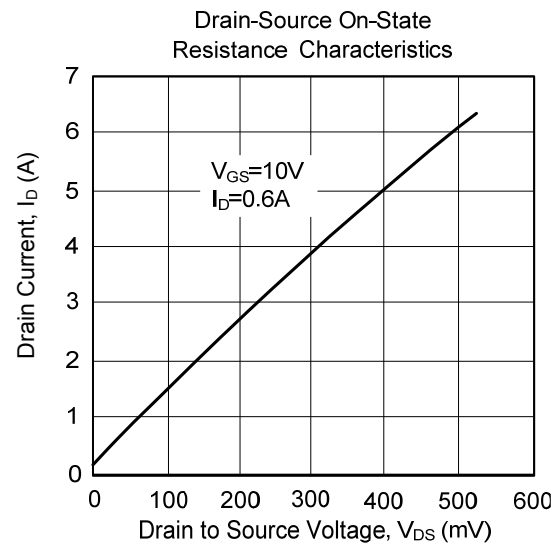
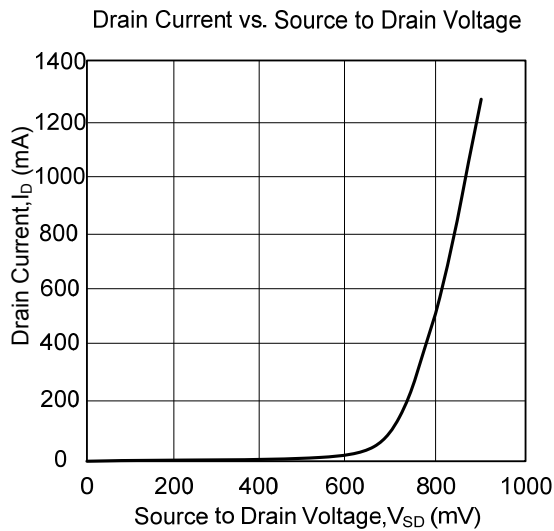


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveformst

TYPICAL CHARACTERISTICS



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