

# Switching (30V, 4.0A)

## RTR040N03

### ●Features

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

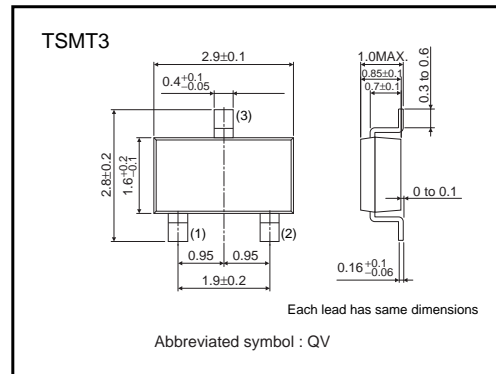
### ●Application

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	

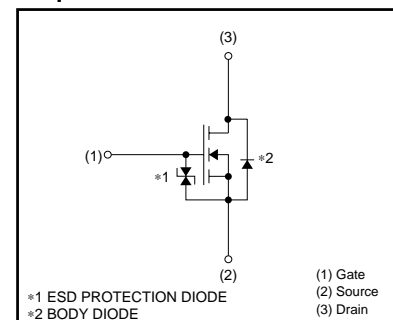
\*1  $P_w \leq 10 \mu s$ , Duty cycle  $\leq 1\%$

\*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	$I_{GSS}$	–	–	10	$\mu A$	$V_{GS}=12V, V_{DS}=0V$
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	–	–	V	$I_D=1mA, V_{GS}=0V$
Zero gate voltage drain current	$I_{DSS}$	–	–	1	$\mu A$	$V_{DS}=30V, V_{GS}=0V$
Gate threshold voltage	$V_{GS(th)}$	0.5	–	1.5	V	$V_{DS}=10V, I_D=1mA$
Static drain-source on-state resistance	$R_{DS(on)}$ *	–	34	48	$m\Omega$	$I_D=4.0A, V_{GS}=4.5V$
		–	36	50	$m\Omega$	$I_D=4.0A, V_{GS}=4.0V$
		–	47	66	$m\Omega$	$I_D=4.0A, V_{GS}=2.5V$
Forward transfer admittance	$ Y_{fs} $ *	4.0	–	–	S	$V_{DS}=10V, I_D=4.0A$
Input capacitance	$C_{iss}$	–	475	–	pF	$V_{DS}=10V$
Output capacitance	$C_{oss}$	–	120	–	pF	$V_{GS}=0V$
Reverse transfer capacitance	$C_{rss}$	–	70	–	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}$ *	–	10	–	ns	$I_D=2.0A$
Rise time	$t_r$ *	–	18	–	ns	$V_{DD}=15V$
Turn-off delay time	$t_{d(off)}$ *	–	37	–	ns	$V_{GS}=4.5V$
Fall time	$t_f$ *	–	19	–	ns	$R_L=7.5\Omega$
Total gate charge	$Q_g$	–	5.9	8.3	nC	$V_{DD}=15V$
Gate-source charge	$Q_{gs}$	–	1.0	–	nC	$V_{GS}=4.5V$
Gate-drain charge	$Q_{gd}$	–	2.0	–	nC	$I_D=4.0A$
						$R_L=3.75\Omega$
						$R_G=10\Omega$

\*Pulsed

## Body diode characteristics (source-drain characteristics)

Forward voltage	$V_{SD}$	–	–	1.2	V	$I_S=0.8A, V_{GS}=0V$
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Transistors

