# UNISONIC TECHNOLOGIES CO., LTD

**UF2307 Preliminary Power MOSFET** 

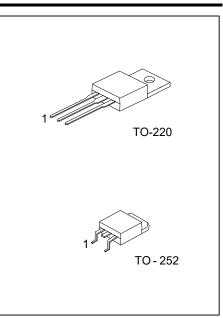
# 42A, 75V **N-CHANNEL POWER MOSFET**

#### **DESCRIPTION**

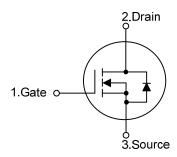
The UTC UF2307 is a N-channel Power MOSFET, utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this design are a 150°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device.

#### **FEATURES**

- \*  $R_{DS(ON)} \le 14 \text{ m}\Omega$  @  $V_{GS}=10V$ ,  $I_D=32A$
- \* Fast Switching
- \* Ultra Low On-Resistance
- \* With 100% Avalanche Tested



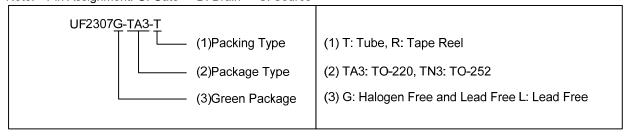
### **SYMBOL**



#### ORDERING INFORMATION

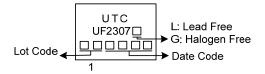
Ordering Number		Daakana	Pin Assignment			Daakina	
Lead Free	Halogen Free	Package	1	2	3	Packing	
UF2307L-TA3-T	UF2307G-TA3-T	TO-220	G	D	S	Tube	
UF2307L-TN3-R	UF2307G-TN3-R	TO-252	G	D	S	Tape Reel	

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



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# ■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	75	V
Gate-Source Voltage	_		±20	V
Duraina Oceanna art	Continuous	I <sub>D</sub>	42	Α
Drain Current	Pulsed (Note 2)	I <sub>DM</sub>	84	Α
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	45	mJ
Peak Diode Recovery	dv/dt (Note 4)	dv/dt 2.9		V/ns
D Dii	TO-220	-	70	W
Power Dissipation	TO-252	P <sub>D</sub>	56	A mJ V/ns W W °C
Junction Temperature	unction Temperature		+150	°C
Storage Temperature F	Temperature Range 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 = 0.1mH,  $I_{AS}$  = 30A,  $V_{DD}$  = 25V,  $R_{G}$  = 25 $\Omega$ , Starting  $T_{J}$  = 25°C
- 4.  $I_{SD} \leq 30 A$ , di/dt  $\leq 200 A/\mu s$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J$  = 25°C

#### **■ THERMAL DATA**

PARA	METER	SYMBOL RATING		UNIT
lumation to Ameliant	TO-220	0	62.5	°C/W
Junction to Ambient	TO-252	θја	110	°C/W
Junction to Case	TO-220	0	1.78	°C/W
	TO-252	θις	2.23 (Note)	°C/W

Note: Device mounted on FR-4 substrate Pc board, 2oz copper, with 1inch square copper plate.

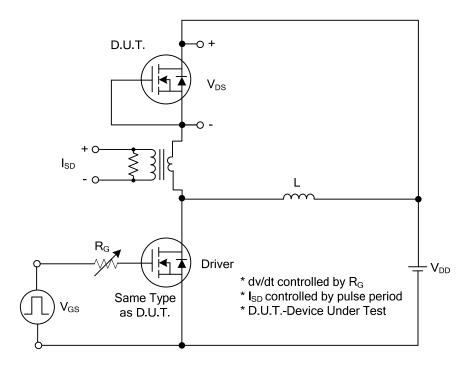
# ■ **ELECTRICAL CHARACTERISTICS** (T<sub>J</sub>=25°C, unless otherwise specified)

