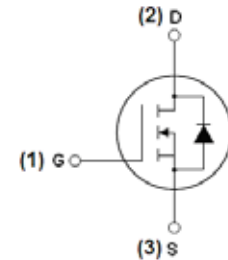


## N-Channel Super Trench Power MOSFET

### Description

The RM48N100D3 uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.



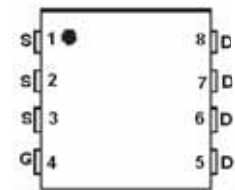
Schematic diagram

### General Features

- $V_{DS} = 100V, I_D = 48A$   
 $R_{DS(ON)} < 13.6m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} < 22m\Omega @ V_{GS} = 4.5V$
- Excellent gate charge x  $R_{DS(on)}$  product
- Very low on-resistance  $R_{DS(on)}$
- Pb-free lead plating
- 100% UIS tested



pin assignment



DFN 3x3 EP top view

### Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification
- Halogen-free
- P/N suffix V means AEC-Q101 qualified, e.g:RM48N100D3V

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
48N100	RM48N100D3	DFN 3X3	-	-	-

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	20/-12	V
Drain Current-Continuous (Silicon Limited)	$I_D$	48	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	30	A
Pulsed Drain Current	$I_{DM}$	192	A
Maximum Power Dissipation	$P_D$	61	W
Derating factor		0.49	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	115	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-50 To 150	$^\circ C$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	2.04	$^{\circ}\text{C}/\text{W}$
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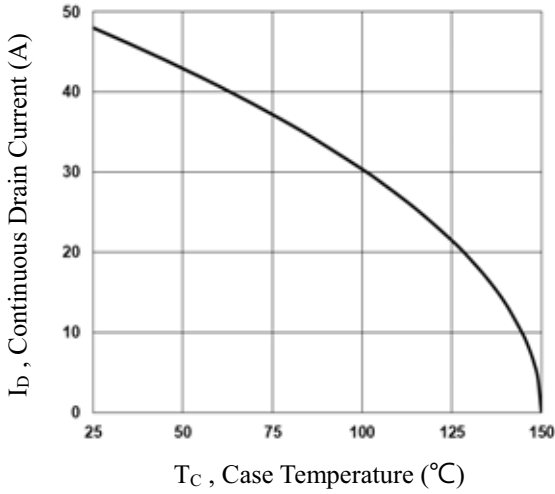
## Electrical Characteristics ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	100		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> <sup>(Note 3)</sup>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	2.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	11.3	13.6	$m\Omega$
		$V_{GS}=4.5V, I_D=15A$	-	16.7	22	$m\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=10V, I_D=3A$	-	8	-	S
<b>Dynamic Characteristics</b> <sup>(Note 4)</sup>						
Input Capacitance	$C_{iss}$	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	1640	3280	PF
Output Capacitance	$C_{oss}$		-	240	480	PF
Reverse Transfer Capacitance	$C_{rss}$		-	4	10	PF
<b>Switching Characteristics</b> <sup>(Note 4)</sup>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=50V, I_D=1A$ $V_{GS}=10V, R_G=6\Omega$	-	14.2	28	nS
Turn-on Rise Time	$t_r$		-	20.8	42	nS
Turn-Off Delay Time	$t_{d(off)}$		-	42	84	nS
Turn-Off Fall Time	$t_f$		-	30	60	nS
Total Gate Charge	$Q_g$	$V_{DS}=50V, I_D=10A,$ $V_{GS}=10V$	-	27.8	55	nC
Gate-Source Charge	$Q_{gs}$		-	3.5	7	nC
Gate-Drain Charge	$Q_{gd}$		-	8.8	17	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=1A$	-		1.0	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	48	A
Reverse Recovery Time	$t_{rr}$	$T_J=25^{\circ}\text{C}, I_F=I_S$	-	43.5		nS
Reverse Recovery Charge	$Q_{rr}$	$di/dt=100A/\mu s$ <sup>(Note 3)</sup>	-	59.6		nC

