

1N65

Power MOSFET

1.2A, 650V N-CHANNEL POWER MOSFET

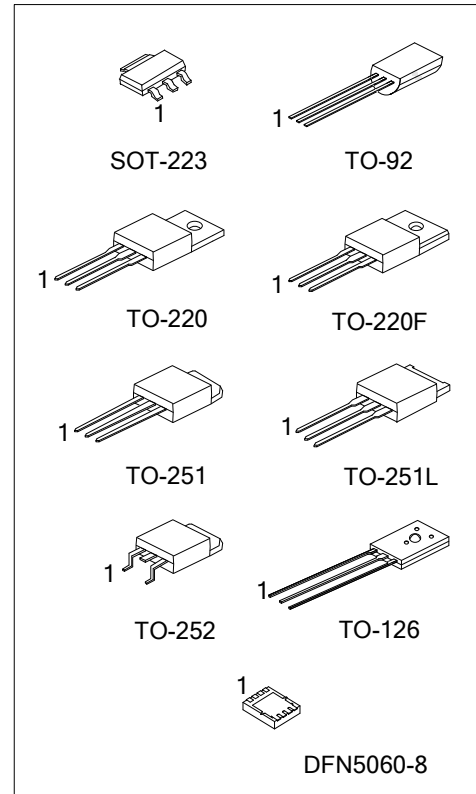
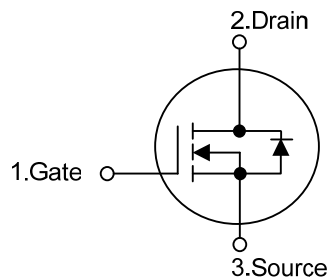
DESCRIPTION

The **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

- * $R_{DS(ON)} < 12.5\Omega$ @ $V_{GS}=10V$, $I_D=0.6A$
- * 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	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-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-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-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-K08-5060-R	1N65G-K08-5060-R	DFN5060-8	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) 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, TMA: TO-251L, T60: TO-126, K08-5060: DFN5060-8 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING

PACKAGE	MARKING
SOT-223	1N65 AA3R 1 L: Lead Free G: Halogen Free Data Code
TO-220 TO-220F TO-251 TO-251L TO-252	1N65 AA3R 1 Lot Code L: Lead Free G: Halogen Free Data Code
TO-126	1N65 AA3R 1 Data Code L: Lead Free G: Halogen Free
TO-92	1N65 AA3R 1 L: Lead Free G: Halogen Free Data Code
DFN5060-8	1N65 AA3R 1 Lot Code Date Code

■ **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-251/TO-251L		28	W
	TO-252			
	TO-220		40	W
	TO-220F		21	W
	TO-92 ($T_A=25^\circ\text{C}$)		1	W
	TO-126		12.5	W
	DFN5060-8		14	W
Junction Temperature		T_J	$+150$	$^\circ\text{C}$
Operating Temperature		T_{OPR}	$-55 \sim +150$	$^\circ\text{C}$
Storage Temperature		T_{STG}	$-55 \sim +150$	$^\circ\text{C}$

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	$^{\circ}\text{C/W}$
	TO-220/TO-220F		62.5	
	TO-251/TO-251L		4.53	
	TO-252			
	TO-92		140	
	TO-126		132	
	DFN5060-8		75	
Junction to Case	SOT-223	θ_{JC}	14	$^{\circ}\text{C/W}$
	TO-220		3.13	
	TO-220F		5.95	
	TO-251/TO-251L		4.53	
	TO-252			
	TO-92		80	
	TO-126		10	
	DFN5060-8		8.9	