●Electrical characteristic curves

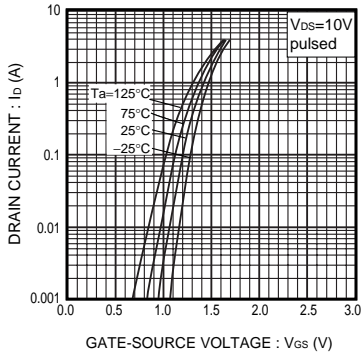


Fig.1 Typical Transfer Characteristics

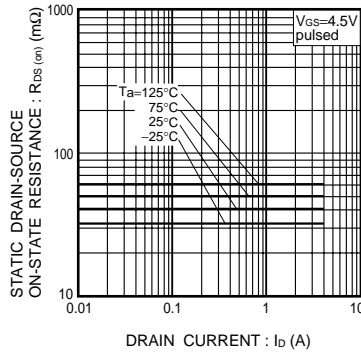


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

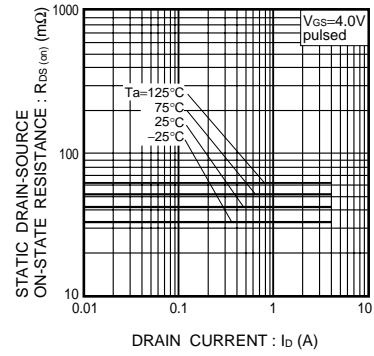


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

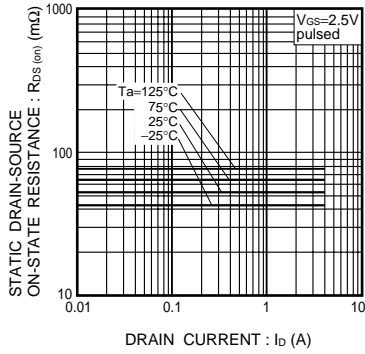


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

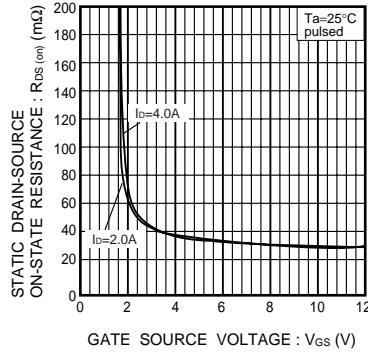


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

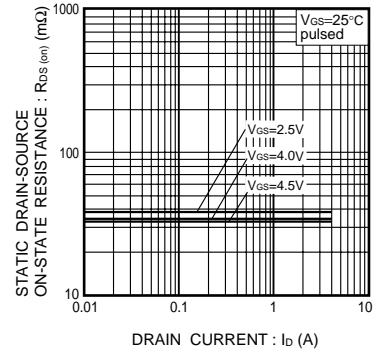


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

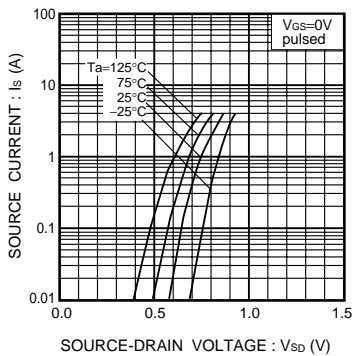


Fig.7 Source Current vs. Source-Drain Voltage

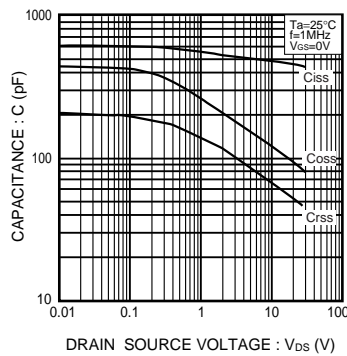


Fig.8 Typical Capacitance vs. Drain-Source Voltage

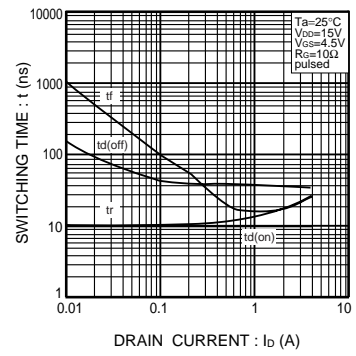


Fig.9 Switching Characteristics

Transistors

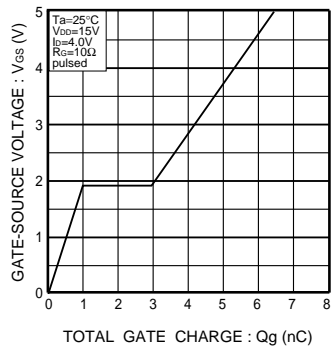


Fig.10 Dynamic Input Characteristics

● Measurement circuits

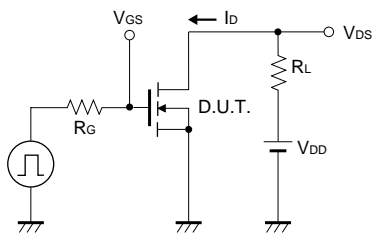


Fig.11 Switching Time Test Circuit

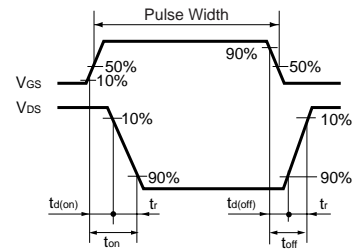


Fig.12 Switching Time Waveforms

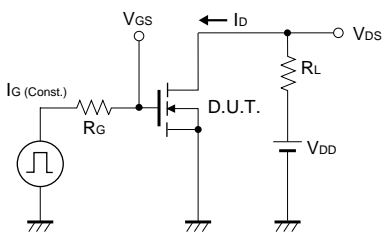


Fig.13 Gate Charge Test Circuit

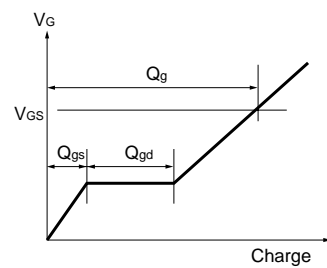


Fig.14 Gate Charge Waveform

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