



VMDSEMI

**VUTA004R035NA**

**Datasheet**



VMDSEMI

## General Description

## Symbol

$V_{(BR)DSS}$	$R_{DS(ON)_{max}}$	$I_D$
40V	3.5mΩ@10V	130A
	4.0mΩ@4.5V	

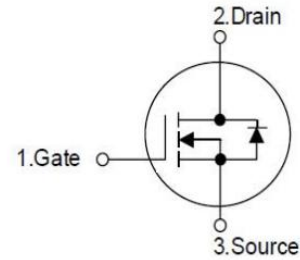


Figure 1 Symbol of VUTA004R035NA

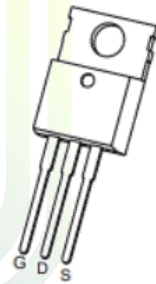
## Features

- Trench Technology Power MOSFET
- Low  $R_{DS(ON)}$
- Low Gate Charge
- Low Gate Resistance
- 100% UIS Tested

## Application

- Battery protection applications
- Power Switch Application

## Package Type



**TO-220-3L-C**

Figure 2 Package Type of VUTA004R035NA

## Ordering Information

Product Name	Package
VUTA004R035NA	TO-220-3L-C

**Absolute Maximum Ratings** ( $T_A = 25\text{ °C}$ , unless otherwise specified)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>Note1</sup>	$I_D$	$T_C = 25\text{ °C}$	130
Continuous Drain Current <sup>Note1</sup>		$T_C = 100\text{ °C}$	48
Pulsed Drain Current <sup>Note2</sup>	$I_{DM}$	520	A
Avalanche Current <sup>Note3</sup>	$I_{AS}$	31	A
Single Pulsed Avalanche Energy <sup>Note3</sup>	$E_{AS}$	240	mJ
Total Power Dissipation <sup>Note5</sup>	$P_D$	$T_C = 25\text{ °C}$	260
Junction Temperature	$T_J$	150	°C
Storage Temperature	$T_{STG}$	-55 to 150	°C

**Thermal Resistance**

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Ambient <sup>Note6</sup>	$R_{\theta JA}$		60		°C/W
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$		0.48		°C/W