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

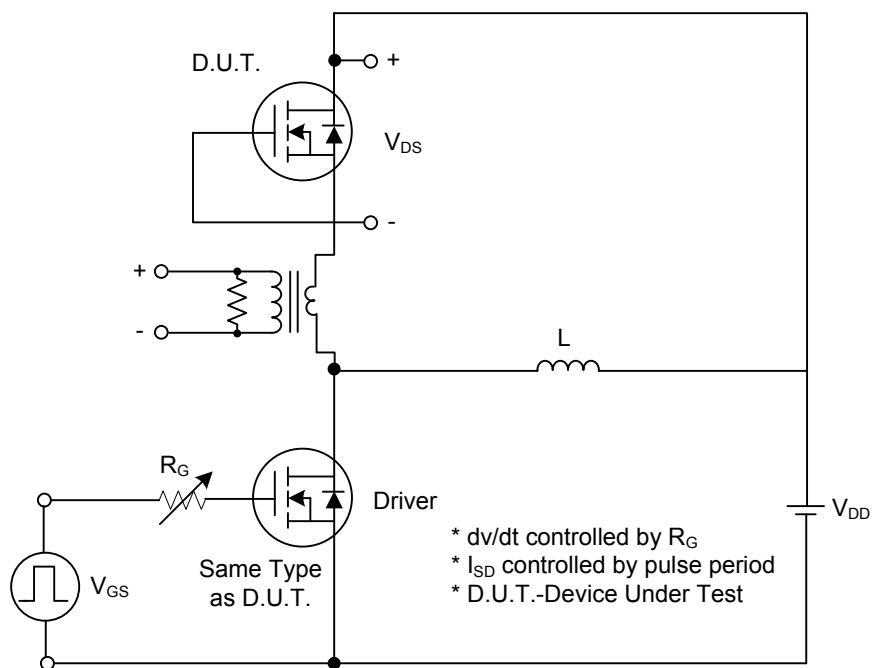
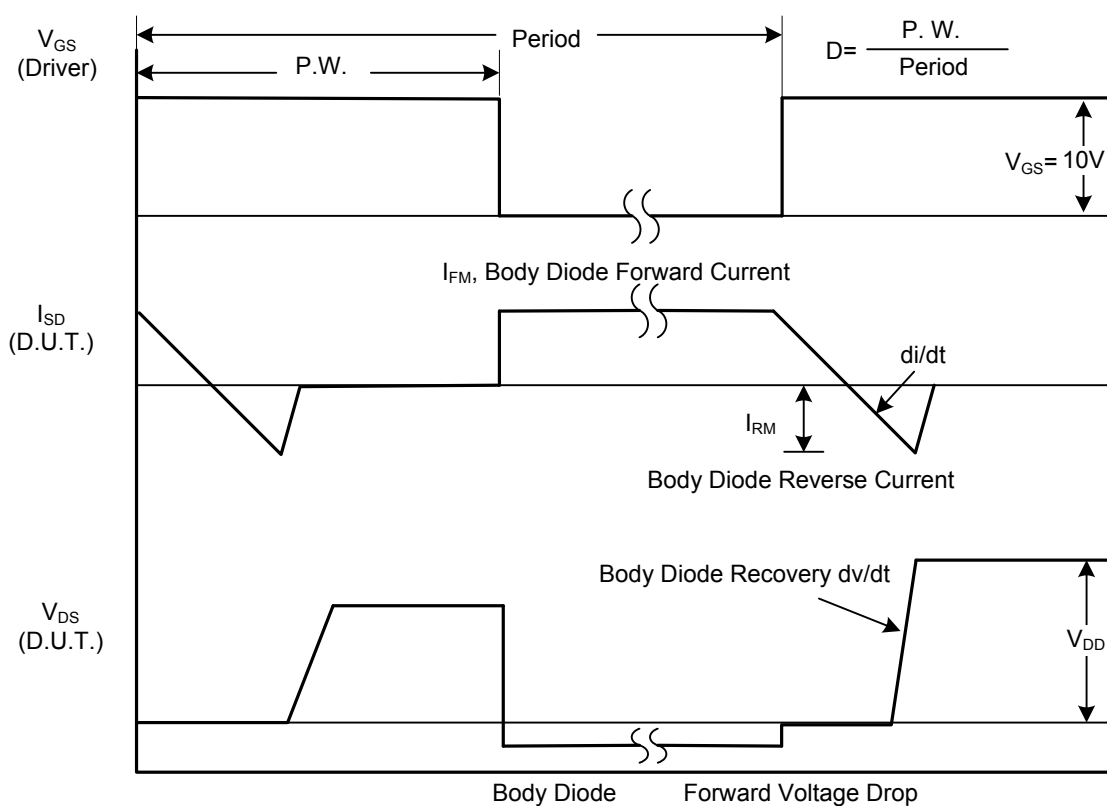
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	650			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V, V _{DS} =0V			100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-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}	dl _F /dt=100A/μs (Note 1)		0.3		μC

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

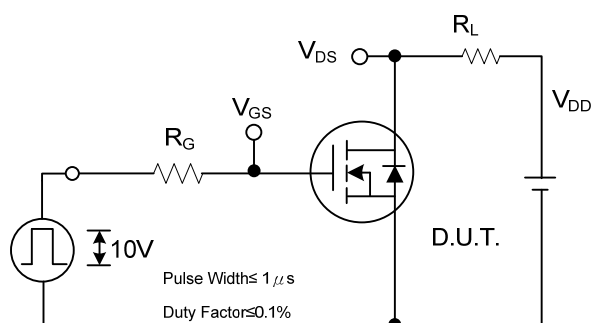
2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

