



2N65-CB

Power MOSFET

2A, 650V N-CHANNEL POWER MOSFET

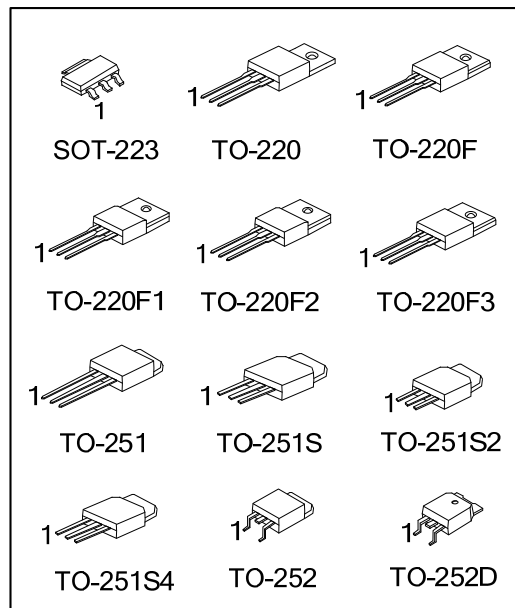
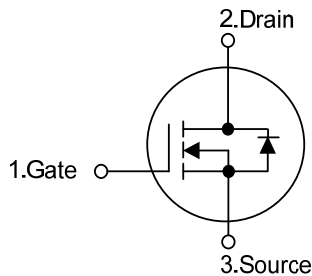
DESCRIPTION

The UTC **2N65-CB** 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 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

- * $R_{DS(ON)} < 5.0\Omega$ @ $V_{GS} = 10V, I_D = 1.0A$
- * 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	
2N65L-AA3-R	2N65G-AA3-R	SOT-223	G	D	S	Tape Reel
2N65L-TA3-T	2N65G-TA3-T	TO-220	G	D	S	Tube
2N65L-TF3-T	2N65G-TF3-T	TO-220F	G	D	S	Tube
2N65L-TF1-T	2N65G-TF1-T	TO-220F1	G	D	S	Tube
2N65L-TF2-T	2N65G-TF2-T	TO-220F2	G	D	S	Tube
2N65L-TF3T-T	2N65G-TF3T-T	TO-220F3	G	D	S	Tube
2N65L-TM3-T	2N65G-TM3-T	TO-251	G	D	S	Tube
2N65L-TMS-T	2N65G-TMS-T	TO-251S	G	D	S	Tube
2N65L-TMS2-T	2N65G-TMS2-T	TO-251S2	G	D	S	Tube
2N65L-TMS4-T	2N65G-TMS4-T	TO-251S4	G	D	S	Tube
2N65L-TN3-R	2N65G-TN3-R	TO-252	G	D	S	Tape Reel
2N65L-TND-R	2N65G-TND-R	TO-252D	G	D	S	Tape Reel

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

<p>2N65G-AA3-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF1: TO-220F2, TF3T: TO-220F3, TM3: TO-251, TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TND: TO-252D</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

<p>TO-220</p> <p>TO-220F</p> <p>TO-220F1</p> <p>TO-220F2</p> <p>TO-220F3</p> <p>TO-251</p>	<p>TO-251S</p> <p>TO-251S2</p> <p>TO-251S4</p> <p>TO-252</p> <p>TO-252D</p>	<p>SOT-223</p>
<p>UTC</p> <p>2N65</p> <p>Lot Code</p> <p>L: Lead Free</p> <p>G: Halogen Free</p> <p>Data Code</p> <p>1</p>	<p>2N65</p> <p>Lot Code</p> <p>L: Lead Free</p> <p>G: Halogen Free</p> <p>Data Code</p> <p>1</p>	

■ 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}	2.0	A
Drain Current	Continuous	I_D	2.0	A
	Pulsed (Note 2)	I_{DM}	8.0	A
Avalanche Energy		E_{AS}	40	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.0	V/ns
Power Dissipation	SOT-223	P_D	44	W
	TO-220		55	W
	TO-220F/TO-220F1		24	W
	TO-220F3			
	TO-220F2		25	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		44	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 T_J .

