

## UTR4502G-AE3-R-VB Datasheet

# P-Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	$R_{DS(on)}$ ( $\Omega$ ) Typ.	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)			
	0.046 at V <sub>GS</sub> = - 10 V	- 5.6				
- 30	0.049 at V <sub>GS</sub> = - 6 V	- 5	11.4 nC			
	0.054 at V <sub>GS</sub> = - 4.5 V	-4.5				





#### **FEATURES**

- Trench Power MOSFET
- 100 % R<sub>g</sub> Tested



#### **APPLICATIONS**

- For Mobile Computing
  - Load Switch
  - Notebook Adaptor Switch
  - DC/DC Converter

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)						
Parameter		Symbol	Limit	Unit		
Drain-Source Voltage		V <sub>DS</sub>	- 30	V		
Gate-Source Voltage		V <sub>GS</sub>	± 20	V		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	- 5.6			
	T <sub>C</sub> = 70 °C		- 5.1	A		
	T <sub>A</sub> = 25 °C		- 5.4 <sup>b,c</sup>			
	T <sub>A</sub> = 70 °C		- 4.3 <sup>b,c</sup>			
Pulsed Drain Current (t = 100 μs)		I <sub>DM</sub>	- 18			
Continous Source-Drain Diode Current	T <sub>C</sub> = 25 °C	- I <sub>S</sub>	- 2.1			
	T <sub>A</sub> = 25 °C		- 1 <sup>b,c</sup>			
	T <sub>C</sub> = 25 °C	P <sub>D</sub>	2.5	W		
Maximum Power Dissipation	T <sub>C</sub> = 70 °C		1.6			
	T <sub>A</sub> = 25 °C		1.25 <sup>b,c</sup>	] vv		
	T <sub>A</sub> = 70 °C	1	0.8 <sup>b,c</sup>			
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>sta</sub>	- 55 to 150	°C		

THERMAL RESISTANCE RATINGS							
Parameter	Symbol	Typical	Maximum	Unit			
Maximum Junction-to-Ambient <sup>b,d</sup>	t ≤ 5 s	R <sub>thJA</sub>	75	100	°C/W		
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	40	50	C/VV		

#### Notes:

- a. Based on  $T_C$  = 25 °C. b. Surface mounted on 1" x 1" FR4 board.
- c. t = 5 s.
- d. Maximum under steady state conditions is 166 °C/W.

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Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V, } I_D = -250  \mu\text{A}$	- 30			V	
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	1 050		- 19		1/00	
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_{J}$	I <sub>D</sub> = - 250 μA		4		mV/°C	
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}$ , $I_{D} = -250 \mu\text{A}$	- 0.5		- 2.0	V	
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
<u> </u>	I <sub>DSS</sub>	V <sub>DS</sub> = - 30 V, V <sub>GS</sub> = 0 V			- 1	μA	
Zero Gate Voltage Drain Current		V <sub>DS</sub> = - 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			- 5		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \le -5 \text{ V}, V_{GS} = -10 \text{ V}$	- 2.5			Α	
	. ,	V <sub>GS</sub> =- 10 V, I <sub>D</sub> = - 4.4 A		0.046			
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> =- 6 V, I <sub>D</sub> = - 4 A		0.049		Ω	
	, ,	V <sub>GS</sub> =- 4.5 V, I <sub>D</sub> = - 3.6 A		0.054		1	
Forward Transconductance <sup>a</sup>	$g_{fs}$ $V_{DS} = -15 \text{ V}, I_{D} = -3.4 \text{ A}$			18		S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>			1295			
Output Capacitance	C <sub>oss</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		150		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			130			
·		V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 5.4 A		24	36		
Total Gate Charge	$Q_g$			11.4	17	nC	
Gate-Source Charge	Q <sub>gs</sub>	V <sub>DS</sub> = - 15 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 5.4 A		3.4			
Gate-Drain Charge	Q <sub>gd</sub>	1		3.8			
Gate Resistance	$R_g$	f = 1 MHz	1.5	7.7	15.4	Ω	
Turn-On Delay Time	t <sub>d(on)</sub>			13	20		
Rise Time	t <sub>r</sub>	$V_{DD} = -15 \text{ V}, R_{L} = 3.5 \Omega$		4	8		
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong -4.3 \text{ A}, V_{GEN} = -10 \text{ V}, R_g = 1 \Omega$		38	57		
Fall Time	t <sub>f</sub>	1 1		6	12	1	
Turn-On Delay Time	t <sub>d(on)</sub>			28	42	ns -	
Rise Time	t <sub>r</sub>	$V_{DD} = -15 \text{ V, R}_{L} = 3.5 \Omega$		16	24		
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong -4.3 \text{ A}, V_{GEN} = -4.5 \text{ V}, R_g = 1 \Omega$		30	45		
Fall Time	t <sub>f</sub>	1		10	20		
<b>Drain-Source Body Diode Characteristic</b>	s ·			l	l		
Continuous Source-Drain Diode Current	Is	T <sub>C</sub> = 25 °C			- 2.1		
Pulse Diode Forward Current (t = 100 μs)	I <sub>SM</sub>				- 80	A	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = - 4.3 A, V <sub>GS</sub> = 0 V		- 0.8	- 1.2	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>			15	23	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	1		7	14	nC	
Reverse Recovery Fall Time	t <sub>a</sub>			8			
Reverse Recovery Rise Time	t <sub>b</sub>	1		7	<u> </u>	ns	

