



# 7N10

*Power MOSFET*

## 7A, 100V N-CHANNEL POWER MOSFET

### DESCRIPTION

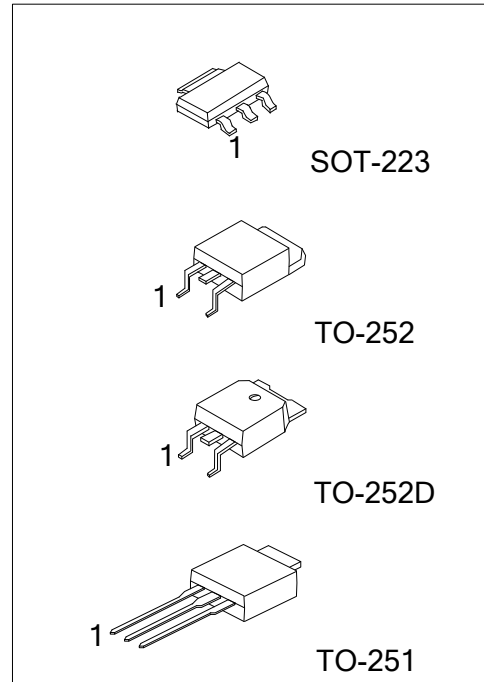
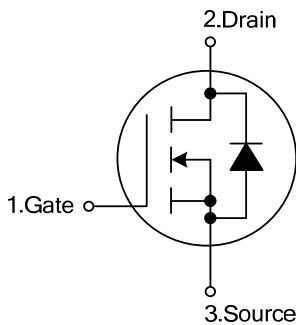
The UTC **7N10** is an N-Channel enhancement mode power MOSFET, providing customers with excellent switching performance and minimum on-state resistance. The UTC **7N10** uses planar stripe and DMOS technology to provide perfect quality. This device can also withstand high energy pulse in the avalanche and the commutation mode.

The UTC **7N10** is generally applied in low voltage applications, such as DC motor controls, audio amplifiers and high efficiency switching DC/DC converters.

### FEATURES

- \*  $R_{DS(ON)} < 0.35\Omega @ V_{GS}=10V, I_D=3.5A$
- \* Fast Switching
- \* Improved dv/dt Capability

### SYMBOL



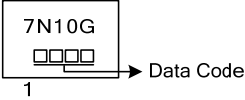
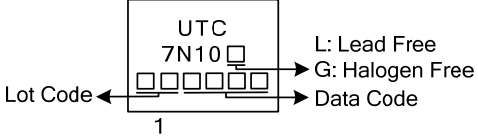
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	7N10G-AA3-R	SOT-223	G	D	S	Tape Reel
7N10L-TM3-T	7N10G-TM3-T	TO-251	G	D	S	Tube
7N10L-TN3-R	7N10G-TN3-R	TO-252	G	D	S	Tape Reel
7N10L-TND-R	7N10G-TND-R	TO-252D	G	D	S	Tape Reel

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

<p>7N10G-AA3-R</p>	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) AA3: SOT-223, TM3: TO-251, TN3: TO-252 TND: TO-252D</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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## MARKING

SOT-223	TO-251 / TO-252 / TO-252D
 <p>A diagram of a SOT-223 package showing the marking '7N10G' above three small squares. An arrow points from the squares to the text 'Data Code'. The number '1' is located below the package.</p>	 <p>A diagram of a TO-251 / TO-252 / TO-252D package showing the marking 'UTC' above '7N10' and a small square. Below these are five small squares. An arrow points from the squares to the text 'Data Code'. An arrow points from the left side of the package to the text 'Lot Code'. The number '1' is located below the package. To the right of the package, a legend indicates: 'L: Lead Free' and 'G: Halogen Free'.</p>

■ ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain -Source Voltage		$V_{DSS}$	100	V
Gate-Source Voltage		$V_{GSS}$	$\pm 25$	V
Continuous Drain Current	$T_C=25^\circ\text{C}$	$I_D$	7	A
	$T_C=70^\circ\text{C}$	$I_D$	6.8	A
Pulsed Drain Current (Note 2)		$I_{DM}$	16	A
Avalanche Current (Note 2)		$I_{AR}$	7	A
Repetitive Avalanche Energy (Note 2)		$E_{AR}$	0.2	mJ
Single Pulsed Avalanche Energy (Note 3)		$E_{AS}$	50	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	6.0	V/ns
Power Dissipation	SOT-223	$P_D$	2.0	W
	TO-251/TO-252 TO-252D		2.5	
	Derate above $25^\circ\text{C}$		SOT-223	0.016
	TO-251/TO-252 TO-252D	0.02		
Operating Junction Temperature		$T_J$	$-55 \sim +150$	$^\circ\text{C}$
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.  $L=26\text{mH}$ ,  $I_{AS}=1.7\text{A}$ ,  $V_{DD}=25\text{V}$ ,  $R_G=25\Omega$  Starting  $T_J=25^\circ\text{C}$
4.  $I_{SD}\leq 7.3\text{A}$ ,  $di/dt\leq 300\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-252 TO-252D		50	
	Junction to Case		SOT-223	$\theta_{JC}$
TO-251/TO-252 TO-252D		7.5		

Note: When mounted on the minimum pad size recommended (PCB Mount)