OFF CHARACTERISTICS           Drain-Source Breakdown Voltage         BV <sub>DSS</sub> I <sub>D</sub> =250μA, V <sub>GS</sub> =0V         75         V           Drain-Source Leakage Current Gate-Source Cleakage Current Gate-Gate-Gate-Gate-Gate-Gate-Gate-Gate-						I		T
Drain-Source Breakdown Voltage   BV <sub>DSS</sub>   I <sub>D</sub> =250μA, V <sub>GS</sub> =0V   75   V   V   V   V   V   V   V   V   V	PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Drain-Source Leakage Current   Source Leakage Current   Forward Reverse   I <sub>SS</sub>   V <sub>S</sub> =75V	OFF CHARACTERISTICS							
Forward Reverse   IGSS   VGS=+20V, VDS=0V   Forward Reverse   IGSS   VGS=+20V, VDS=0V   Forward Reverse   IGSS   VGS=-20V, VDS=0V   Forward VGS=-20V   Forward VGS=-20	Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	75			V
Gate - Source Leakage Current   Reverse   Reverse   Reverse   V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V   -100   nA	Orain-Source Leakage Current		$I_{DSS}$	V <sub>DS</sub> =75V			1	μΑ
Reverse   V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V	Gate-Source Leakage Current	Forward		$V_{GS}$ =+20V, $V_{DS}$ =0V			+100	nA
Gate Threshold Voltage $V_{GS(TH)}$ $I_D=250\mu A$ , $V_{DS}=V_{GS}$ 2.04.0VStatic Drain-Source On-State Resistance $R_{DS(ON)}$ $V_{GS}=10V$ , $I_D=32A$ 14 $m\Omega$ DYNAMIC PARAMETERSInput Capacitance $C_{ISS}$ $V_{DS}=25V$ , $V_{GS}=0V$ , $f=1MHz$ 2340 $pF$ Output Capacitance $C_{CSS}$ $V_{DS}=25V$ , $V_{GS}=0V$ , $f=1MHz$ 235 $pF$ Reverse Transfer Capacitance $C_{RSS}$ $V_{DS}=25V$ , $V_{GS}=0V$ , $f=1MHz$ 235 $pF$ SWITCHING PARAMETERSTotal Gate Charge $Q_G$ $V_{DD}=60V$ , $V_{GS}=10V$ , $I_D=42A$ 85 $nC$ Gate to Source Charge $Q_{GS}$ $(Note 1, 2)$ 30 $nC$ Gate to Drain Charge $Q_{GD}$ $V_{DD}=60V$ , $V_{GS}=10V$ , $I_D=42A$ 18 $nC$ Turn-ON Delay Time $I_{D(ON)}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ Turn-OFF Delay Time $I_{D(OFF)}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ Turn-OFF Delay Time $I_{D(OFF)}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSMaximum Body-Diode Continuous Current $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ Maximum Body-Diode Pulsed Current $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ Prain-Source Diode Forward Voltage $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_{AS}$ $I_$		Reverse	IGSS	V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V			-100	nA
Static Drain-Source On-State Resistance   R <sub>DS(ON)</sub>   V <sub>GS</sub> =10V, I <sub>D</sub> =32A	ON CHARACTERISTICS							
DYNAMIC PARAMETERS	Gate Threshold Voltage		$V_{GS(TH)}$	I <sub>D</sub> =250μA, V <sub>DS</sub> =V <sub>GS</sub>	2.0		4.0	V
Disput Capacitance	Static Drain-Source On-State Re	esistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =32A			14	mΩ
Output Capacitance         C <sub>OSS</sub> V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz         235         pF           Reverse Transfer Capacitance         C <sub>RSS</sub> 190         pF           SWITCHING PARAMETERS         190         pF           Total Gate Charge         Q <sub>G</sub> V <sub>DD</sub> =60V, V <sub>GS</sub> =10V, I <sub>D</sub> =42A         85         nC           Gate to Source Charge         Q <sub>GS</sub> (Note 1, 2)         30         nC           Turn-ON Delay Time         t <sub>D</sub> (ON)         13         ns           Rise Time         t <sub>R</sub> V <sub>DD</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =42A,         19         ns           Turn-OFF Delay Time         t <sub>D</sub> (OFF)         R <sub>G</sub> =3Ω, (Note 1, 2)         39         ns           Fall-Time         t <sub>F</sub> 21         ns           SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS         42         A           Maximum Body-Diode Continuous Current         I <sub>S</sub> 42         A           Maximum Body-Diode Pulsed Current         I <sub>SM</sub> 84         A           Drain-Source Diode Forward Voltage         V <sub>SD</sub> I <sub>S</sub> =42A         1.4         V           Reverse Recovery Time         t <sub>rr</sub> I <sub>S</sub> =30A, V <sub>GS</sub> =0V         44         nS	DYNAMIC PARAMETERS							
