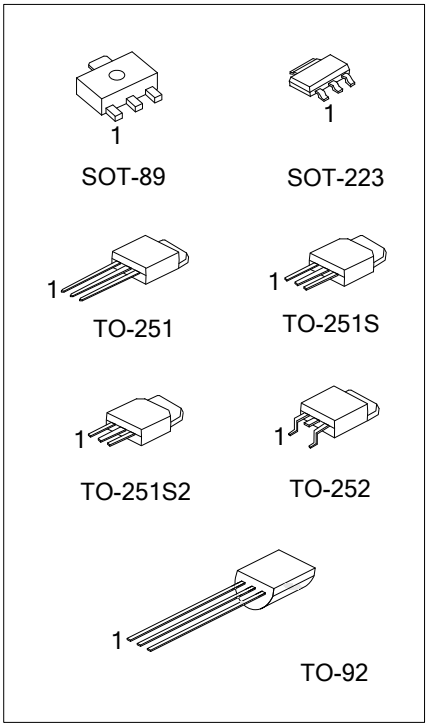
1A, 500V N-CHANNEL POWER MOSFET



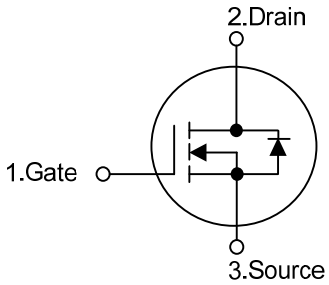
■ DESCRIPTION

The UTC **1N50-CB** 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

* $R_{DS(ON)}$ < 12Ω @ V_{GS}=10V, I_D=0.5A
* Fast switching capability
* Avalanche energy specified
* Improved dv/dt capability, high ruggedness

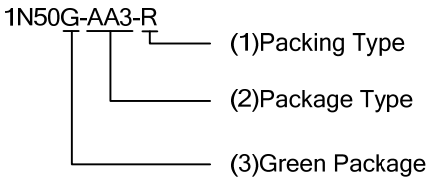
■ SYMBOL



■ ORDERING INFORMATION

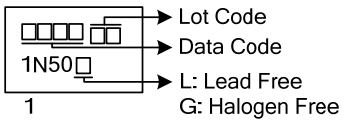
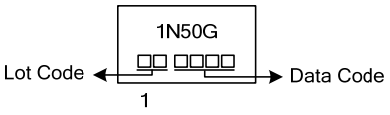
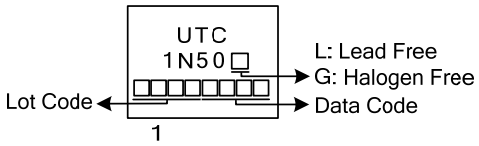
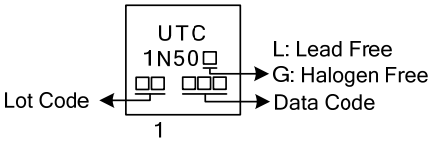
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N50L-AA3-R	1N50G-AA3-R	SOT-223	G	D	S	Tape Reel
1N50L-AB3-R	1N50G-AB3-R	SOT-89	G	D	S	Tape Reel
1N50L-TM3-T	1N50G-TM3-T	TO-251	G	D	S	Tube
1N50L-TMS-T	1N50G-TMS-T	TO-251S	G	D	S	Tube
1N50L-TMS2-T	1N50G-TMS2-T	TO-251S2	G	D	S	Tube
1N50L-TN3-R	1N50G-TN3-R	TO-252	G	D	S	Tape Reel
1N50L-T92-B	1N50G-T92-B	TO-92	G	D	S	Tape Box
1N50L-T92-K	1N50G-T92-K	TO-92	G	D	S	Bulk

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



(1) R: Tape Reel, T: Tube, B: Tape Box, K: Bulk
(2) AA3: SOT-223, AB3: SOT-89, TM3: TO-251
TMS: TO-251S, TMS2: TO-251S2,
TN3: TO-252, T92: TO-92
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