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

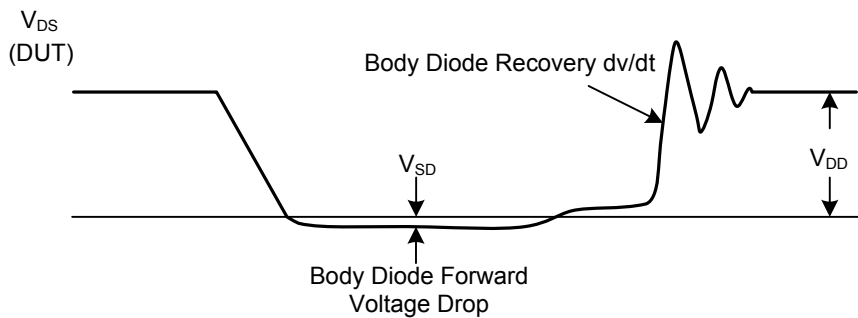
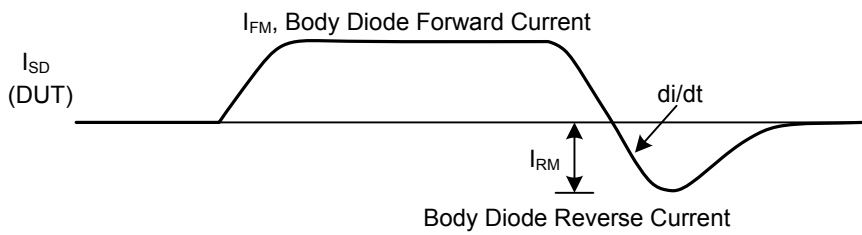
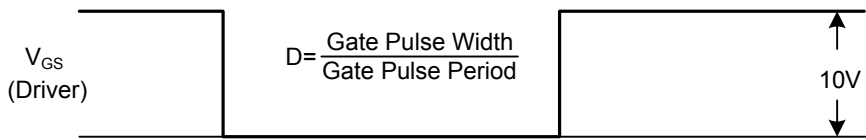
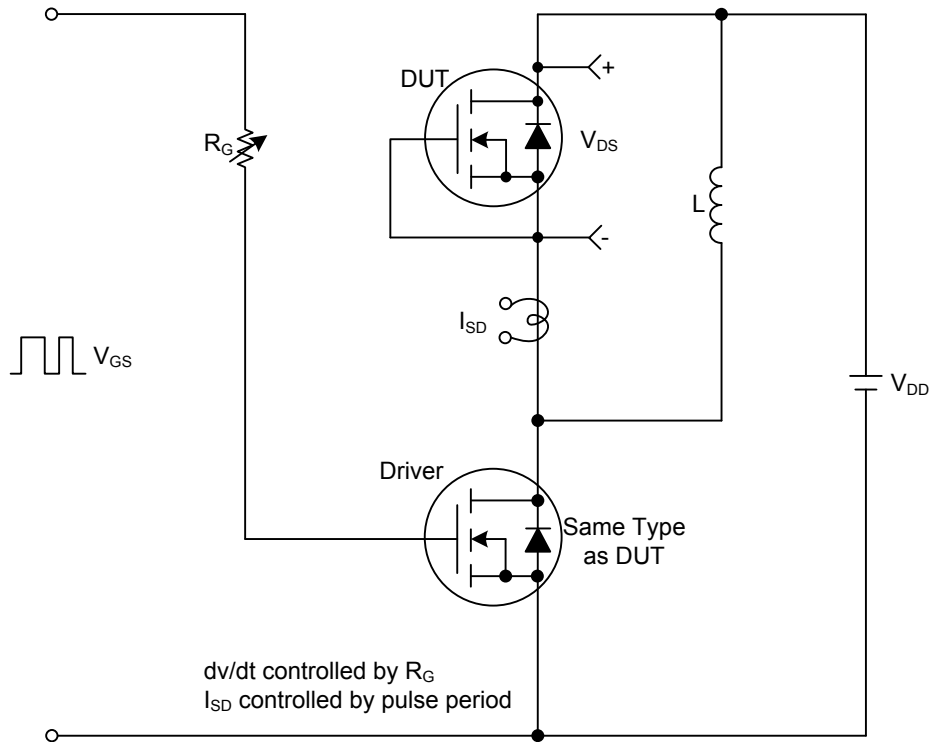
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	100			V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ\text{C}, I_D=250\mu A$		0.1		V/ $^\circ\text{C}$
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$			1	$\mu A$
		$V_{DS}=80V, T_C=125^\circ\text{C}$			10	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 25V, V_{DS}=0V$			$\pm 100$	nA
<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-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.5A$		0.144	0.35	$\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=40V, I_D=0.85A$ (Note 1)		1.85		S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$		380	450	pF
Output Capacitance	$C_{OSS}$			70	85	pF
Reverse Transfer Capacitance	$C_{RSS}$			11	15	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{GS}=10V, V_{DS}=50V, I_D=1.3A$ (Note 1,2)		14.3		nC
Gate Source Charge	$Q_{GS}$			4.2		nC
Gate Drain Charge	$Q_{GD}$			3.2		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=30V, I_D=0.5A, R_G=25\Omega$ (Note 1,2)		30	38	ns
Turn-ON Rise Time	$t_R$			40	50	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			80	90	ns
Turn-OFF Fall-Time	$t_F$			35	40	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				7	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				16	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S=7A, V_{GS}=0V$			1.5	V
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_S=7.3A,$		70		ns
Reverse Recovery Charge	$Q_{RR}$	$di_F/dt=100A/\mu s$		150		nC

Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$

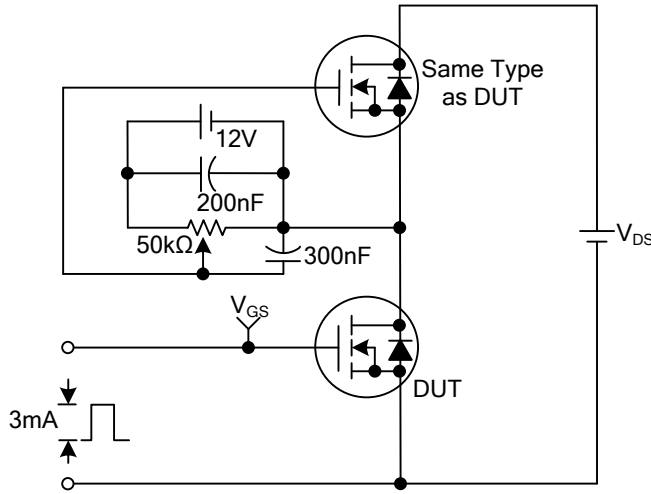
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