3. $L=20\text{mH}$, $I_{AS}=2.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 2.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, 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 TO-220F3		62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	θ_{JC}	14	$^\circ\text{C}/\text{W}$
	TO-220		2.27	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F3		5.2	$^\circ\text{C}/\text{W}$
	TO-220F2		5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		2.84	$^\circ\text{C}/\text{W}$

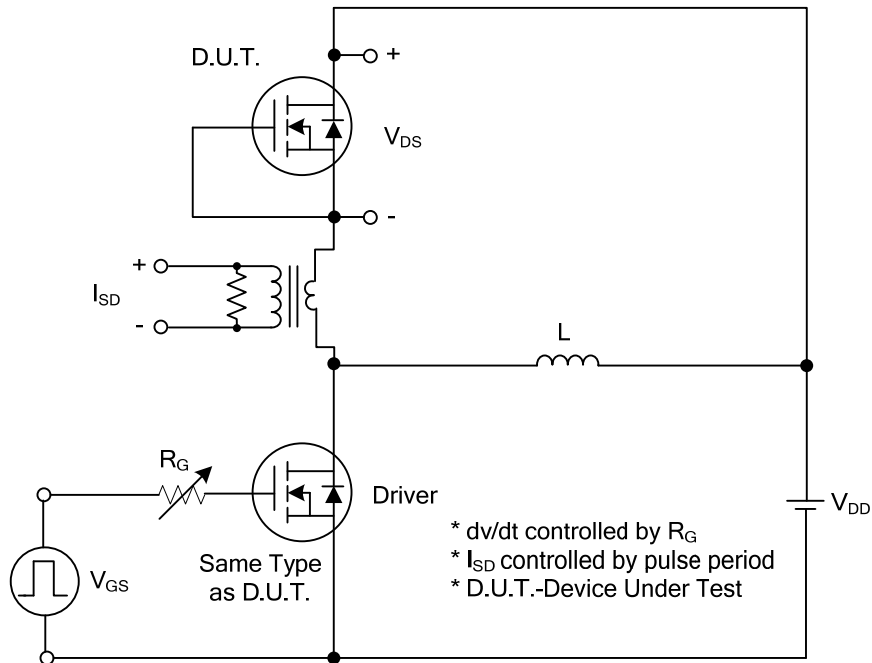
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

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				V _{GS} = 30V, V _{DS} = 0V	
		V _{GS} = -30V, V _{DS} = 0V			-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C		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 = 1.0A			5.0	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz		192		pF
Output Capacitance	C _{OSS}			32		pF
Reverse Transfer Capacitance	C _{RSS}			3.4		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q _G	V _{DS} =50V, V _{GS} =1.0V, I _D =1.3A (Note 1, 2)		35		nC
Gate-Source Charge	Q _{GS}			3.5		nC
Gate-Drain Charge	Q _{GD}			1.8		nC
Turn-On Delay Time	t _{D(ON)}	V _{DD} = 30V, I _D = 0.5A, R _G = 25Ω (Note 1, 2)		40		ns
Turn-On Rise Time	t _R			15		ns
Turn-Off Delay Time	t _{D(OFF)}			62		ns
Turn-Off Fall Time	t _F			22		ns
DRAIN-SOURCE DIODE CHARACTERISTICS						
Continuous Drain-Source Current	I _{SD}				2.0	A
Pulsed Drain-Source Current	I _{SM}				8.0	A
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0 V, I _{SD} = 2.0 A			1.4	V
Body Diode Reverse Recovery Time	t _{rr}	I _S =2.0A, dI/dt=100A/μs		310		nS
Body Diode Reverse Recovery Charge	Q _{rr}			0.7		nC