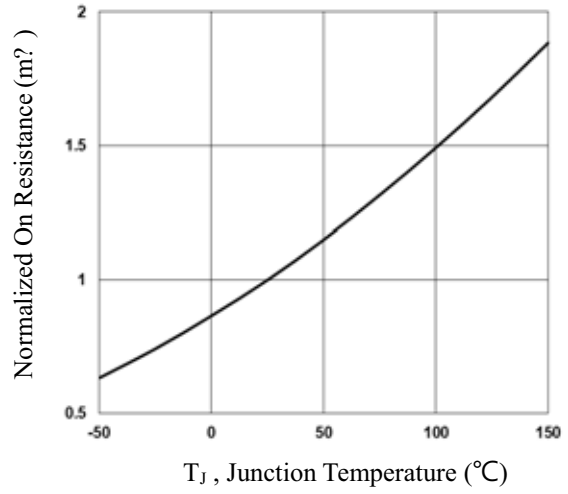
### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, L=0.5mH, R_g=25\Omega$

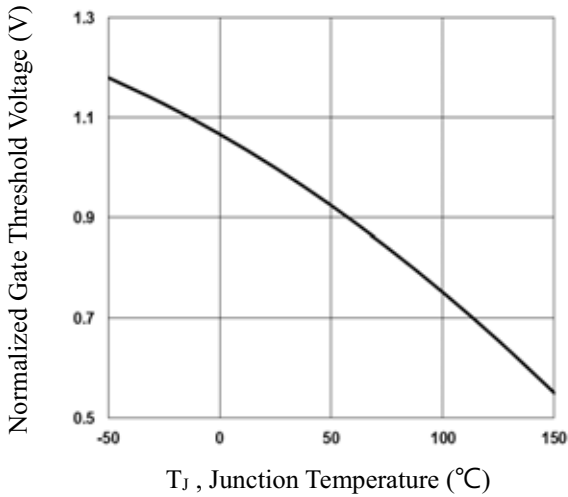
## RATING AND CHARACTERISTICS CURVES (RM48N100D3 )



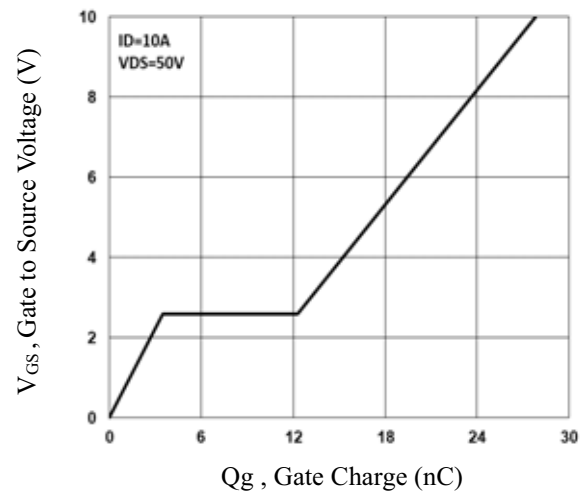
**Fig.1 Continuous Drain Current vs.  $T_c$**



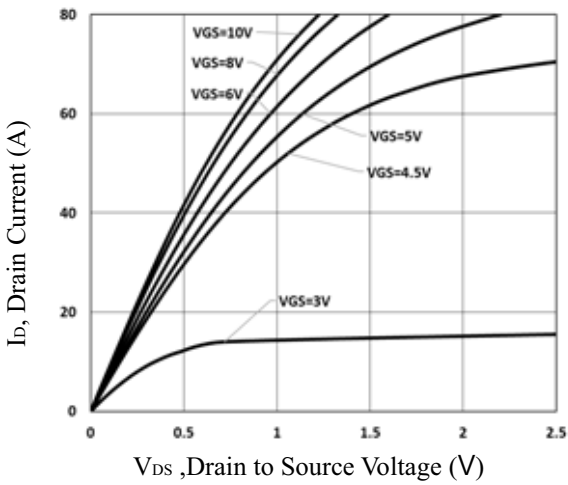
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_j$**



