

# UNISONIC TECHNOLOGIES CO., LTD

UT3416 **Preliminary Power MOSFET** 

# N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR

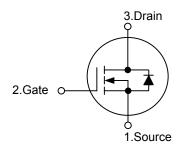
#### **DESCRIPTION**

The UTC UT3416 is advanced n-channel enhancement MOSFET which can provide the designer with the best combination of excellent R<sub>DS (ON)</sub>, low gate charge and low gate voltages as low as 1.8V.When it is used as a load switch or in PWM application, the UTC UT3416 can be considered as an ideal.

#### **FEATURES**

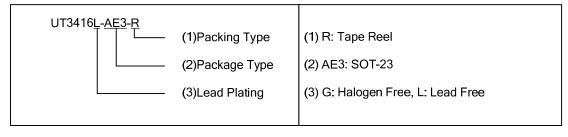
- \*  $V_{DS}$  =20 V
- \*  $I_D = 6.5 A$
- \*  $R_{DS(ON)} < 22 \text{ m}\Omega @V_{GS} = 4.5 \text{ V}$  $R_{DS(ON)}$  < 26 m $\Omega$  @ $V_{GS}$  = 2.5 V $R_{DS(ON)}\!<\!34~m\Omega$  @V  $_{GS}$  = 1.8 V

# SYMBOL

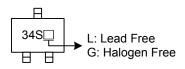


#### ORDERING INFORMATION

Ordering Number		Dookogo	Pin Assignment			Daakina	
Lead Free	Halogen Free	Package	1	2	3	Packing	
UT3416L-AE3-R	UT3416G-AE3-R	SOT-23	S	G	D	Tape Reel	



#### **MARKING**



SOT-23

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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	20	V
Gate-Source Voltage	$V_{GSS}$	±8	V
Continuous Drain Current (Ta=25°C)	I <sub>D</sub>	6.5	Α
Pulsed Drain Current (Note 2)	I <sub>DM</sub>	30	Α
Power Dissipation (Ta=25°C)(Note 3)	$P_D$	1.4	W
Junction Temperature	$T_J$	+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. Pulse width limited by T<sub>J(MAX)</sub>
- 3. Surface mounted on 1in2 copper pad of FR4 board

### ■ THERMAL DATA

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Junction to Ambient (Note)	$\theta_{JA}$		85	125	°C/W