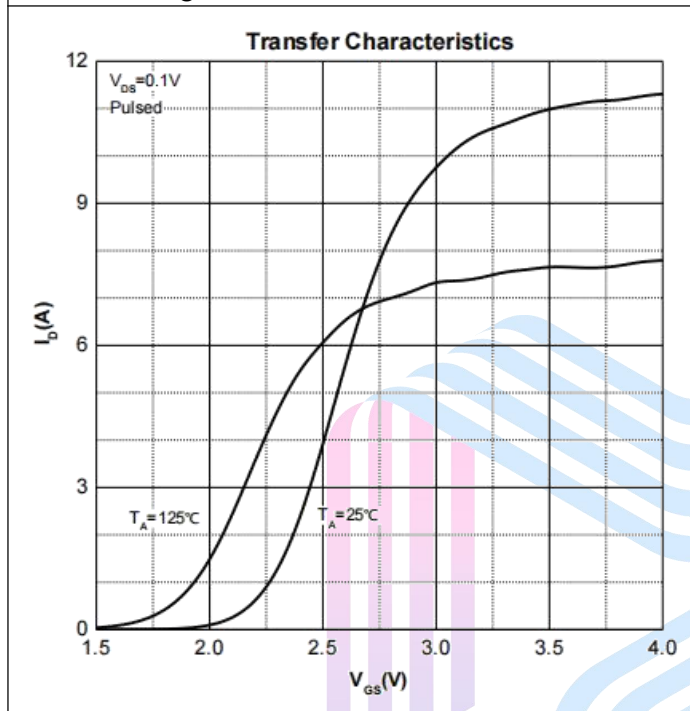
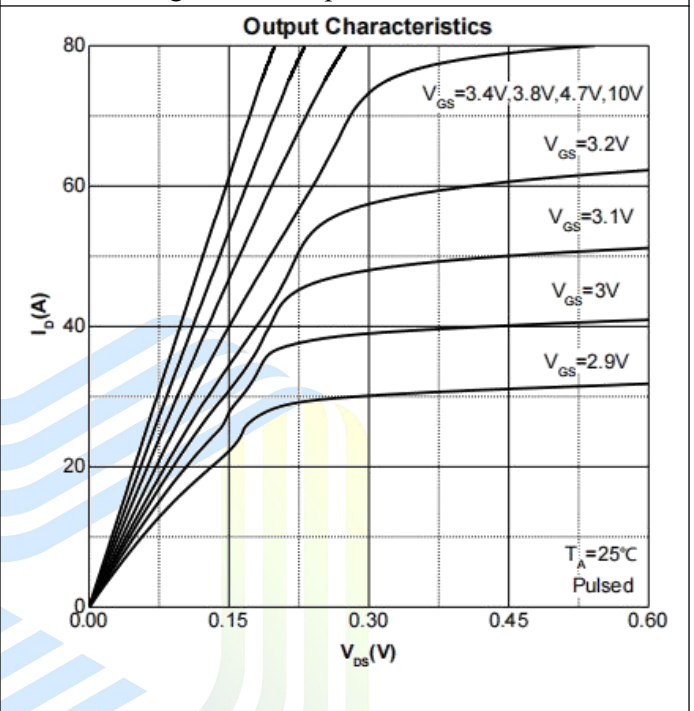
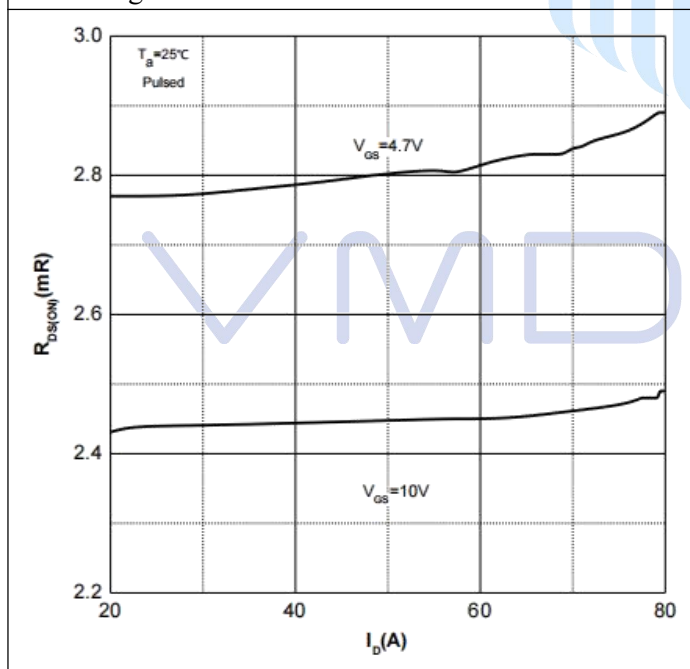
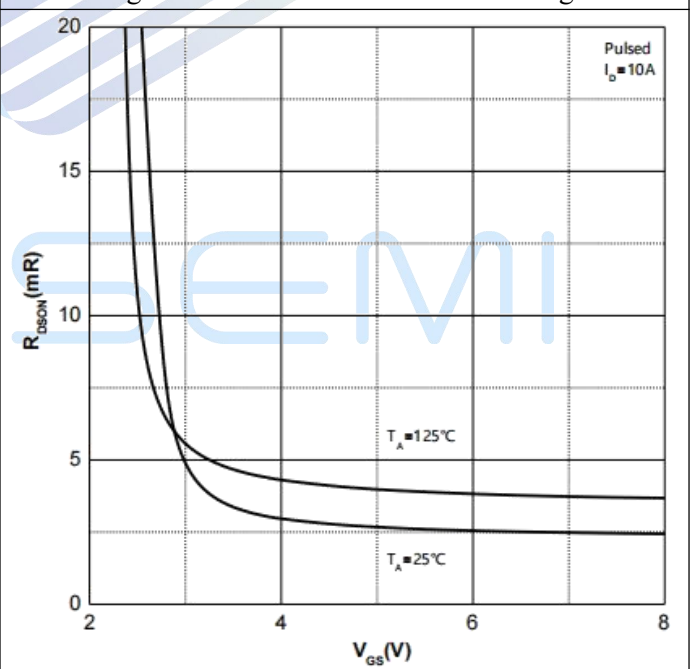
**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