SOT-89	SOT-223
	
TO-251 / TO-251S TO-251S2 / TO-252	TO-92
	

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	±30	V
Avalanche Current (Note 2)		I_{AR}	1.0	A
Continuous Drain Current		I_D	1.0	A
Pulsed Drain Current (Note 2)		I_{DM}	4.0	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	80	mJ
	Repetitive (Note 2)	E_{AR}	4.0	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.6	V/ns
Power Dissipation (T_C=25°C)	SOT-223	P_D	7.8	W
	SOT-89		8.0	W
	TO-251/TO-251S TO-251S2/TO-252		25	W
	TO-92		1.56	W
Junction Temperature		T_J	+150	°C
Operating Temperature		T_{OPR}	-55 ~ +150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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 = 159mH, I_{AS} = 1.0A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
4. I_{SD} ≤ 1.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

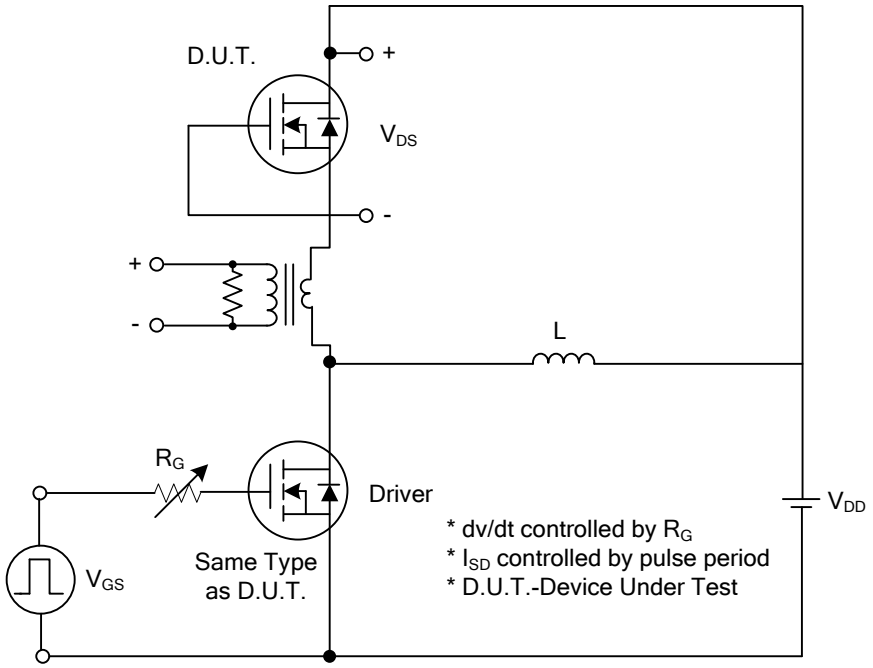
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	°C/W
	SOT-89		160	°C/W
	TO-251/TO-251S TO-251S2/TO-252		110	°C/W
	TO-92		180	°C/W
Junction to Case	SOT-223	θ_{JC}	16	°C/W
	SOT-89		15.6	°C/W
	TO-251/TO-251S TO-251S2/TO-252		5	°C/W
	TO-92		80	°C/W