3. Essentially Independent of Operating Temperature

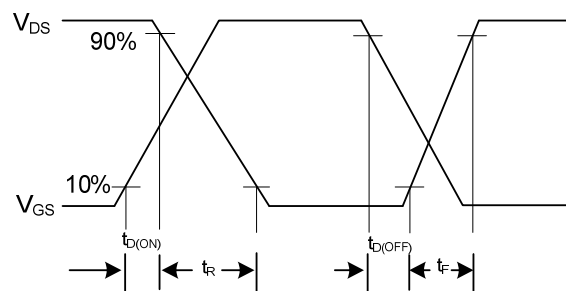
TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test CircuitPeak Diode Recovery dv/dt Waveforms

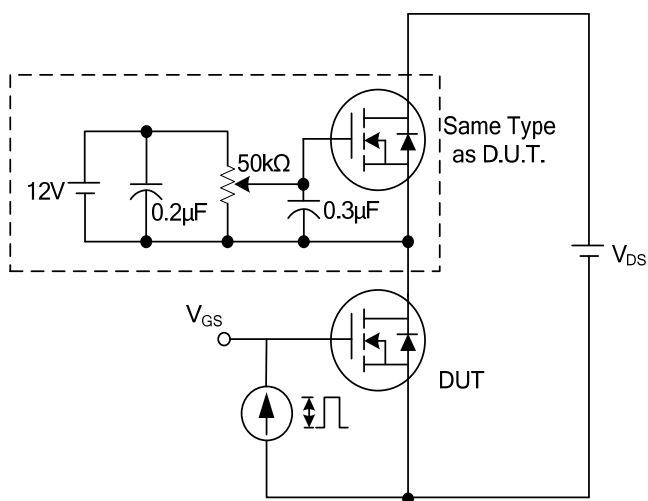
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



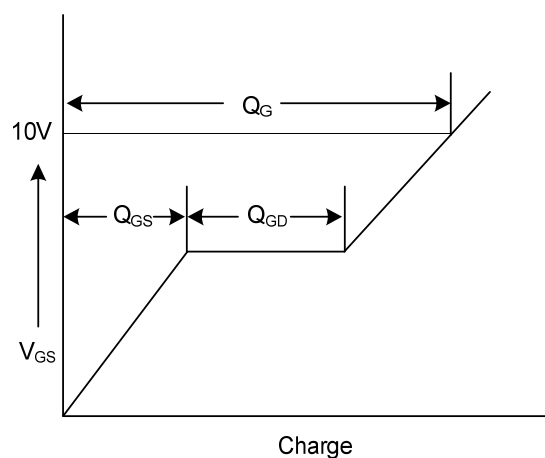
Switching Test Circuit



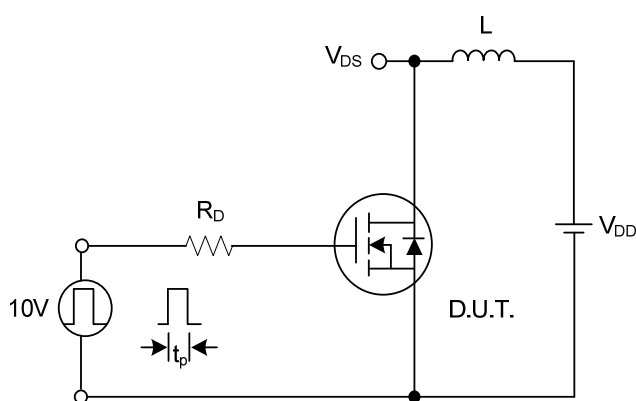
Switching Waveforms



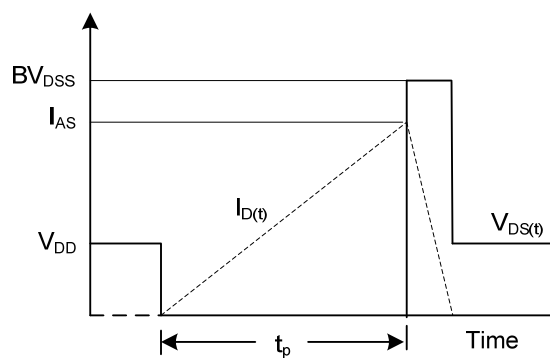
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveform

■ TYPICAL CHARACTERISTICS