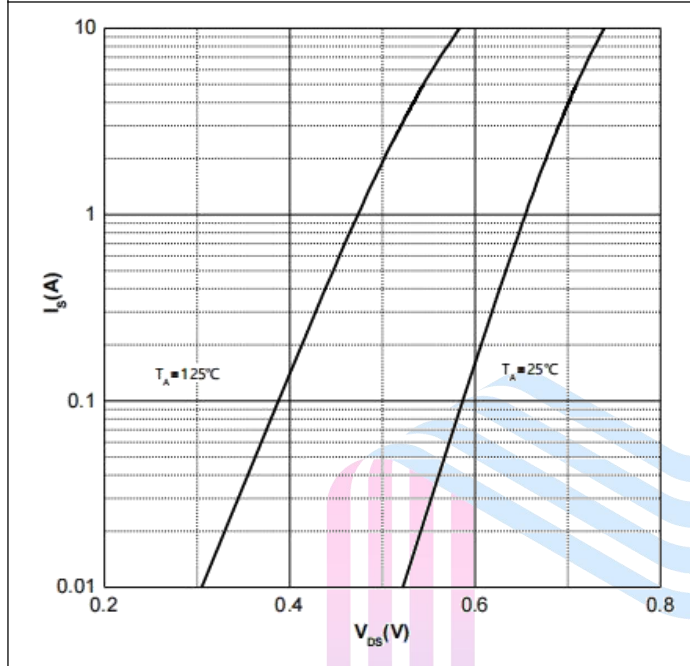
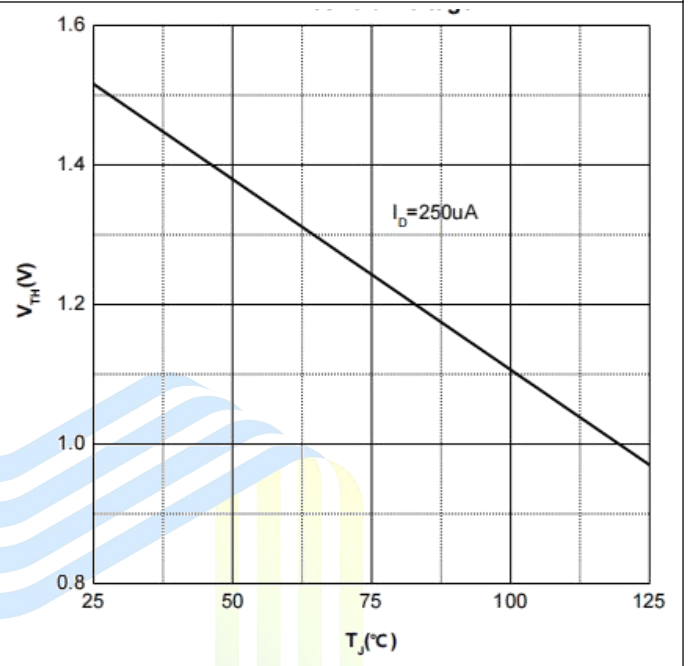
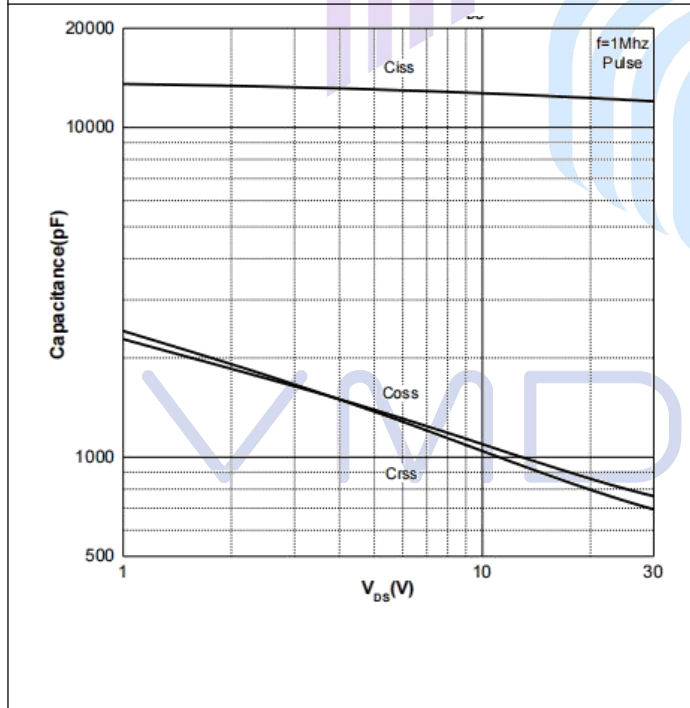
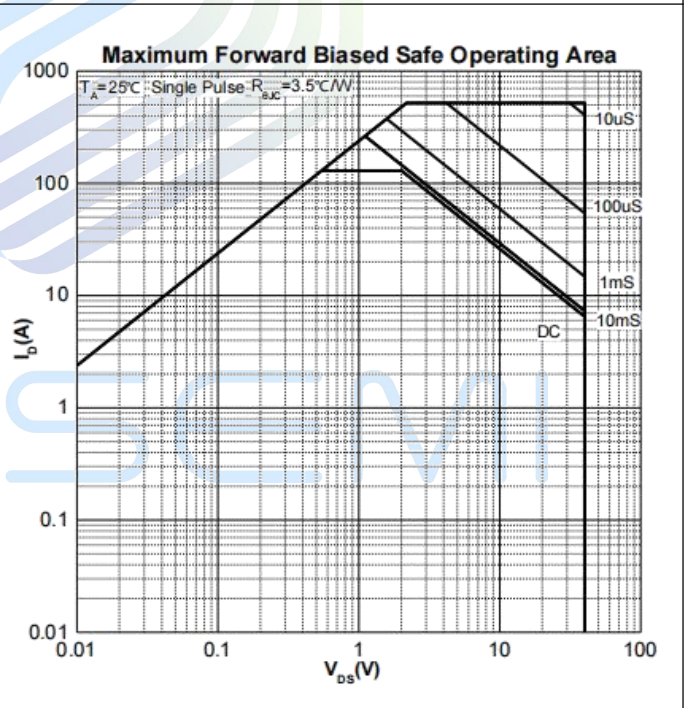
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Statistic Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	40			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=40V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS}=0V$			$\pm 100$	nA
Gate Threshold Voltage <sup>Note4</sup>	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	3.0	V
Static Drain-Source On-Resistance <sup>Note4</sup>	$R_{DS(on)}$	$V_{GS}=10V, I_D=10A$		2.8	3.5	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$		3.1	4.0	
Forward Transconductance <sup>Note4</sup>	$g_{FS}$	$V_{DS}=5V, I_D=20A$		100		S
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=20V$		12655		pF