#### Notes

- a. Pulse test; pulse width  $\leq$  300 µs, duty cycle  $\leq$  2 %.
- b. Guaranteed by design, not subject to production testing.

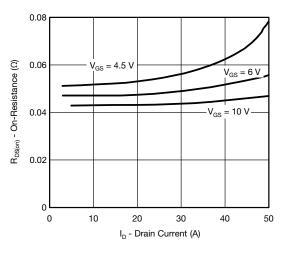
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



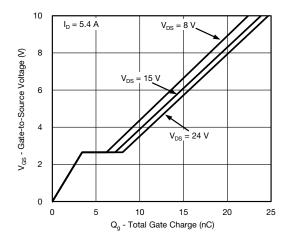
### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



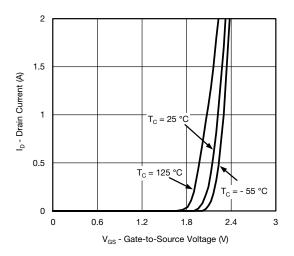
#### **Output Characteristics**



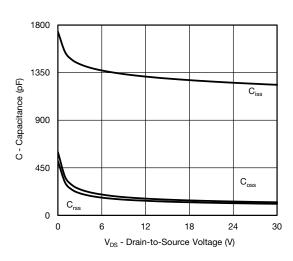
On-Resistance vs. Drain Current



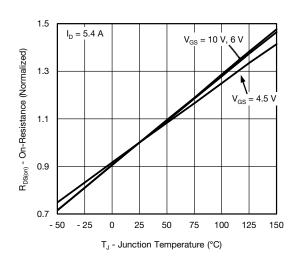
**Gate Charge** 



**Transfer Characteristics** 



Capacitance



On-Resistance vs. Junction Temperature



 $I_D = 5.4 A$ 

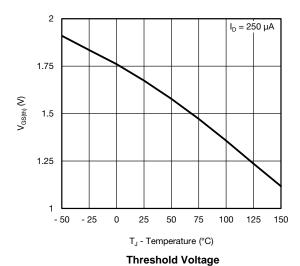
T<sub>J</sub> = 125 °C

T<sub>J</sub> = 25 °C

### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



#### Source-Drain Diode Forward Voltage



0.000 2 4 6 8

0.080

0.060

0.040

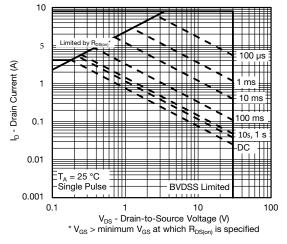
0.020

R<sub>DS(on)</sub> - On-Resistance (Ω)