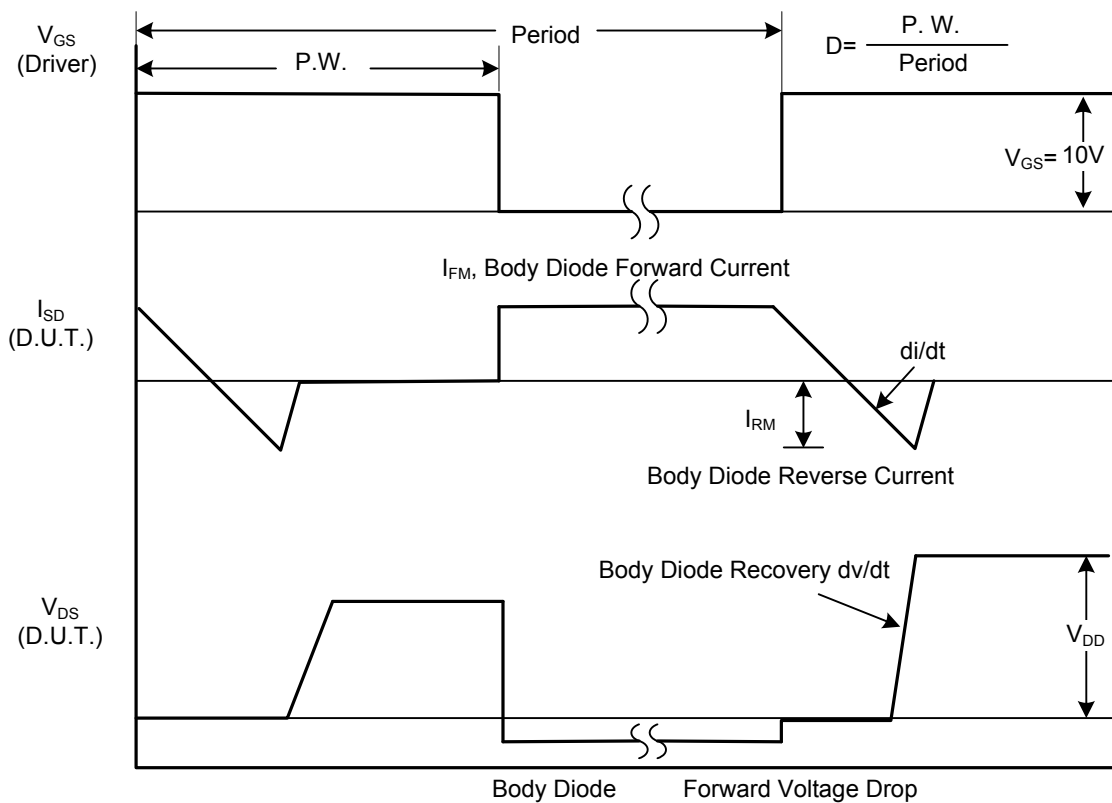
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

