

Transistors

# DC-DC Converter (-20V, -4.0A)

## RTQ040P02

●Features

- 1) Low on-resistance. (110mΩ at 2.5V)
- 2) High power package.
- 3) High speed switching.
- 4) Low voltage drive. (2.5V)

●Applications

DC-DC converter

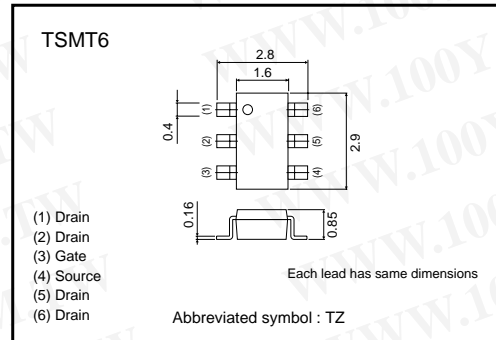
●Structure

Silicon P-channel  
 MOS FET

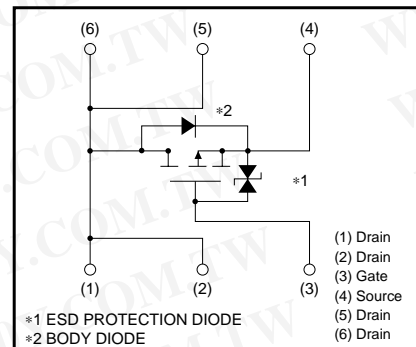
●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
RTQ040P02		○

●External dimensions (Unit : mm)



●Equivalent circuit



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●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Drain-source voltage	V <sub>DSS</sub>	-20	V
Gate-source voltage	V <sub>GSS</sub>	±12	V
Drain current	Continuous	I <sub>D</sub>	±4.0
	Pulsed	I <sub>DP</sub>	±16
Source current (Body diode)	Continuous	I <sub>S</sub>	-1
	Pulsed	I <sub>SP</sub>	-16
Total power dissipation	P <sub>D</sub>	1.25	W
Channel temperature	T <sub>ch</sub>	150	°C
Range of Storage temperature	T <sub>stg</sub>	-55 to +150	°C

\*1 P<sub>WS</sub>≤10μs, Duty cycle≤1%  
 \*2 Mounted on a ceramic board

●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>	-20	-	-	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> =-20V, V <sub>GS</sub> =0V
Gate threshold voltage	V <sub>GS(th)</sub>	-0.7	-	-2.0	V	V <sub>DS</sub> =-10V, I <sub>D</sub> =-1mA
Static drain-source on-state resistance	R <sub>DS(on)</sub>	-	35	50	mΩ	I <sub>D</sub> =-4A, V <sub>GS</sub> =-4.5V
		-	40	55	mΩ	I <sub>D</sub> =-4A, V <sub>GS</sub> =-4V
		-	60	85	mΩ	I <sub>D</sub> =-2.0A, V <sub>GS</sub> =-2.5V
Forward transfer admittance	Y <sub>fs</sub>	3.5	-	-	S	V <sub>DS</sub> =-10V, I <sub>D</sub> =-2.0A
Input capacitance	C <sub>iss</sub>	-	1350	-	pF	V <sub>DS</sub> =-10V
Output capacitance	C <sub>oss</sub>	-	210	-	pF	V <sub>GS</sub> =0V
Reverse transfer capacitance	C <sub>rss</sub>	-	150	-	pF	f=1MHz
Turn-on delay time	t <sub>d(on)</sub>	-	15	-	ns	I <sub>D</sub> =-2.0A
Rise time	t <sub>r</sub>	-	35	-	ns	V <sub>DD</sub> =-15V
Turn-off delay time	t <sub>d(off)</sub>	-	60	-	ns	V <sub>GS</sub> =-4.5V
Fall time	t <sub>f</sub>	-	30	-	ns	R <sub>L</sub> =7.5Ω
Total gate charge	Q <sub>g</sub>	-	12.2	-	nC	R <sub>GS</sub> =10Ω
Gate-source charge	Q <sub>gs</sub>	-	2.6	-	nC	V <sub>DD</sub> =-15V R <sub>L</sub> =3.75Ω
Gate-drain charge	Q <sub>gd</sub>	-	3.4	-	nC	V <sub>GS</sub> =-4.5V R <sub>GS</sub> =10Ω
						I <sub>D</sub> =-4.0A

