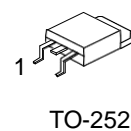
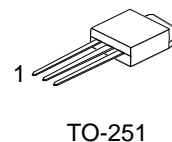
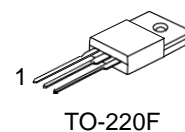
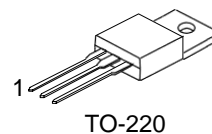


## 5.0A 650V N-CHANNEL POWER MOSFET

### Description:

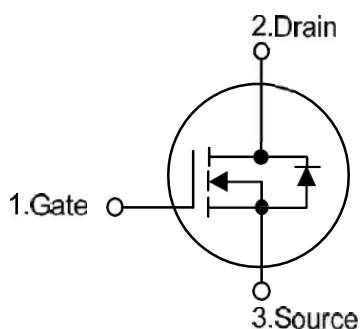
The KW5N65 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.



### Features:

- \*  $V_{DS} = 650V$
- \*  $I_D = 5.0A$
- \*  $R_{DS(ON)} = 2.5\Omega @ V_{GS} = 10V$ .
- \* Ultra Low gate charge (typical 15nC)
- \* Low reverse transfer capacitance ( $C_{RSS} =$  typical 6.5 pF)
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

### SYMBOL



### ORDERING INFORMATION

Ordering Number	Package	Pin Assignment			Packing
		1	2	3	
KW5N65-LI	TO-220	G	D	S	Tape Box
KW5N65-BL	TO-220	G	D	S	Bulk
KW5N65F-LI	TO-220F	G	D	S	Tube
KW5N65A-LI	TO-251	G	D	S	Tube
KW5N65D-TR	TO-252	G	D	S	Tape Ree
KW5N65D-LI	TO-252	G	D	S	Tube

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

**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
Avalanche Current (Note 2)	$I_{AR}$	4.5	A
Continuous Drain Current	$I_D$	4.5	A
Pulsed Drain Current (Note 2)	$I_{DM}$	18	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	210
	Repetitive (Note 2)	$E_{AR}$	10
Peak Diode Recovery $dv/dt$ (Note 4)	$dv/dt$	4.5	V/ns
Power Dissipation	TO-220	$P_D$	100
	TO-220F		36
	TO-251 / TO-252		54
Junction Temperature	$T_J$	+150	$^\circ\text{C}$
Operation Temperature	$T_{OPR}$	-55 ~ +150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

Note: 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. Pulse width limited by  $T_{J(MAX)}$

3.  $L = 18.9\text{mH}$ ,  $I_{AS} = 4.5\text{ A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$ .

4.  $I_{SD} \leq 4.5\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$ .

**THERMAL DATA**

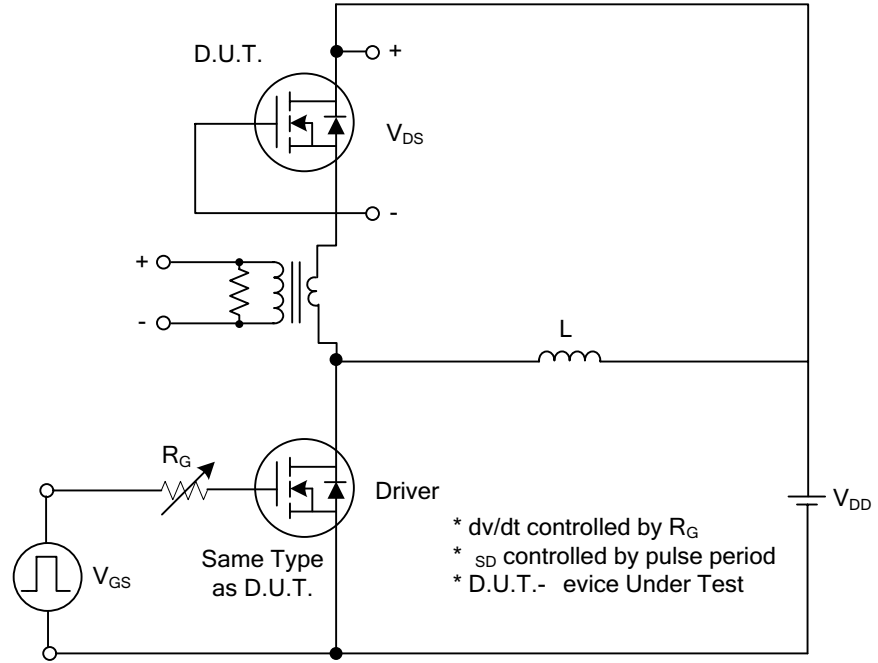
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	$\theta_{JA}$	62.5
	TO-220F		62.5
	TO-251 / TO-252		160
Junction to Case	TO-220	$\theta_{JC}$	1.25
	TO-220F		3.47
	TO-251 / TO-252		2.3

