

**UTC** UNISONIC TECHNOLOGIES CO., LTD

### 1N70-CB

Preliminary

## 1.0A, 700V N-CHANNEL **POWER MOSFET**

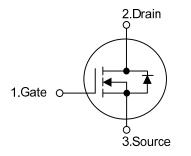
### DESCRIPTION

The UTC 1N70-CB is a high voltage MOSFET 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 at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

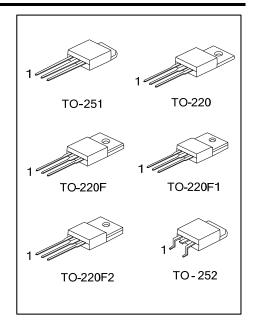
#### FEATURES

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

#### SYMBOL

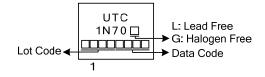


ORDERING INFORMATION							
Ordering Number		Dealvaga	Pin Assignment			Dealises	
Lead Free	Halogen Free	Package	1	2	3	Packing	
1N70L-TA3-T	1N70G-TA3-T	TO-220	G	D	S	Tube	
1N70L-TF1-T	1N70G-TF1-T	TO-220F1	G	D	S	Tube	
1N70L-TF2-T	1N70G-TF2-T	TO-220F2	G	D	S	Tube	
1N70L-TF3-T	1N70G-TF3-T	TO-220F	G	D	S	Tube	
1N70L-TM3-T	1N70G-TM3-T	TO-251	G	D	S	Tube	
1N70L-TN3-R	1N70L-TN3-R 1N70G-TN3-R		G	D	S	Tape Reel	
Note: Pin Assignment: G: Gate D: Drain S: Source							
	<ul> <li>(1) T: Tube, R: Tape Reel</li> <li>(2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TM3: TO-251, TN3: TO-252</li> <li>(3) L: Lead Free, G: Halogen Free and Lead Free</li> </ul>						



# 1N70-CB

#### MARKING





#### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub> = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	700	V
Gate-Source Voltage		V <sub>GSS</sub>	±30	V
Drain Current	Continuous	I <sub>D</sub>	1.0	А
	Pulsed (Note 2)	I <sub>DM</sub>	4.0	А
Avalanche Current (Note 2)		I <sub>AR</sub>	1.5	А
Avalanche Energy	Single Pulsed (Note 3)	Single Pulsed (Note 3) E <sub>AS</sub> 11		mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.6	V/ns
Power Dissipation	TO-220		40	W
	TO-220F/TO-220F1 TO-220F2	P <sub>D</sub>	21	W
	TO-251/TO-252		28	W
Junction Temperature		ТJ	+150	°C
Storage Temperature		T <sub>STG</sub>	-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=10mH, I<sub>AS</sub>=1.5A, V<sub>DD</sub>=50V, R<sub>G</sub>=25  $\Omega,$  Starting T<sub>J</sub> = 25°C

4. I<sub>SD</sub> $\leq$ 1.0A, di/dt $\leq$ 200A/µs, V<sub>DD</sub> $\leq$  BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C

#### THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT	
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2	θ <sub>JA</sub>	62.5	°C/W	
	TO-251/TO-252		110	°C/W	
Junction to Case	TO-220		3.13	°C/W	
	TO-220F/TO-220F1 TO-220F2	$\theta_{JC}$	5.95	°C/W	
	TO-251/TO-252		4.46	°C/W	



#### ■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C, unless otherwise specified)

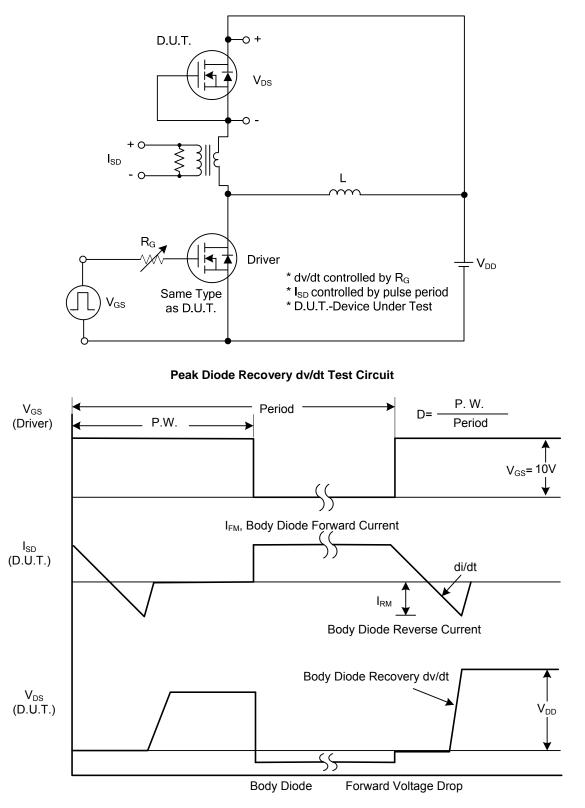
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS		01111202				100 0 0	0.111
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA	700			V
Drain-Source Leakage Current		I <sub>DSS</sub>	$V_{DS} = 700V, V_{GS} = 0V$			1	μA
Gate-Source Leakage Current	Forward	- I <sub>GSS</sub>	V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V			100	nA
	Reverse		V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V <sub>GS(TH)</sub>	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> =0.5A			12	Ω
DYNAMIC CHARACTERISTICS				÷			
Input Capacitance		CISS			195		рF
Output Capacitance		Coss	$V_{DS}$ =25V, $V_{GS}$ =0V, f =1MHz		29		рF
Reverse Transfer Capacitance		C <sub>RSS</sub>			15		рF
SWITCHING CHARACTERISTIC	S						
Total Gate Charge (Note 1)		$Q_G$	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.83A		18		nC
Gate to Source Charge		$Q_{GS}$	$I_{G}$ =100µA (Note 1, 2)		1.7		nC
Gate to Drain Charge		$Q_{GD}$	$IG = 100 \mu A$ (Note 1, 2)		1.7		nC
Turn-ON Delay Time (Note 1)		t <sub>D (ON)</sub>			36		ns
Rise Time		t <sub>R</sub>	$V_{DS}$ =30V, $V_{GS}$ =10V, $I_{D}$ =0.5A,		14		ns
Turn-OFF Delay Time		$t_{D(OFF)}$	R <sub>G</sub> =25Ω (Note 1, 2)		78		ns
Fall-Time		t <sub>F</sub>			12		ns
SOURCE- DRAIN DIODE RATIN	GS AND CH	ARACTERIS	TICS				
Maximum Body-Diode Continuous Current		I <sub>SD</sub>				1.0	А
Maximum Body-Diode Pulsed Current		I <sub>SM</sub>				4.0	А
Drain-Source Diode Forward Voltage (Note 1)		$V_{\text{SD}}$	I <sub>S</sub> =1.0A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t <sub>rr</sub>	I <sub>S</sub> =1.0A, V <sub>GS</sub> =0V,		250		nS
Body Diode Reverse Recovery Charge		Qrr	dI <sub>F</sub> /dt=100A/µs		0.43		μC

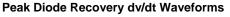
Notes: 1. Pulse Test: Pulse width  $\leq$  300µs, Duty cycle $\leq$ 2%.

2. Essentially independent of operating temperature.



#### TEST CIRCUITS AND WAVEFORMS



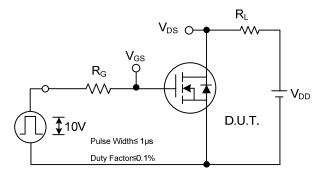


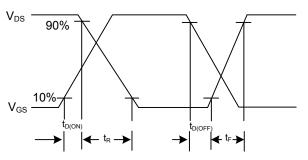


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### Preliminary

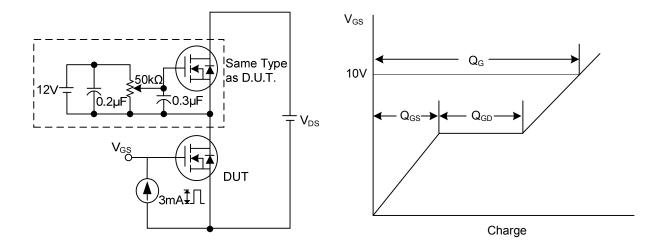
### TEST CIRCUITS AND WAVEFORMS (Cont.)





#### Switching Test Circuit

Switching Waveforms



BV<sub>DSS</sub>

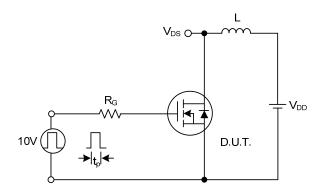
 $V_{\text{DD}}$ 

Gate Charge Test Circuit

Gate Charge Waveform

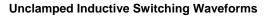
 $E_{AS} = \frac{1}{2}LI_{AS^2} \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$ 

D(t)



Unclamped Inductive Switching Test Circuit

l**←** t<sub>p</sub> → Time





V<sub>DS(t)</sub>

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