Output Capacitance	$C_{OSS}$	$V_{GS}=0V$		802		pF
Reverse Transfer Capacitance	$C_{RSS}$	$f=1MHz$		882		pF
Total Gate Charge	$Q_g$	$V_{DS}=20V$		221		nC
Gate-Source Charge	$Q_{gs}$	$V_{GS}=10V$		29		
Gate-Drain Charge	$Q_{gd}$	$I_D=10A$		36		
Gate Resistance	$R_g$	$f=1MHz, \text{Open drain}$		1.5		$\Omega$
<b>Switching Parameters</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V$		18		ns
Turn-on Rise Time	$t_r$	$V_{GS}=10V$		7		
Turn-off Delay Time	$t_{d(off)}$	$R_L=0.75\Omega$		64		
Turn-off Fall Time	$t_f$	$R_G=3\Omega$		11		
<b>Diode Characteristics</b>						
Diode Forward Voltage <sup>Note4</sup>	$V_{SD}$	$V_{GS}=0V, I_S=10A$			1.2	V
Diode Reverse Recovery Time	$t_{rr}$	$I_F=20A, dI/dt=400A/ms$		26		ns
Diode Reverse Recovery Charge	$Q_{rr}$	$I_F=20A, dI/dt=400A/ms$		82		nC