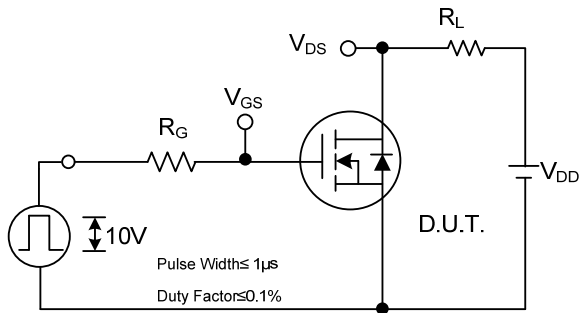


Peak Diode Recovery dv/dt Test Circuit

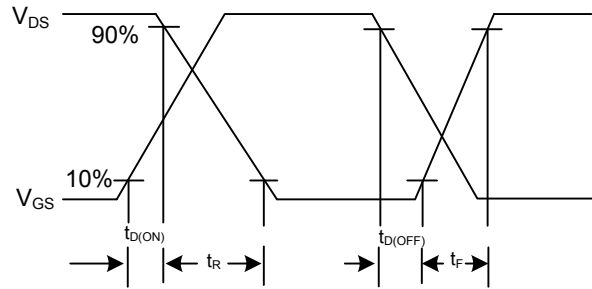


Peak Diode Recovery dv/dt Waveforms

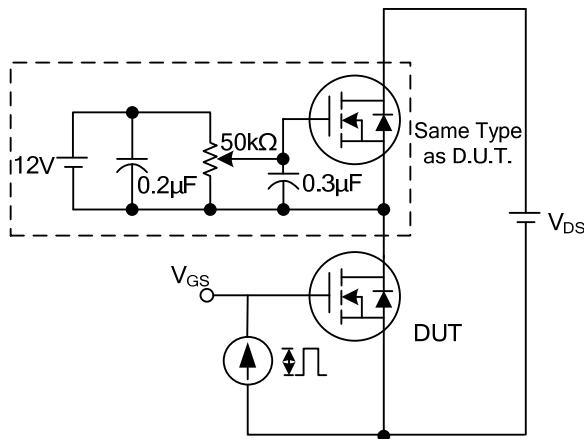
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