Note: Surface mounted on 1 in2 copper pad of FR4 board

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

Drain-Source Breakdown Voltage         BV <sub>DSS</sub> V <sub>GS</sub> =0V, I <sub>D</sub> =250μA         20         V           Drain-Source Leakage Current         I <sub>DSS</sub> V <sub>GS</sub> =0V, V <sub>DS</sub> =16V         1         μA           Gate-Source Leakage Current         I <sub>GSS</sub> V <sub>GS</sub> =±8.5V, V <sub>DS</sub> =0V         ±1         μA           ON CHARACTERISTICS         Gate Threshold Voltage         V <sub>GS</sub> (TH)         V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA         0.4         0.6         1         V           On State Drain Current         I <sub>D(DN)</sub> V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V         30         A         A           Static Drain-Source On-Resistance         R <sub>DS(ON)</sub> V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V         30         A         A           Static Drain-Source On-Resistance         R <sub>DS(ON)</sub> V <sub>GS</sub> =4.5V, I <sub>D</sub> =5.5A         18         22         mΩ           Static Drain-Source On-Resistance         R <sub>DS(ON)</sub> V <sub>GS</sub> =1.8V, I <sub>D</sub> =5.5A         26         34         mΩ           Static Drain-Source On-Resistance         C <sub>ISS</sub> V <sub>GS</sub> =1.8V, I <sub>D</sub> =5.5A         21         26         mΩ           DryNAMIC PARAMETERS         Input Capacitance         C <sub>ISS</sub> V <sub>GS</sub> =0.5V, I <sub>D</sub> =10V, f =1MHz         187         pF           Reverse Transfer Capacitance         R <sub>GS</sub> V <sub>GS</sub> =0V, V <sub>D</sub>	PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT			
Drain-Source Leakage Current   IDSS   VGS = 0V, VDS = 16V   1	OFF CHARACTERISTICS									
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	$V_{GS}$ =0V, $I_D$ =250 $\mu$ A	20			V			
Static Drain-Source Con-Resistance   Cliss   Dipon	Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =16V			1	μΑ			
V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V	Gato Source Leakage Current	I <sub>GSS</sub>	$V_{GS}$ =±4.5V, $V_{DS}$ =0V			±1	μΑ			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Gale-Source Leakage Current		$V_{GS} = \pm 8V$ , $V_{DS} = 0V$			±10	μΑ			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu A$	0.4	0.6	1	V			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	On State Drain Current	I <sub>D(ON)</sub>	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	30			Α			
V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 5A   26   34   mΩ			$V_{GS}$ =4.5 $V$ , $I_{D}$ =6.5 $A$		18	22	mΩ			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Static Drain-Source On-Resistance		V <sub>GS</sub> =2.5V, I <sub>D</sub> =5.5A		21	26	mΩ			
Input Capacitance $C_{ISS}$ $V_{GS} = 0V$ , $V_{DS} = 10V$ , $f = 1MHz$ 1160pFOutput Capacitance $C_{OSS}$ $V_{GS} = 0V$ , $V_{DS} = 10V$ , $f = 1MHz$ 187pFReverse Transfer Capacitance $C_{RSS}$ 146pFGate Resistance $R_G$ $V_{GS} = 0V$ , $V_{DS} = 0V$ , $f = 1MHz$ 1.5 $\Omega$ SWITCHING PARAMETERSTotal Gate Charge $Q_G$ 16nCGate Source Charge $Q_{GS}$ $V_{DS} = 10V$ , $V_{GS} = 4.5V$ , $I_D = 6.5A$ 0.8nCGate Drain Charge $Q_{GD}$ 3.8nCTurn-ON Delay Time $I_{D(ON)}$ 6.2nsTurn-ON Rise Time $I_R$ $V_{GS} = 5V$ , $V_{DS} = 10V$ 12.7nsTurn-OFF Delay Time $I_{D(OFF)}$ $I_{COFF)}$ 51.7nsTurn-OFF Fall-Time $I_F$ 16nsSOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICSDiode Forward Voltage $V_{SD}$ $I_S = 1A$ , $V_{GS} = 0V$ 0.761VMaximum Body-Diode Continuous Current $I_S$ $I_S = 6.5A$ , $I_S = $			V <sub>GS</sub> =1.8V, I <sub>D</sub> =5A		26	34	mΩ			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	DYNAMIC PARAMETERS			-		-				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Input Capacitance	C <sub>ISS</sub>			1160		pF			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Output Capacitance		$V_{GS}$ =0V, $V_{DS}$ =10V, f =1MHz		187		pF			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Reverse Transfer Capacitance	C <sub>RSS</sub>			146		pF			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Gate Resistance	$R_G$	$V_{GS}$ =0V , $V_{DS}$ =0V, f =1MHz		1.5		Ω			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	SWITCHING PARAMETERS			-	-	-				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Total Gate Charge	$Q_G$			16		nC			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Gate Source Charge	$Q_{GS}$	$V_{DS} = 10V, V_{GS} = 4.5V, I_{D} = 6.5A$		0.8		nC			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Gate Drain Charge	$Q_{GD}$			3.8		nC			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Turn-ON Delay Time	t <sub>D(ON)</sub>			6.2		ns			
Turn-OFF Fall-Time $t_F$ 16     ns       SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS       Diode Forward Voltage $V_{SD}$ $I_S = 1A$ , $V_{GS} = 0V$ 0.76     1     V       Maximum Body-Diode Continuous $I_S$ 2.5     A       Current $I_{RR}$ $I_{RR}$ $I_{RR}$ 17.7     ns	Turn-ON Rise Time	t <sub>R</sub>	V <sub>GS</sub> =5V, V <sub>DS</sub> =10V		12.7		ns			
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS       Diode Forward Voltage $V_{SD}$ $I_S = 1A$ , $V_{GS} = 0V$ 0.76     1     V       Maximum Body-Diode Continuous $I_S$ 2.5     A       Current $I_{SD}$ $I_{SD}$ 17.7     ns	Turn-OFF Delay Time	t <sub>D(OFF)</sub>	$R_L = 1.5\Omega$ , $R_{GEN} = 3\Omega$		51.7		ns			
Diode Forward Voltage $V_{SD}$ $I_S = 1A, V_{GS} = 0V$ 0.76 1 $V$ Maximum Body-Diode Continuous $I_S$ $I_S = 1A, V_{GS} = 0V$ 0.76 1 $V$ Body Diode Reverse Recovery Time $I_{RR}$ $I_{E} = 6.5A, dI/dt = 100A/us$ 17.7 $I_{RR}$	Turn-OFF Fall-Time	t <sub>F</sub>			16		ns			
Maximum Body-Diode Continuous Current  Body Diode Reverse Recovery Time  L <sub>E</sub> = 6.5A, dl/dt=100A/us  17.7  Is  17.7  Is	SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS									
Current $I_S$ $Z.5$ A $I_{RR}$	Diode Forward Voltage	$V_{SD}$	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.76	1	V			
Current  Body Diode Reverse Recovery Time	Maximum Body-Diode Continuous	1-				2.5	^			
	Current					2.5	А			
Body Diode Reverse Recovery Charge   Q <sub>RR</sub>   IF = 0.5A, αι/αι = 100A/μS   6.7   nC	Body Diode Reverse Recovery Time	$t_{RR}$			17.7		ns			
	Body Diode Reverse Recovery Charge	$Q_{RR}$	η0.5A, αι/αι- 100A/μ5		6.7		nC			

Note: Surface mounted on 1 in<sub>2</sub> copper pad of FR4 board

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