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

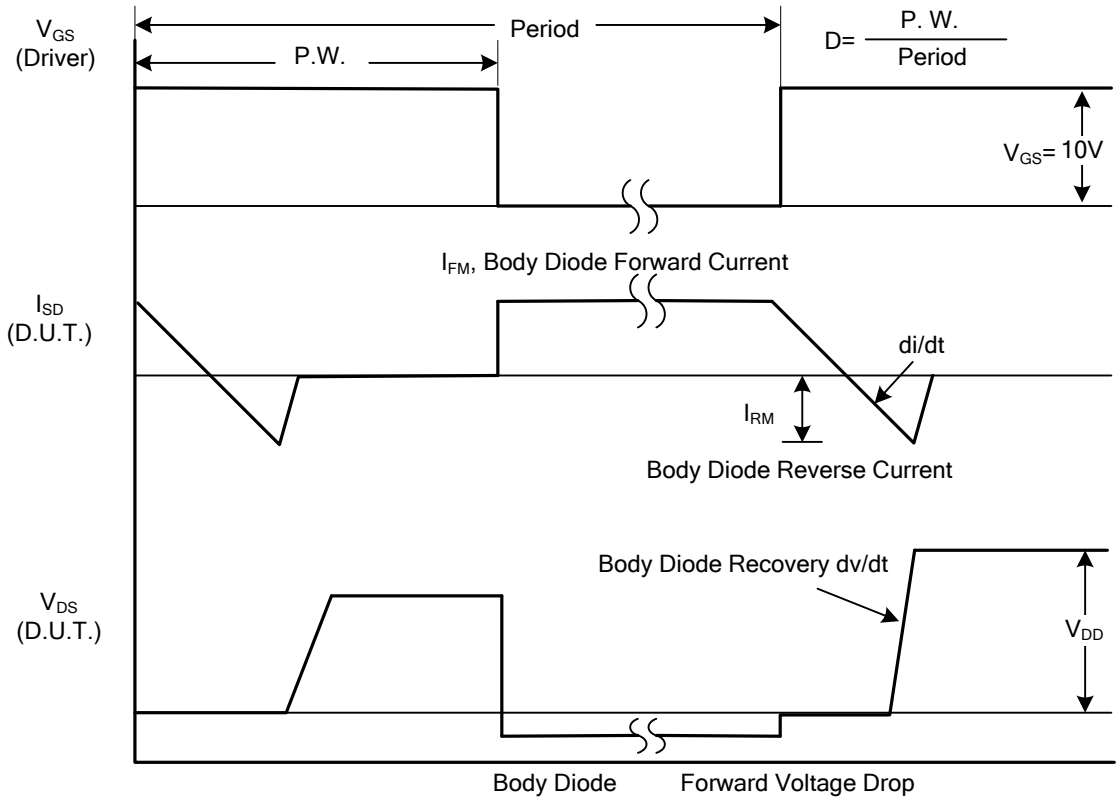
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	500			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=500V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=30V, V_{DS}=0V			100	nA
	Reverse		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=0.5A			12	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1MHz		120		pF
Output Capacitance		C_{OSS}			22		pF
Reverse Transfer Capacitance		C_{RSS}			4.7		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q_G	V_{DS}=50V, V_{GS}=10V, I_D=1.3A, I_G = 250μA (Note 1, 2)		10.1		nC
Gate-Source Charge		Q_{GS}			1.2		nC
Gate-Drain Charge		Q_{GD}			0.5		nC
Turn-On Delay Time		$t_{D(ON)}$	V_{DD} =30V, V_{GS}=10V, I_D =0.5A, R_G=25Ω (Note 1, 2)		24		ns
Turn-On Rise Time		t_R			18		ns
Turn-Off Delay Time		$t_{D(OFF)}$			56		ns
Turn-Off Fall Time		t_F			27		ns
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				1.0	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 =1.0A			1.4	V
Reverse Recovery Time		t_{rr}	V_{GS}=0V, I_S=1.0A dI$_F$/dt=100A/μs (Note 1)		110		ns
Reverse Recovery Charge		Q_{RR}			0.28		μC