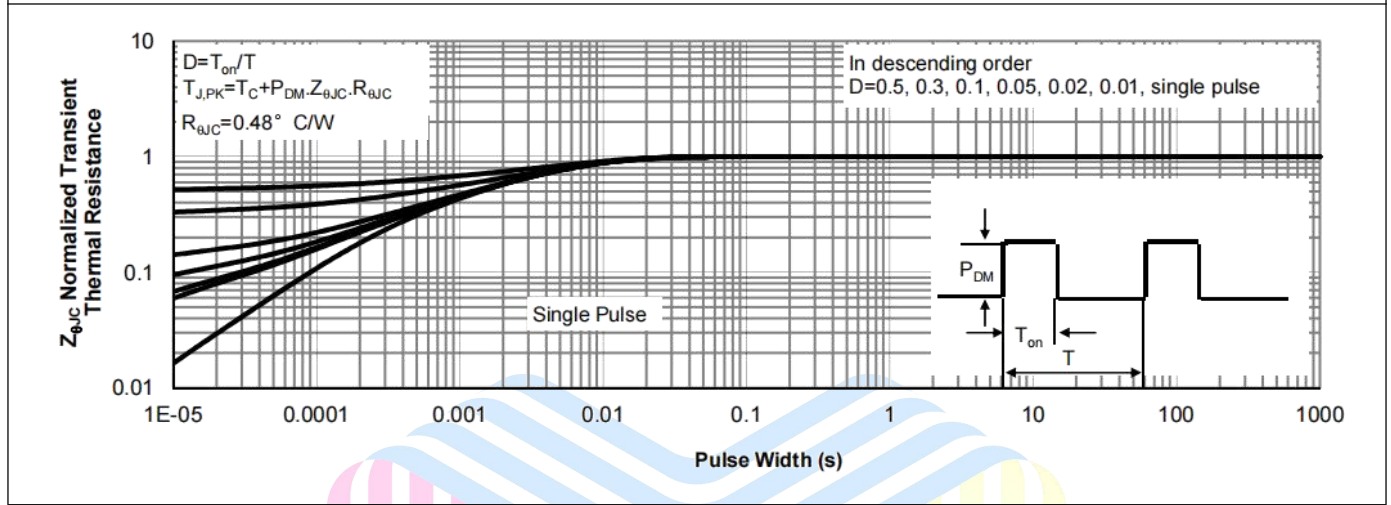
**Notes :**

- The maximum current rating is limited by package. And device mounted on a large heatsink.
- Pulse Test : Pulse Width  $\leq 10\mu s$ , duty cycle  $\leq 1\%$ .
- $E_{AS}$  condition:  $V_{DD}=25V, V_{GS}=10V, L=0.5mH, R_G=25\Omega$  Starting  $T_J=25^\circ C$ .
- Pulse Test : Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- The power dissipation  $P_D$  is limited by  $T_{J(MAX)}=150^\circ C$ . And device mounted on a large heatsink
- Device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ C$ .

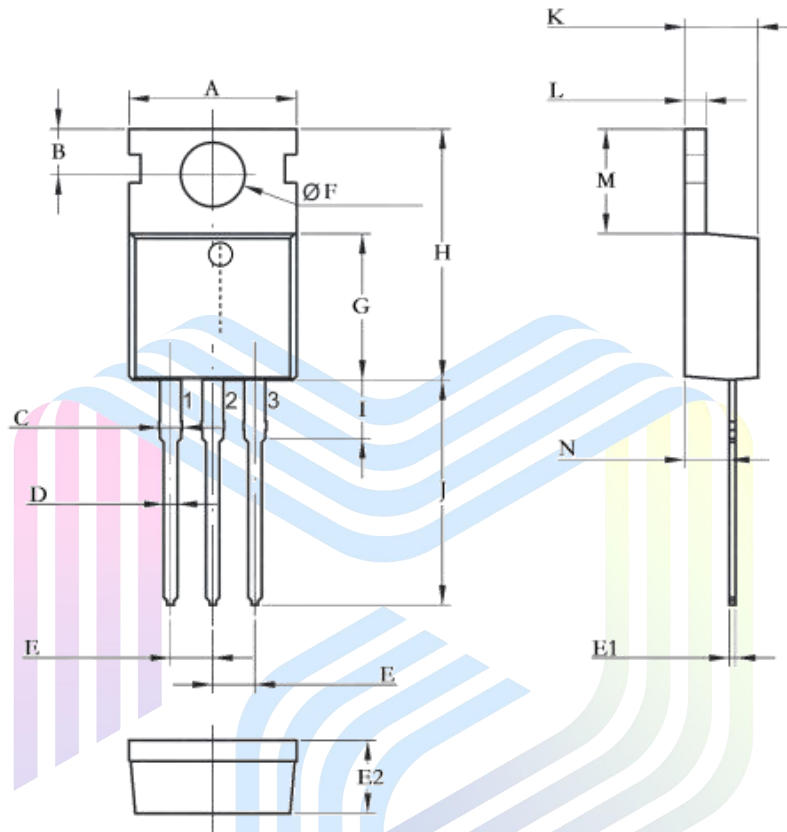
## Typical Performance Characteristics

**Figure 3: Transfer Characteristics**

**Figure 4: Output Characteristics**

**Figure 5: On-Resistance vs. Drain Current**

**Figure 6: On-Resistance vs. Gate Voltage**


**Figure 7: Body Diode Characteristics**

**Figure 8: Threshold Voltage**

**Figure 9: Typical Capacitance**

**Figure 10: Safe Operation Area**


**Figure 11: Normalized Maximum Transient Thermal Impedance**



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**Mechanical Dimensions:**
**TO-220-3L-C Package Information**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	9.600	10.400	0.378	0.409
B	2.800TYP		0.110TYP	
C	1.200	1.600	0.047	0.063
D	0.600	1.000	0.024	0.039
E	2.540TYP		0.100TYP	
E1	0.300	0.700	0.012	0.028
E2	4.300	4.700	0.169	0.185
F	3.400	4.000	0.134	0.157
G	8.850	9.350	0.348	0.368
H	14.600	16.100	0.575	0.634
I	2.800	4.200	0.110	0.165
J	12.600	14.800	0.496	0.583
K	4.300	4.700	0.169	0.185
L	1.000	1.400	0.039	0.055
M	5.840	7.000	0.230	0.276
N	1.800	2.900	0.071	0.114



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