Output Capacitance         C <sub>OSS</sub> V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz         235         pF           Reverse Transfer Capacitance         C <sub>RSS</sub> 190         pF           SWITCHING PARAMETERS         190         pF           Total Gate Charge         Q <sub>G</sub> V <sub>DD</sub> =60V, V <sub>GS</sub> =10V, I <sub>D</sub> =42A         85         nC           Gate to Source Charge         Q <sub>GS</sub> (Note 1, 2)         30         nC           Turn-ON Delay Time         t <sub>D</sub> (ON)         13         ns           Rise Time         t <sub>R</sub> V <sub>DD</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =42A,         19         ns           Turn-OFF Delay Time         t <sub>D</sub> (OFF)         R <sub>G</sub> =3Ω, (Note 1, 2)         39         ns           Fall-Time         t <sub>F</sub> 21         ns           SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS         42         A           Maximum Body-Diode Continuous Current         I <sub>S</sub> 42         A           Maximum Body-Diode Pulsed Current         I <sub>SM</sub> 84         A           Drain-Source Diode Forward Voltage         V <sub>SD</sub> I <sub>S</sub> =42A         1.4         V           Reverse Recovery Time         t <sub>rr</sub> I <sub>S</sub> =30A, V <sub>GS</sub> =0V         44         nS	Input Capacitance	nput Capacitance				2340		pF
SWITCHING PARAMETERS   Total Gate Charge   Q <sub>G</sub>   Gate to Source Charge   Q <sub>GS</sub>   V <sub>DD</sub> =60V, V <sub>GS</sub> =10V, I <sub>D</sub> =42A   18   nC   Note 1, 2)   30   nC   Turn-ON Delay Time   t <sub>D(ON)</sub>   13   ns   ns   ns   ns   ns   ns   ns   n	•			V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz		235		pF
Total Gate Charge   Q <sub>G</sub>   V <sub>DD</sub> =60V, V <sub>GS</sub> =10V, I <sub>D</sub> =42A   18   nC   Note 1, 2   Note	Reverse Transfer Capacitance		C <sub>RSS</sub>			190		pF
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	SWITCHING PARAMETERS							
Gate to Source Charge   QGS   (Note 1, 2)   30   nC	Total Gate Charge		$Q_G$	\( \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		85		nC
Gate to Drain Charge         Q <sub>GD</sub> 30         nC           Turn-ON Delay Time         t <sub>D(ON)</sub> 13         ns           Rise Time         t <sub>R</sub> V <sub>DD</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =42A,         19         ns           Turn-OFF Delay Time         t <sub>D(OFF)</sub> R <sub>G</sub> =3Ω, (Note 1, 2)         39         ns           Fall-Time         t <sub>F</sub> 21         ns           SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS         42         A           Maximum Body-Diode Continuous Current         I <sub>S</sub> 42         A           Maximum Body-Diode Pulsed Current         I <sub>SM</sub> 84         A           Drain-Source Diode Forward Voltage         V <sub>SD</sub> I <sub>S</sub> =42A         1.4         V           Reverse Recovery Time         t <sub>rr</sub> I <sub>S</sub> =30A, V <sub>GS</sub> =0V         44         nS	Gate to Source Charge		$Q_GS$			18		nC
Rise Time $t_R$ $V_{DD}=20V, V_{GS}=10V, I_D=42A,$ $t_D=42A,$ $t_$	Gate to Drain Charge		$Q_GD$	(Note 1, 2)		30		nC
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Turn-ON Delay Time		t <sub>D(ON)</sub>			13		ns
Fall-Time         t <sub>F</sub> 21         ns           SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS           Maximum Body-Diode Continuous Current         I <sub>S</sub> 42         A           Maximum Body-Diode Pulsed Current         I <sub>SM</sub> 84         A           Drain-Source Diode Forward Voltage         V <sub>SD</sub> I <sub>S</sub> =42A         1.4         V           Reverse Recovery Time         t <sub>rr</sub> I <sub>S</sub> =30A, V <sub>GS</sub> =0V         44         nS	Rise Time			V <sub>DD</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =42A,		19		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS           Maximum Body-Diode Continuous Current         Is         42         A           Maximum Body-Diode Pulsed Current         IsM         84         A           Drain-Source Diode Forward Voltage         VsD         Is=42A         1.4         V           Reverse Recovery Time         trr         Is=30A, VGs=0V         44         nS	Turn-OFF Delay Time		t <sub>D(OFF)</sub>	R <sub>G</sub> =3Ω, (Note 1, 2)		39		ns
Maximum Body-Diode Continuous Current         Is         42         A           Maximum Body-Diode Pulsed Current         IsM         84         A           Drain-Source Diode Forward Voltage         VsD         Is=42A         1.4         V           Reverse Recovery Time         trr         Is=30A, VGs=0V         44         nS	Fall-Time		t <sub>F</sub>			21		ns
Maximum Body-Diode Pulsed Current         IsM         84         A           Drain-Source Diode Forward Voltage         VsD         Is=42A         1.4         V           Reverse Recovery Time         trr         Is=30A, Vgs=0V         44         nS	SOURCE- DRAIN DIODE RATI	NGS AND (	CHARACTERI	STICS				
Drain-Source Diode Forward Voltage $V_{SD}$ $I_{S}$ =42A $I_{S}$ 1.4 $V_{SD}$ Reverse Recovery Time $I_{S}$ =30A, $V_{GS}$ =0V 44 $I_{S}$	Maximum Body-Diode Continuo	us Current	Is				42	Α
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			Ізм				84	Α
Reverse Recovery Time         t <sub>rr</sub> Is =30A, V <sub>GS</sub> =0V         44         nS	-		V <sub>SD</sub>	Is=42A			1.4	V
	Reverse Recovery Time		t <sub>rr</sub>	Is=30A, V <sub>GS</sub> =0V		44		nS
			Qrr	dl <sub>F</sub> /dt=100A/µs		45		nC

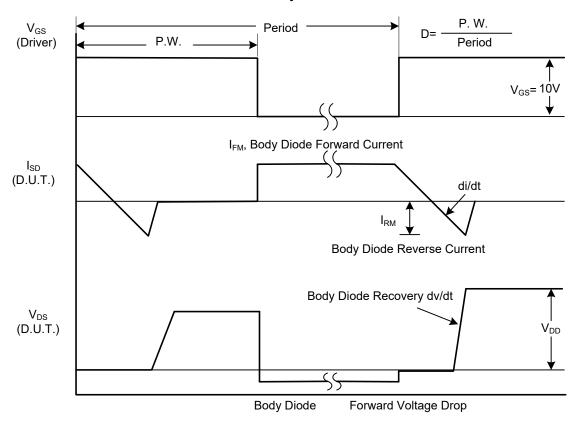
Notes: 1. Pulse Test: Pulse width  $\leq$  300 $\mu$ s, Duty cycle  $\leq$  2%.

<sup>2.</sup> Essentially independent of operating ambient temperature.

### **■ TEST CIRCUITS AND WAVEFORMS**

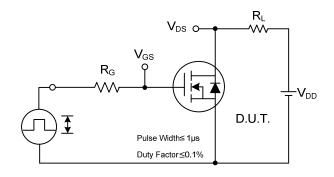


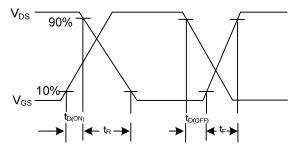
# Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

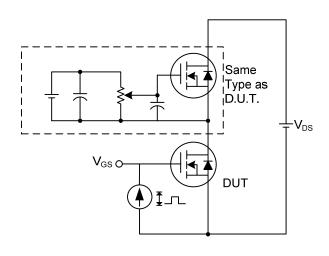
# TEST CIRCUITS AND WAVEFORMS

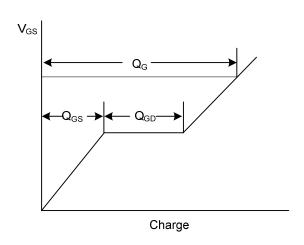




**Switching Test Circuit** 

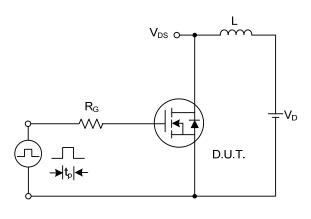
**Switching Waveforms** 

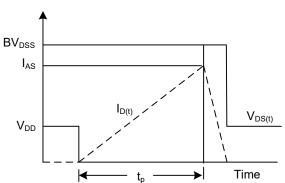




**Gate Charge Test Circuit** 

**Gate Charge Waveform** 





**Unclamped Inductive Switching Test Circuit** 

**Unclamped Inductive Switching Waveforms** 

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