Notes: 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

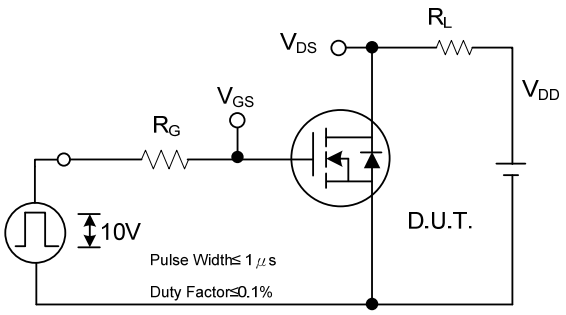


Peak Diode Recovery dv/dt Test Circuit

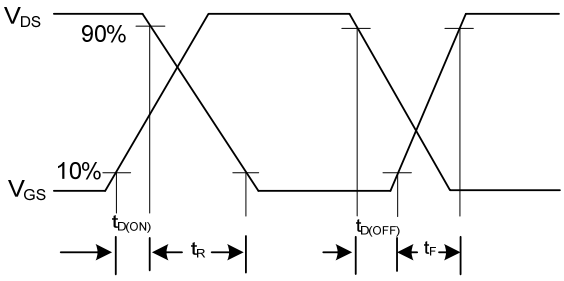


Peak Diode Recovery dv/dt Waveforms

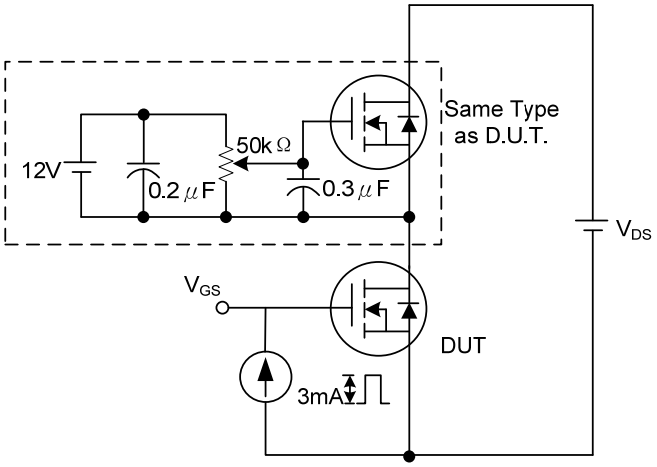
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



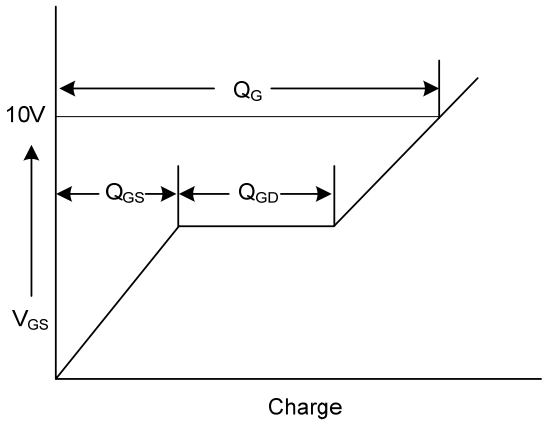
Switching Test Circuit



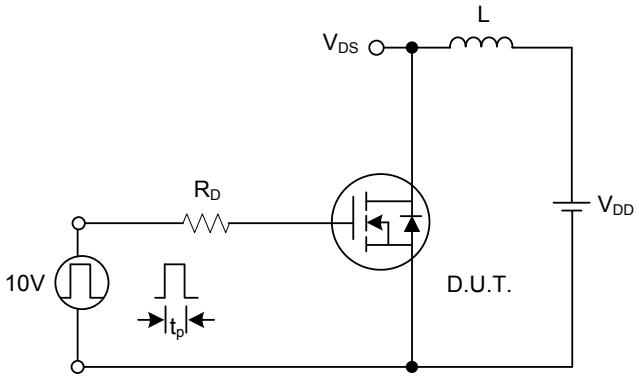
Switching Waveforms



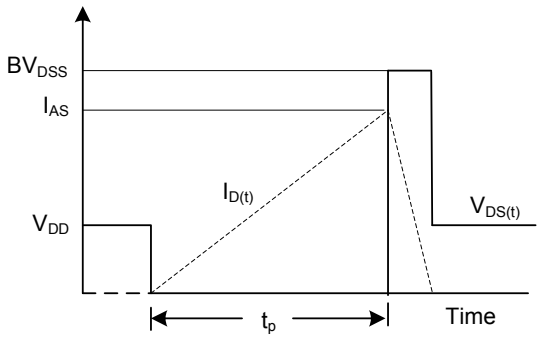
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms