

## RTR040N03TL-VB Datasheet

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

PRODUCT SUMMARY					
V <sub>DS</sub> (V)	$R_{DS(on)}$ ( $\Omega$ )	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)		
30	0.030 at V <sub>GS</sub> = 10 V	6.5	4.5 nC		
	$0.033$ at $V_{GS} = 4.5 \text{ V}$	6.0	4.5 110		

#### **FEATURES**

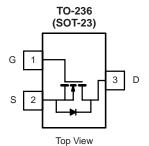
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % R<sub>g</sub> Tested
- Compliant to RoHS Directive 2002/95/EC

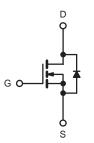


ROHS COMPLIANT HALOGEN FREE

#### **APPLICATIONS**

DC/DC Converter





ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted					
Parameter		Symbol	Limit	Unit	
Drain-Source Voltage		$V_{DS}$	30	V	
Gate-Source Voltage		$V_{GS}$	± 20	ľ	
	T <sub>C</sub> = 25 °C		6.5 <sup>a</sup>		
Continuous Drain Current (T <sub>.1</sub> = 150 °C)	T <sub>C</sub> = 70 °C	I <sub>D</sub>	6.0		
Continuous Brain Carrette (1) = 100 °C)	T <sub>A</sub> = 25 °C	d' 'D	5.3	А	
	T <sub>A</sub> = 70 °C		5.0		
Pulsed Drain Current		I <sub>DM</sub>	25		
$T_C = 2$			1.4		
Continuous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	IS	0.9 <sup>b, c</sup>	1	
	T <sub>C</sub> = 25 °C		1.7		
Maximum Power Dissipation	T <sub>C</sub> = 70 °C	P <sub>D</sub>	1.1	w	
Maximum Fower Dissipation	T <sub>A</sub> = 25 °C	י ט	1.1 <sup>b, c</sup>	]	
	T <sub>A</sub> = 70 °C	]	0.7 <sup>b, c</sup>	1	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C	
Soldering Recommendations (Peak Tempera	ature) <sup>d, e</sup>		260		

THERMAL RESISTANCE RATINGS						
Parameter	Symbol	Typical	Maximum	Unit		
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 5 s	$R_{thJA}$	90	115	°C/W	
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	60	75	0,11	

#### Notes:

- a. Package limited
- b. Surface Mounted on 1" x 1" FR4 board.
- c. t = 5 s.
- d. Maximum under steady state conditions is 130  $^{\circ}\text{C/W}.$



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	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA		31		>//00	
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_{J}$	I <sub>D</sub> = 250 μA		- 5		mV/°C	
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}$ , $I_D = 250 \mu A$	0.7	1.1	2.0	V	
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
7. 0. 1/1. 5. 0		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			1		
Zero Gate Voltage Drain Current	IDSS	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 ^{\circ}\text{C}$			10	μA	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	10			Α	
	_	$V_{GS} = 10 \text{ V}, I_D = 3.2 \text{ A}$		0.030		Ω	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = 4.5 \text{ V}, I_D = 2.8 \text{ A}$		0.033			
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	$V_{DS} = 15 \text{ V}, I_D = 4.8 \text{ A}$		11		S	
Dynamic <sup>b</sup>					L		
Input Capacitance	C <sub>iss</sub>			335			
Output Capacitance	C <sub>oss</sub>	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		45		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			17			
Tatal Oata Ohaana		$V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_{D} = 3.4 \text{ A}$		4.5	6.7	nC	
Total Gate Charge	Qg		2.1	2.1	3.2		
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 15 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 3.4 \text{ A}$		0.85			
Gate-Drain Charge	Q <sub>gd</sub>			0.65			
Gate Resistance	R <sub>g</sub>	f = 1 MHz	0.8	4.4	8.8	Ω	
Turn-On Delay Time	t <sub>d(on)</sub>			12	20		
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 5.6 $\Omega$		50	75	•	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D\cong$ 2.7 A, $V_{GEN}$ = 4.5 V, $R_g$ = 1 $\Omega$		12	20		
Fall Time	t <sub>f</sub>			22	35		
Turn-On Delay Time	t <sub>d(on)</sub>			5	10	ns	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 5.6 $\Omega$		12	20	- - - -	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D\cong$ 2.7 A, $V_{GEN}$ = 10 V, $R_g$ = 1 $\Omega$		10	15		
Fall Time	t <sub>f</sub>			5	10		
<b>Drain-Source Body Diode Characteristi</b>	cs				L		
Continuous Source-Drain Diode Current	I <sub>S</sub>	$T_C = 25  ^{\circ}C$			1.4	۸	
Pulse Diode Forward Current	I <sub>SM</sub>				15	A	
Body Diode Voltage	V <sub>SD</sub>	$I_S = 2.7 \text{ A}, V_{GS} = 0 \text{ V}$		0.8	1.2	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>			10	20	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	L = 2.7 A dl/dt = 100 A/vo T = 25.00		5	10	nC	
Reverse Recovery Fall Time	t <sub>a</sub>	$I_F = 2.7 \text{ A}, \text{ dI/dt} = 100 \text{ A/}\mu\text{s}, T_J = 25 ^{\circ}\text{C}$		6			
Reverse Recovery Rise Time	t <sub>b</sub>			4		ns	