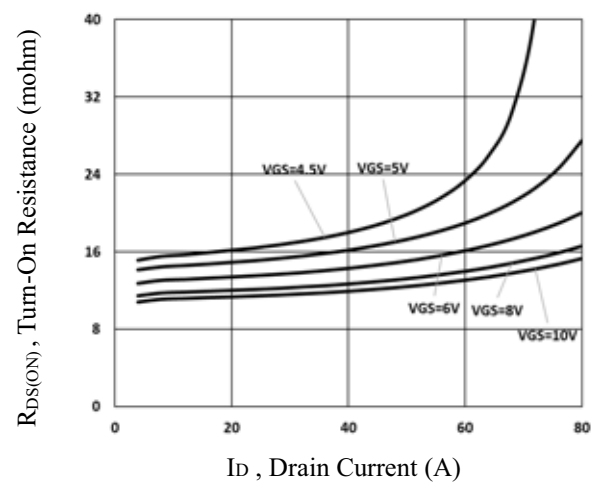
**Fig.3 Normalized  $V_{th}$  vs.  $T_j$**



**Fig.4 Gate Charge Characteristics**

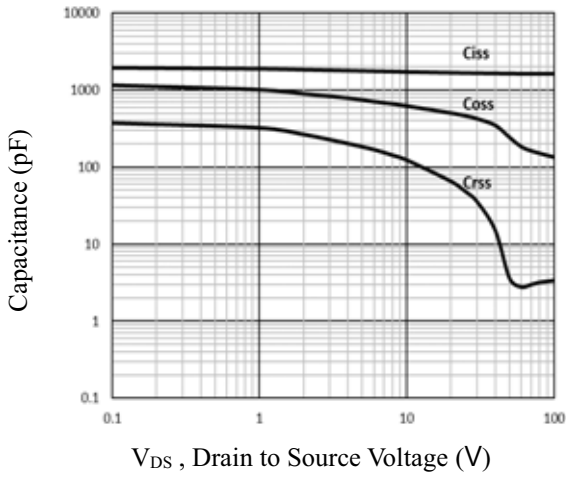


**Fig.5 Typical Output Characteristics**

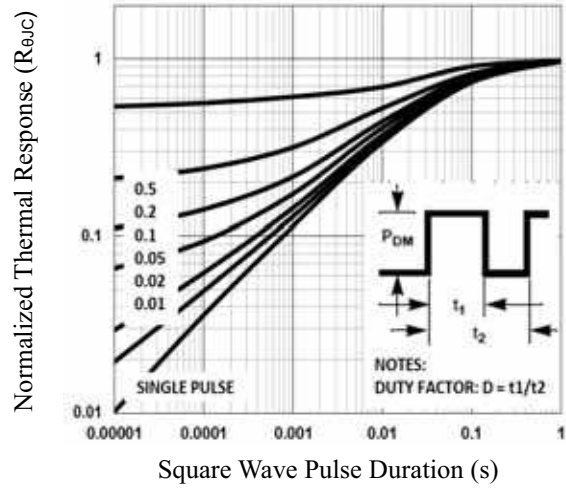


**Fig.6 Turn-On Resistance vs.  $I_D$**

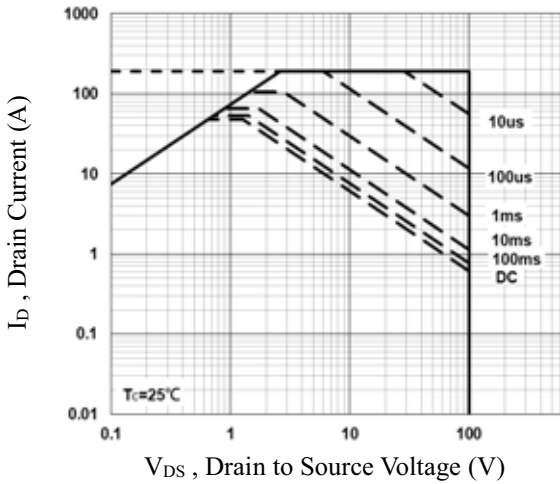
## RATING AND CHARACTERISTICS CURVES (RM48N100D3 )