 $\label{eq:VGS} \mbox{$V_{\rm GS}$ - Gate-to-Source Voltage (V)$}$  On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power (Junction-to-Ambient)



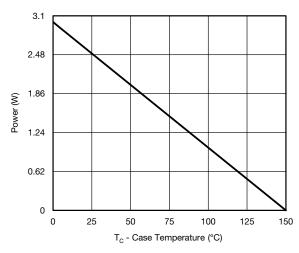
Safe Operating Area, Junction-to-Ambient



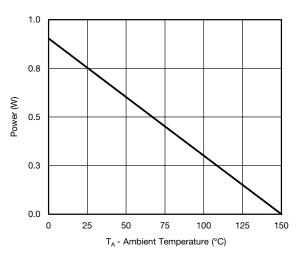
### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



#### **Current Derating\***





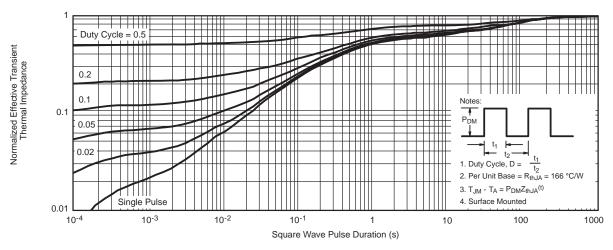


Power, Junction-to-Ambient

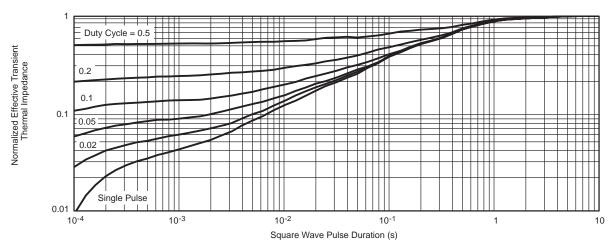
<sup>\*</sup> The power dissipation  $P_D$  is based on  $T_{J(max.)}$  = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



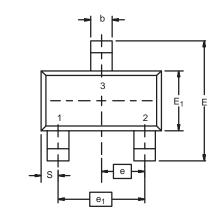
#### Normalized Thermal Transient Impedance, Junction-to-Ambient

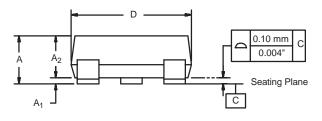


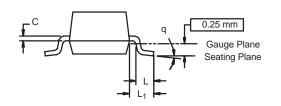
Normalized Thermal Transient Impedance, Junction-to-Foot



## SOT-23 (TO-236): 3-LEAD







<b>Min</b> 0.89	Max	Min	N	
0.89			Max	
	1.12	0.035	0.044	
0.01	0.10	0.0004	0.004	
0.88	1.02	0.0346	0.040	
0.35	0.50	0.014	0.020	
0.085	0.18	0.003	0.007	
2.80	3.04	0.110	0.120	
2.10	2.64	0.083	0.104	
1.20	1.40	0.047	0.055	
0.95 BSC		0.0374 Ref		
1.90 BSC		0.0748 Ref		
0.40	0.60	0.016	0.024	
0.64 Ref		0.025 Ref		
0.50 Ref		0.020 Ref		
3°	8°	3°	8°	
	0.085 2.80 2.10 1.20 0.95 1.90 0.40 0.64 0.50	0.085 0.18 2.80 3.04 2.10 2.64 1.20 1.40 0.95 BSC 1.90 BSC 0.40 0.60 0.64 Ref 0.50 Ref 3° 8°	0.085         0.18         0.003           2.80         3.04         0.110           2.10         2.64         0.083           1.20         1.40         0.047           0.95 BSC         0.0374           1.90 BSC         0.0748           0.40         0.60         0.016           0.64 Ref         0.025           0.50 Ref         0.020           3°         8°         3°	

DWG: 5479



#### **RECOMMENDED MINIMUM PADS FOR SOT-23**



Recommended Minimum Pads Dimensions in Inches/(mm)



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