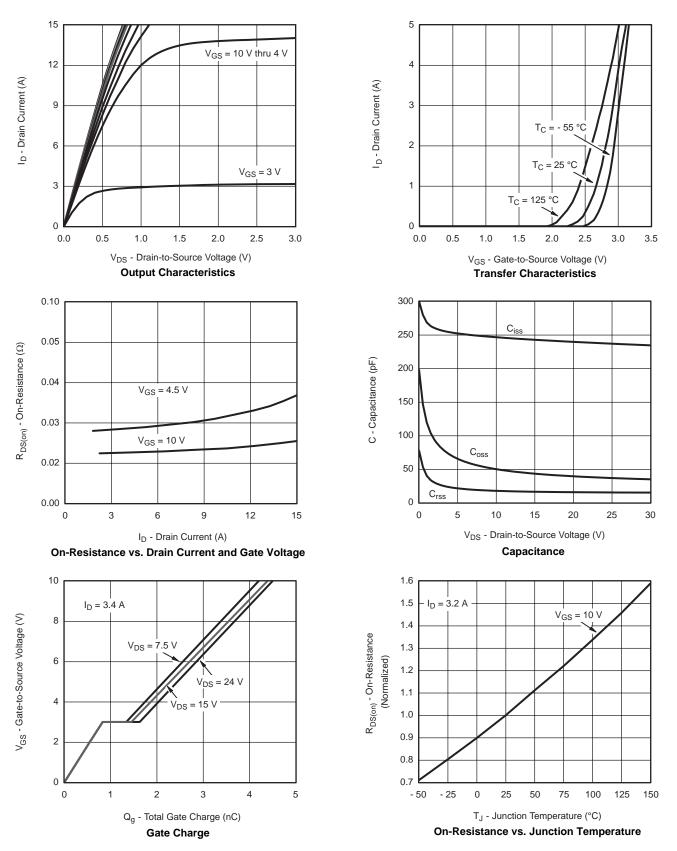
#### Notes:

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

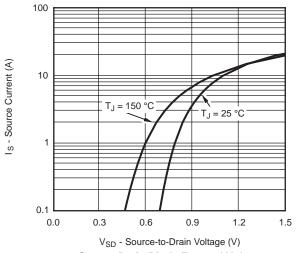
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

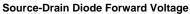
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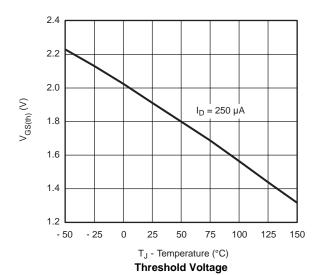