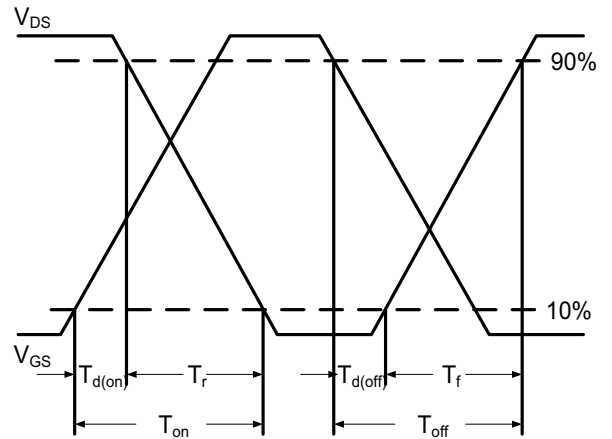
**Fig.7 Capacitance Characteristics**



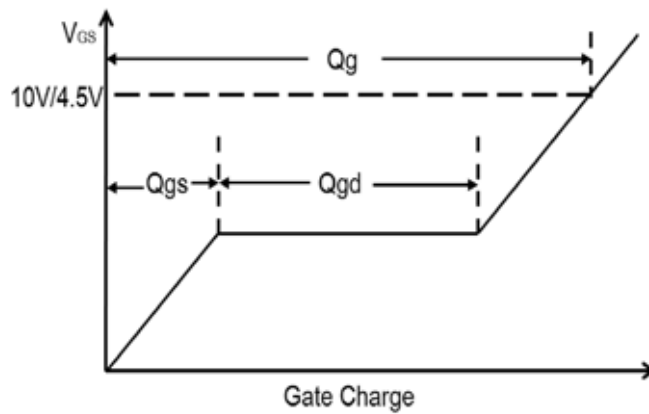
**Fig.8 Normalized Transient Impedance**



**Fig.9 Maximum Safe Operation Area**

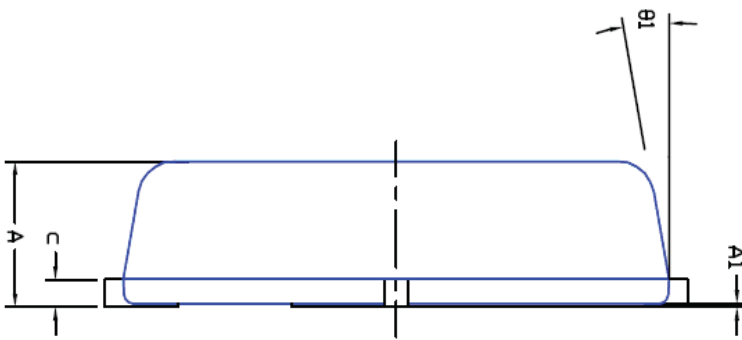
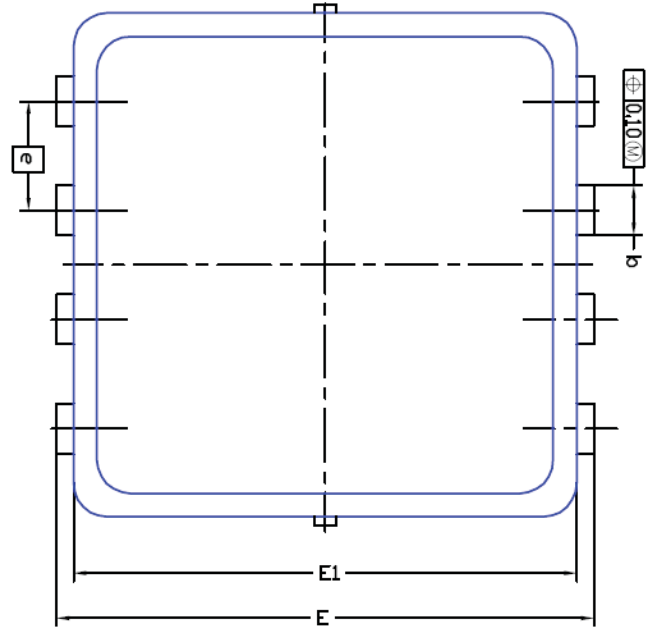
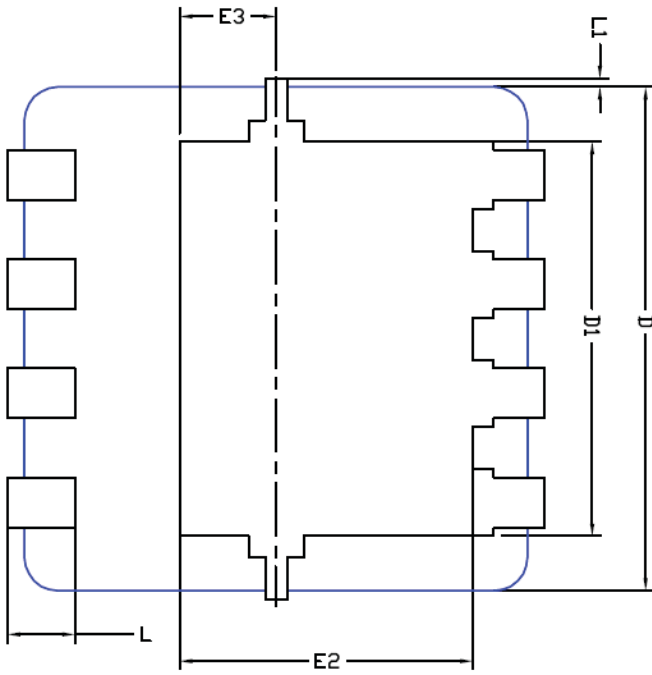