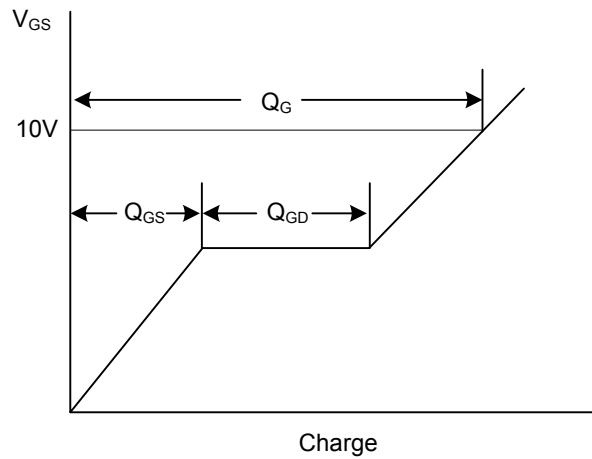
Switching Test Circuit



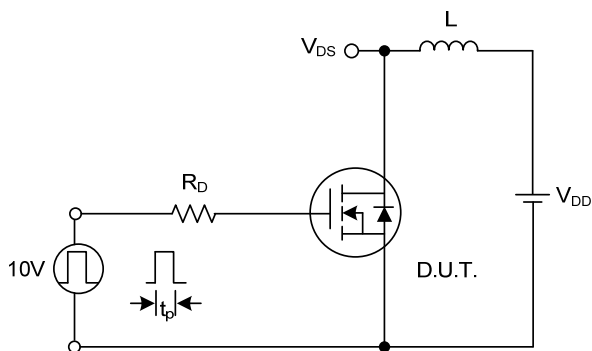
Switching Waveforms



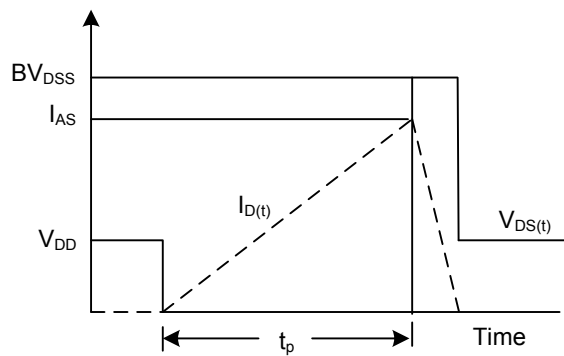
Gate Charge Test Circuit



Gate Charge Waveform

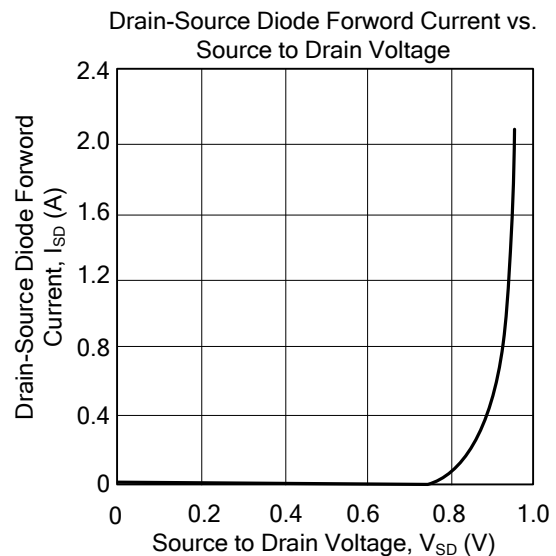
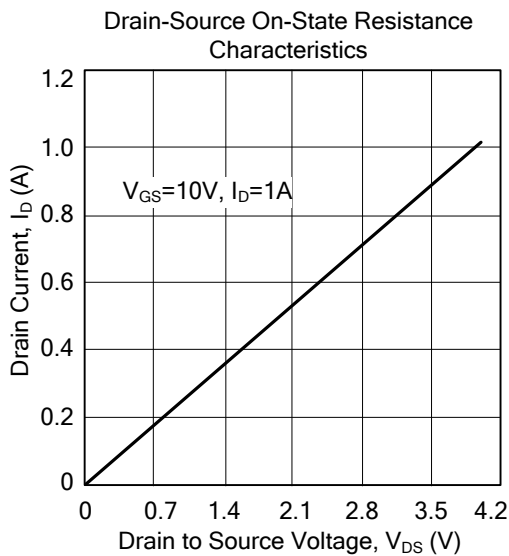
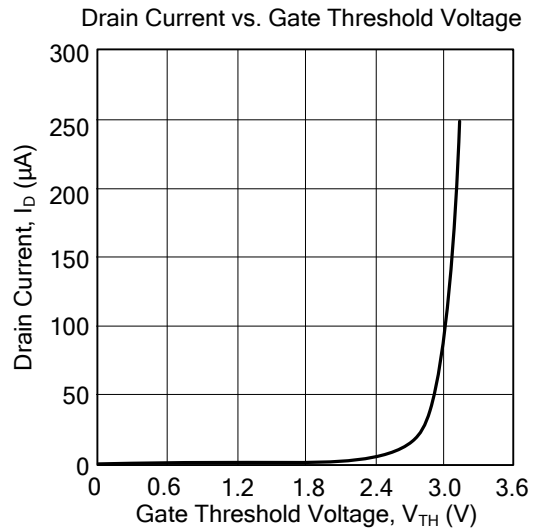
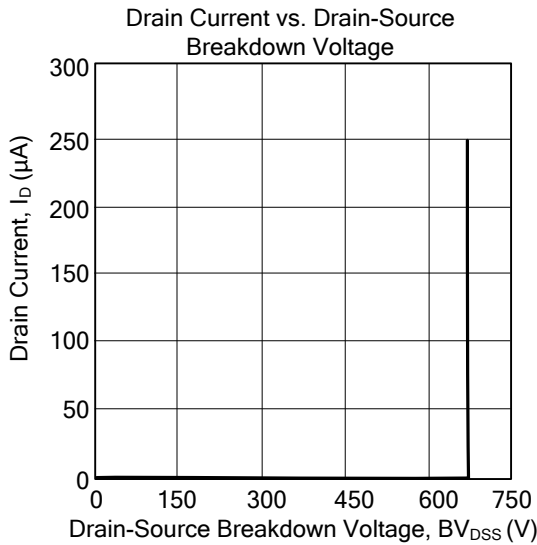


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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