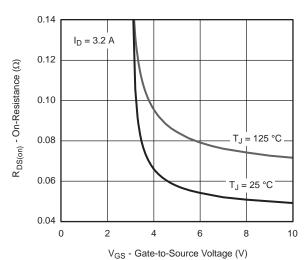








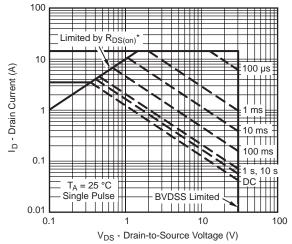




On-Resistance vs. Gate-to-Source Voltage



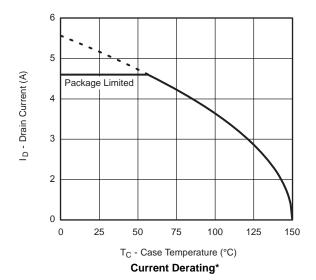
Single Pulse Power

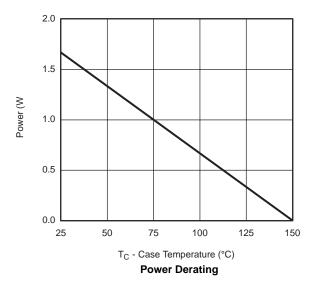


\*  $V_{GS}$  > minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area, Junction-to-Ambient



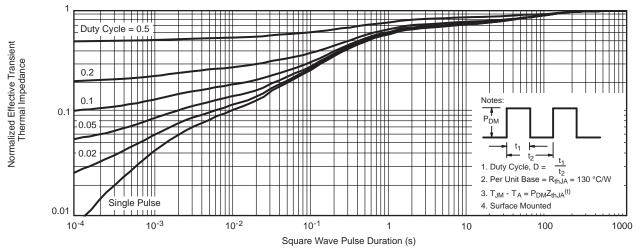




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<sup>\*</sup> The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine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





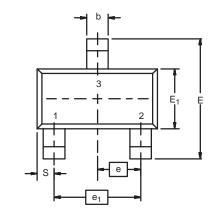
Normalized Thermal Transient Impedance, Junction-to-Ambient

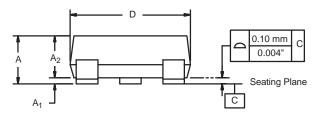


Normalized Thermal Transient Impedance, Junction-to-Foot



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







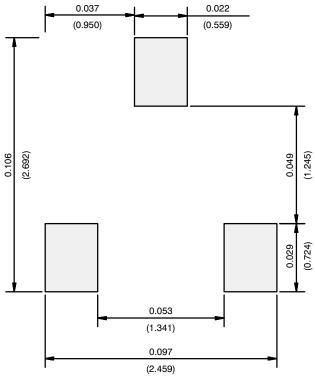
Dim	MILLIM	IETERS	INCHES			
	Min	Max	Min	Max		
Α	0.89	1.12	0.035	0.044		
A <sub>1</sub>	0.01	0.10	0.0004	0.004		
A <sub>2</sub>	0.88	1.02	0.0346	0.040		
b	0.35	0.50	0.014	0.020		
С	0.085	0.18	0.003	0.007		
D	2.80	3.04	0.110	0.120		
E	2.10	2.64	0.083	0.104		
E <sub>1</sub>	1.20	1.40	0.047	0.055		
е	0.95 BSC		0.0374 Ref			
e <sub>1</sub>	1.90 BSC		0.074	748 Ref		
L	0.40	0.60	0.016	0.024		
L <sub>1</sub>	0.64 Ref		0.025	S Ref		
S	0.50 Ref		0.020	) Ref		
q	3°	8°	3°	8°		
ECN: S-03946-Rev. K. 09-	Jul-01	•				

DWG: 5479

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



Recommended Minimum Pads Dimensions in Inches/(mm)

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