**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

# DFN3X3 EP Package Information



DIM.	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.700	0.80	0.900	0.0276	0.0315	0.0354
A1	0.00	---	0.05	0.000	---	0.002
b	0.24	0.30	0.35	0.009	0.012	0.014
c	0.10	0.152	0.25	0.004	0.006	0.010
D	3.00 BSC			0.118 BSC		
D1	2.35 BSC			0.093 BSC		
E	3.20 BSC			0.126 BSC		
E1	3.00 BSC			0.118 BSC		
E2	1.75 BSC			0.069 BSC		
E3	0.575 BSC			0.023 BSC		
e	0.65 BSC			0.026 BSC		
L	0.30	0.40	0.50	0.0118	0.0157	0.0197
L1	0	---	0.100	0	---	0.004
θ1	0°	10°	12°	0°	10°	12°

Package	Tube (pcs/tube)	Tube (pcs/inner box)	Tube (pcs/cartoon)	Tape&Reel (pcs/reel)	Tape&Reel (pcs/inner box)	Tape&Reel (pcs/cartoon)
DFN5x6/DFN3x3	100	10,000	100,000	2,500	5,000	40,000
DFN1006	—	—	—	10,000	10,000	400,000
SOP-8	100	10,000	100,000	4,000	4,000	64,000
TSSOP-8	100	32,000	128,000	3,000	6,000	48,000
SOT-23-3L	—	—	—	3,000	30,000	120,000
SOT-23-6L	—	—	—	3,000	30,000	120,000
SOT-23(6R)	—	—	—	3,000	30,000	120,000
SOT-363	—	—	—	3,000	30,000	120,000
SOT-523	—	—	—	3,000	30,000	120,000
SOT223	—	—	—	2,500	2,500	20,000
TO-220	50	1,000	5,000	—	—	—
TO-220F	50	1,000	10,000	—	—	—
TO-247	30	300	1,200	—	—	—
TO-251	80	4,000	40,000	—	—	—
TO-251S(4R)	80	4,000	40,000	—	—	—
TO-252-2L(4R)	80	4,000	40,000	2,500	2,500	25,000
TO-263-2L	50	1,000	10,000	800	800	8,000
TO-3P	30	300	3,000	—	—	—
TO-92	—	—	—	1,000(袋装)	10,000	100,000

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