

# Switching (30V, 4.0A)

## RTR040N03

### ●Features

- 1) Low On-resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small and Surface Mount Package (TSMT3).

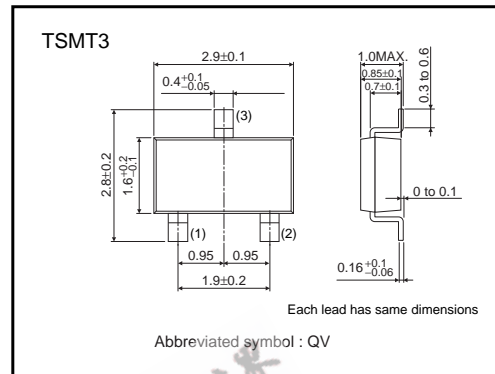
### ●Application

Power switching, DC / DC converter.

### ●Structure

Silicon N-channel  
MOS FET

### ●External dimensions (Unit : mm)



### ●Packaging specifications

Type	Package	Taping
	Code	TL
	Basic ordering unit (pieces)	3000
RTR040N03		○

### ●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit	
Drain-source voltage	$V_{DS}$	30	V	
Gate-source voltage	$V_{GS}$	12	V	
Drain current	Continuous	$I_D$	±4.0	A
	Pulsed	$I_{DP}$ *1	±16	A
Source current (Body diode)	Continuous	$I_S$	0.8	A
	Pulsed	$I_{SP}$ *1	16	A
Total power dissipation	$P_D$ *2	1.0	W	
Channel temperature	$T_{ch}$	150	°C	
Range of Storage temperature	$T_{stg}$	-55 to +150	°C	

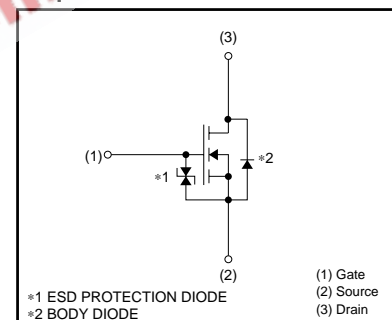
\*1  $P_w \leq 10 \mu s$ , Duty cycle  $\leq 1\%$

\*2 Mounted on a ceramic board

### ●Thermal resistance (Ta=25°C)

Parameter	Symbol	Limits	Unit
Channel to ambient	$R_{th}(ch-a)$	125	°C / W

### ●Equivalent circuit



## Transistors

## ●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I <sub>GSS</sub>	–	–	10	μA	V <sub>GS</sub> =12V, V <sub>DS</sub> =0V
Drain-source breakdown voltage	V <sub>(BR) DSS</sub>	30	–	–	V	I <sub>D</sub> =1mA, V <sub>GS</sub> =0V
Zero gate voltage drain current	I <sub>DSS</sub>	–	–	1	μA	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V
Gate threshold voltage	V <sub>GS(th)</sub>	0.5	–	1.5	V	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA
Static drain-source on-state resistance	R <sub>DS(on)</sub> *	–	34	48	mΩ	I <sub>D</sub> =4.0A, V <sub>GS</sub> =4.5V
		–	36	50	mΩ	I <sub>D</sub> =4.0A, V <sub>GS</sub> =4.0V
		–	47	66	mΩ	I <sub>D</sub> =4.0A, V <sub>GS</sub> =2.5V
Forward transfer admittance	Y <sub>fs</sub>  *	4.0	–	–	S	V <sub>DS</sub> =10V, I <sub>D</sub> =4.0A
Input capacitance	C <sub>iss</sub>	–	475	–	pF	V <sub>DS</sub> =10V
Output capacitance	C <sub>oss</sub>	–	120	–	pF	V <sub>GS</sub> =0V
Reverse transfer capacitance	C <sub>rss</sub>	–	70	–	pF	f=1MHz
Turn-on delay time	t <sub>d(on)</sub> *	–	10	–	ns	I <sub>D</sub> =2.0A
Rise time	t <sub>r</sub> *	–	18	–	ns	V <sub>DD</sub> =15V
Turn-off delay time	t <sub>d(off)</sub> *	–	37	–	ns	V <sub>GS</sub> =4.5V
Fall time	t <sub>f</sub> *	–	19	–	ns	R <sub>L</sub> =7.5Ω
Total gate charge	Q <sub>g</sub>	–	5.9	8.3	nC	R <sub>G</sub> =10Ω
Gate-source charge	Q <sub>gs</sub>	–	1.0	–	nC	V <sub>DD</sub> =15V
Gate-drain charge	Q <sub>gd</sub>	–	2.0	–	nC	V <sub>GS</sub> =4.5V
						I <sub>D</sub> =4.0A
						R <sub>L</sub> =3.75Ω
						R <sub>G</sub> =10Ω

\*Pulsed

## Body diode characteristics (source-drain characteristics)

Forward voltage	V <sub>SD</sub>	–	–	1.2	V	I <sub>S</sub> =0.8A, V <sub>GS</sub> =0V
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Transistors