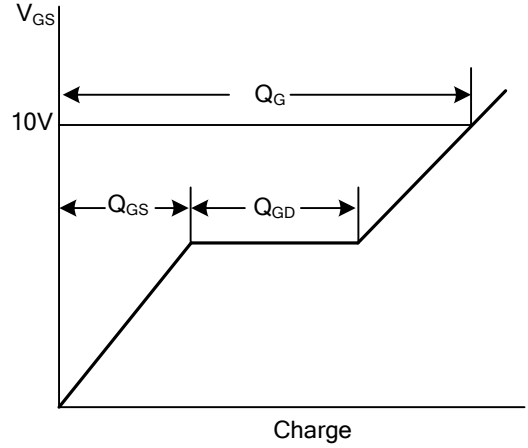
Peak Diode Recovery dv/dt Test Circuit & Waveforms



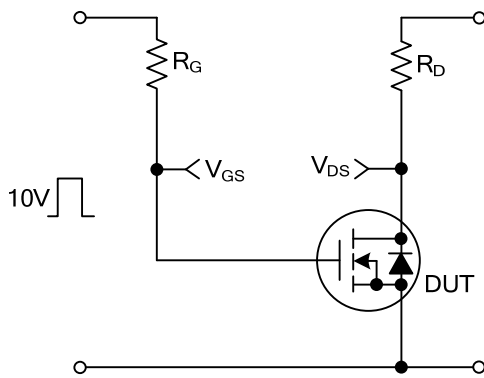
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