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

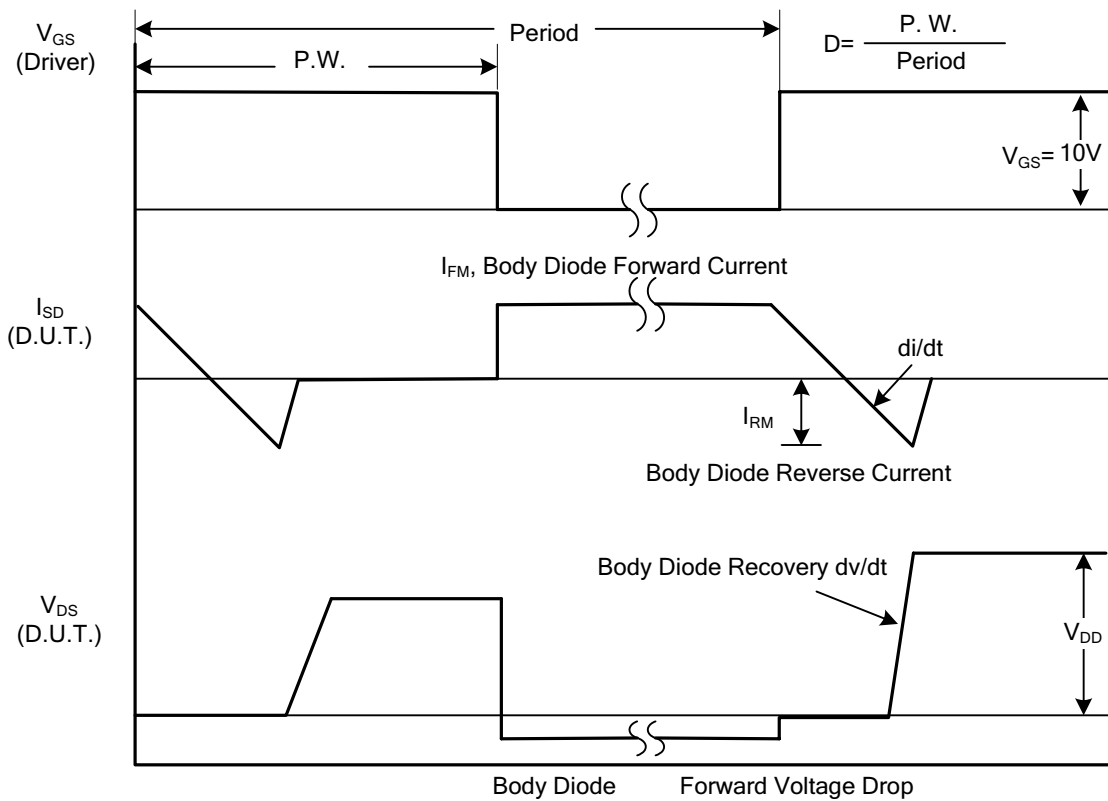
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	650			V	
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 650V, V_{GS} = 0V$			1	$\mu A$	
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA	
	Reverse				-100		
Breakdown Voltage Temperature Coefficient	$I_D BV_{DSS} / \xi T_J$	$I_D = 250\mu A$ , Referenced to $25^\circ\text{C}$		0.6		V/°C	
<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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 2.25A$		2.0	2.5	$\Omega$	
<b>DYNAMIC CHARACTERISTICS</b>							
Input Capacitance	$C_{ISS}$	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$		515	670	pF	
Output Capacitance	$C_{OSS}$				55	72	pF
Reverse Transfer Capacitance	$C_{RSS}$				6.5	8.5	pF
<b>SWITCHING CHARACTERISTICS</b>							
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 325V, I_D = 4.5A,$ $R_G = 25\Omega$ (Note 1, 2)		10	30	ns	
Turn-On Rise Time	$t_R$			42	90	ns	
Turn-Off Delay Time	$t_{D(OFF)}$			38	85	ns	
Turn-Off Fall Time	$t_F$			46	100	ns	
Total Gate Charge	$Q_G$	$V_{DS} = 520V, I_D = 4.5A,$ $V_{GS} = 10V$ (Note 1, 2)		15	19	nC	
Gate-Source Charge	$Q_{GS}$			2.5		nC	
Gate-Drain Charge	$Q_{GD}$			6.6		nC	
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>							
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0V, I_S = 4.5A$			1.4	V	
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				4.5	A	
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				18	A	
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0V, I_S = 4.5A,$		300		ns	
Reverse Recovery Charge	$Q_{RR}$	$dI_F / dt = 100A/\mu s$ (Note 1)		2.2		$\mu C$	

Note 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$   
 2. Essentially independent of operating temperature