●Electrical characteristic curves

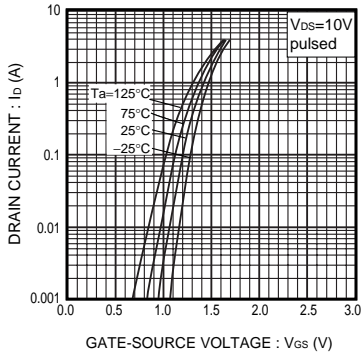


Fig.1 Typical Transfer Characteristics

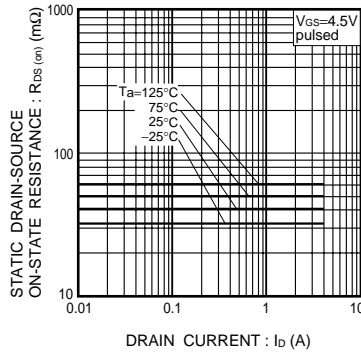


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

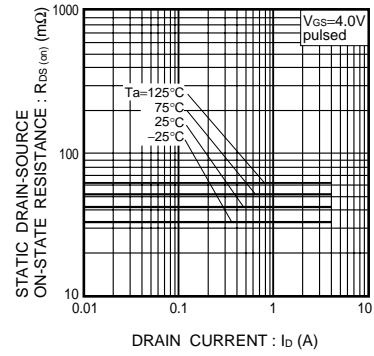


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

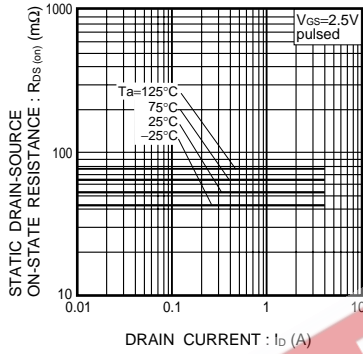


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

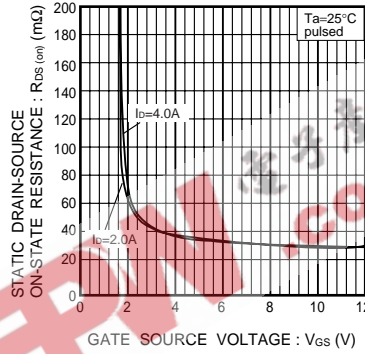


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

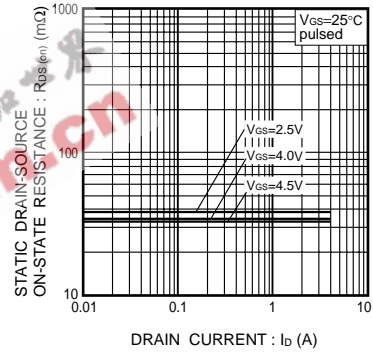


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

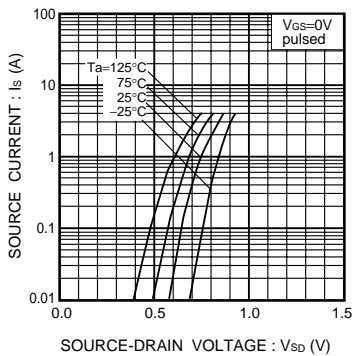


Fig.7 Source Current vs. Source-Drain Voltage

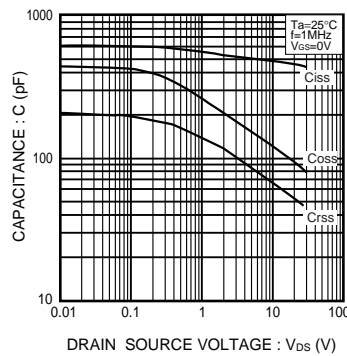


Fig.8 Typical Capacitance vs. Drain-Source Voltage

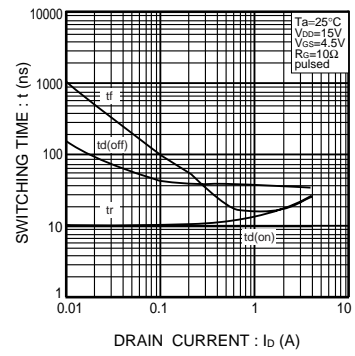


Fig.9 Switching Characteristics

Transistors

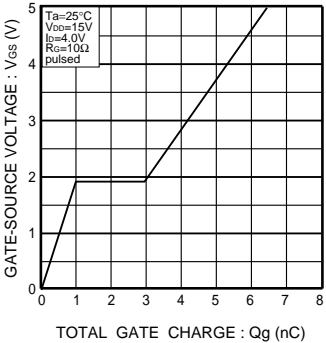


Fig.10 Dynamic Input Characteristics

●Measurement circuits

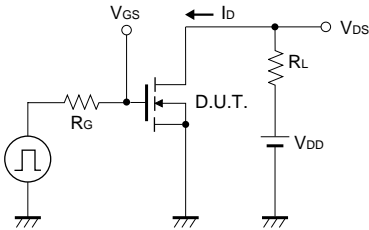


Fig.11 Switching Time Test Circuit

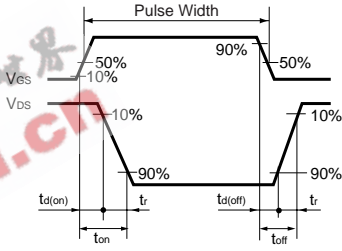


Fig.12 Switching Time Waveforms

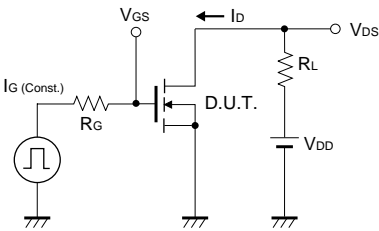


Fig.13 Gate Charge Test Circuit

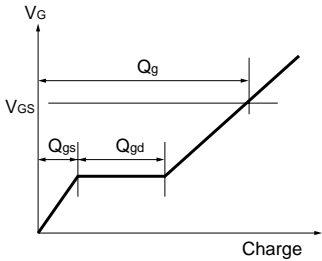


Fig.14 Gate Charge Waveform

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