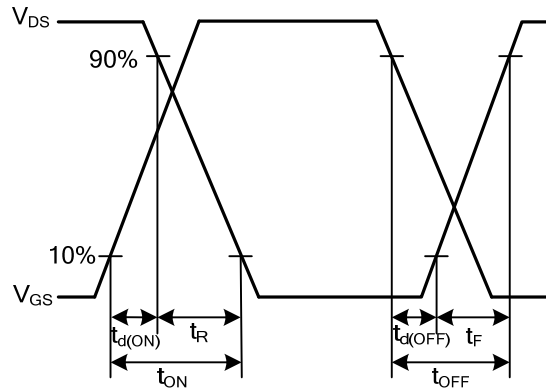
Gate Charge Test Circuit



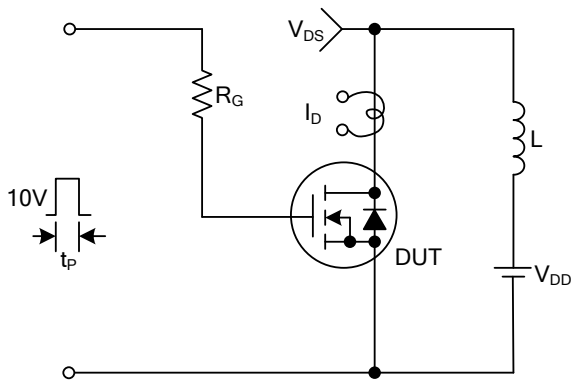
Gate Charge Waveforms



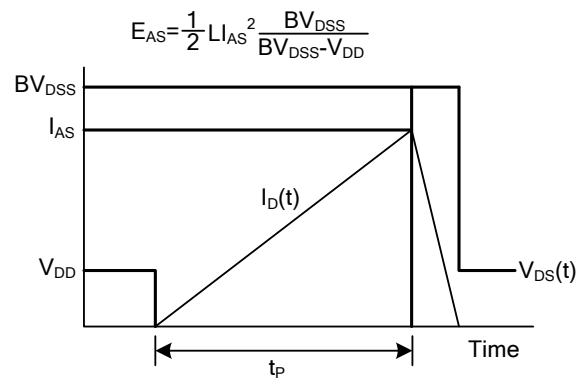
Resistive Switching Test Circuit



Resistive Switching Waveforms

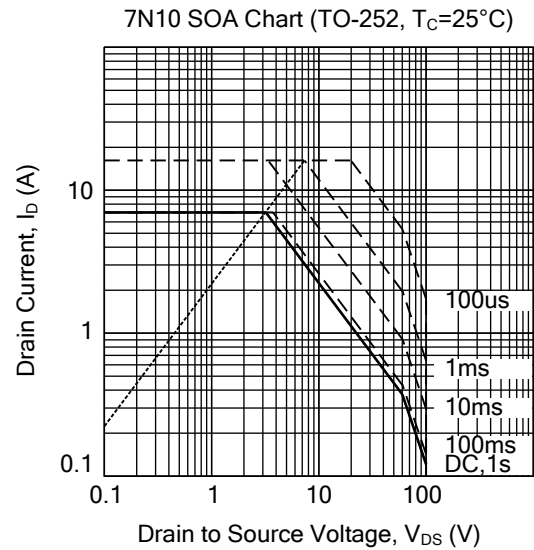
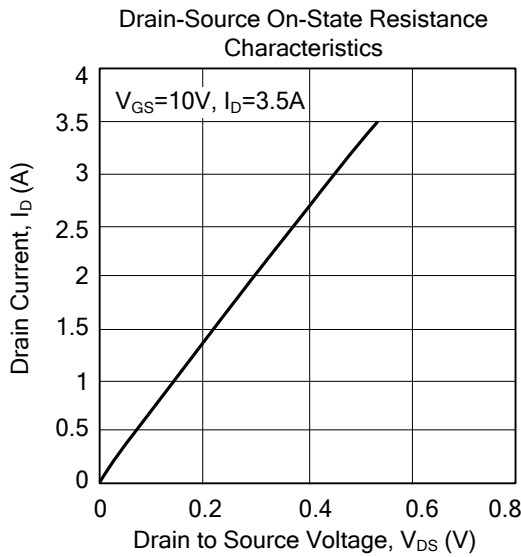
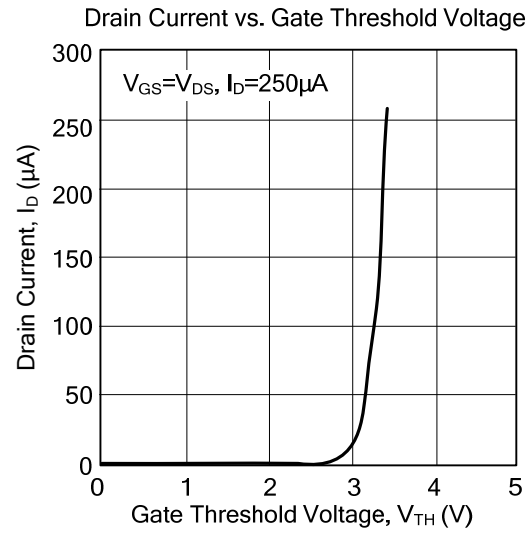
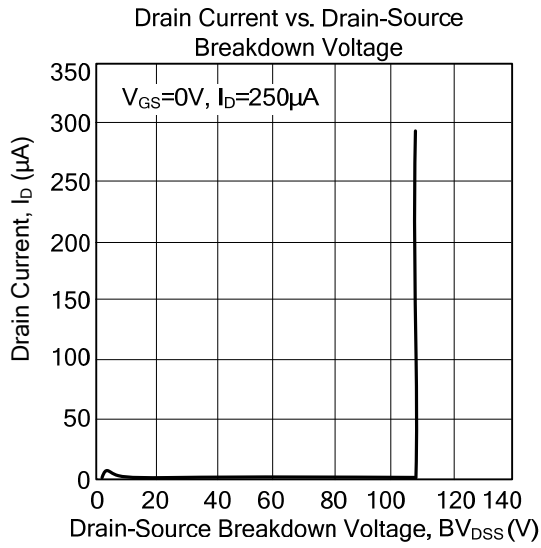


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

### TYPICAL CHARACTERISTICS



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