**TEST CIRCUITS AND WAVEFORMS**

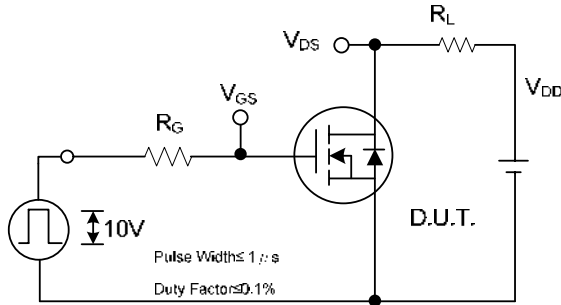


Peak Diode Recovery  $dv/dt$  Test Circuit

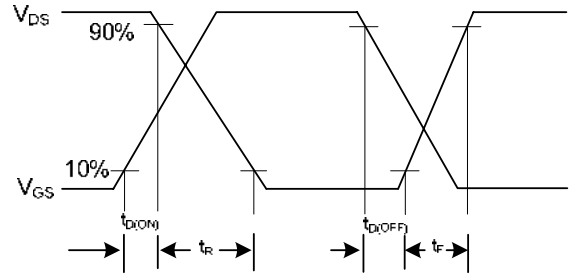


Peak Diode Recovery  $dv/dt$  Waveforms

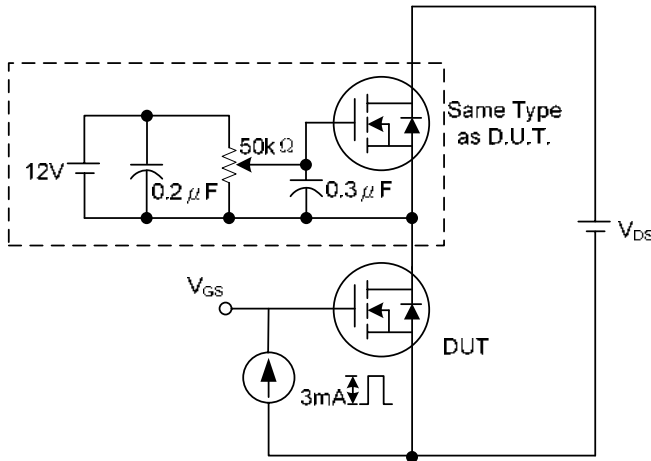
**TEST CIRCUITS AND WAVEFORMS (Cont.)**



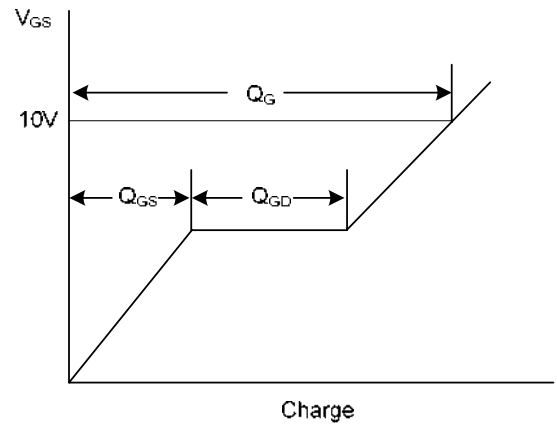
**Switching Test Circuit**



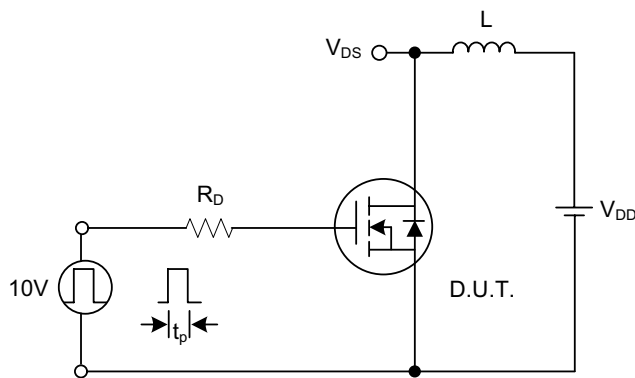
**Switching Waveforms**



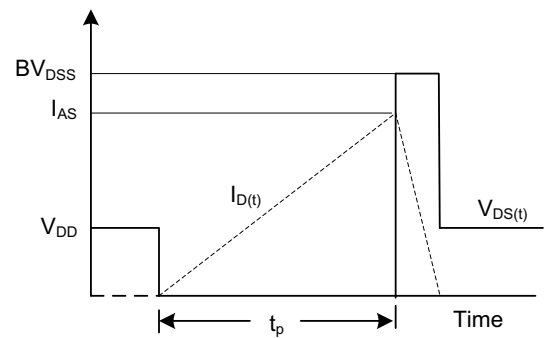
**Gate Charge Test Circuit**



**Gate Charge Waveform**



**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

**TYPICAL CHARACTERISTICS**