\*Pulsed

Body diode characteristics (source-drain characteristics)

Forward voltage	V <sub>SD</sub>	-	-	-1.2	V	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V
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●Electrical characteristic curves

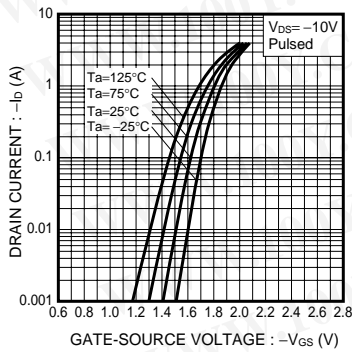


Fig.1 Typical Transfer Characteristics

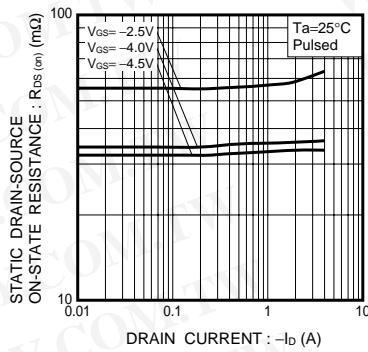


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

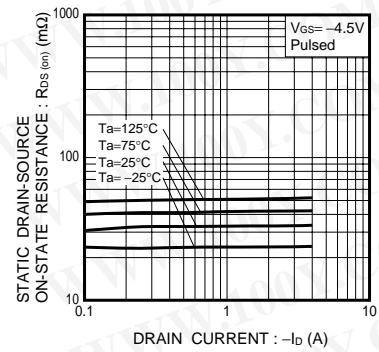


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

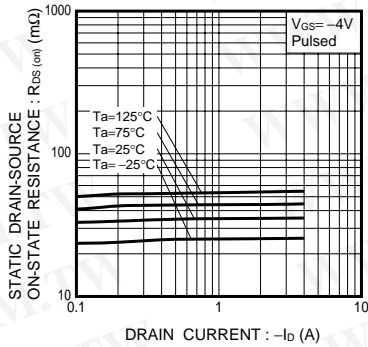


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

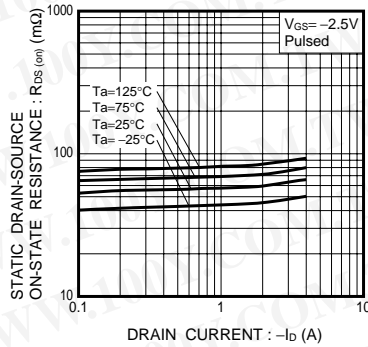


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

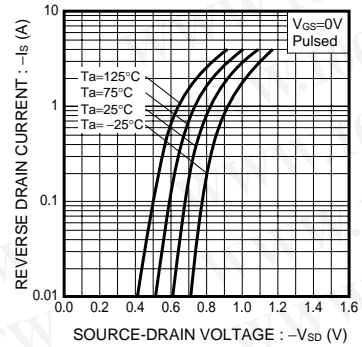


Fig.6 Reverse Drain Current vs. Source-Drain Voltage

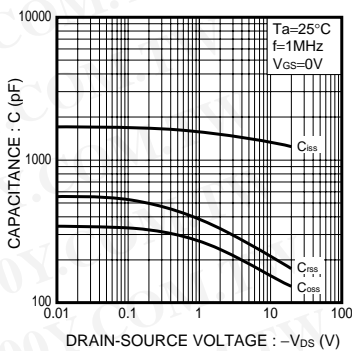


Fig.7 Typical Capacitance vs. Drain-Source Voltage

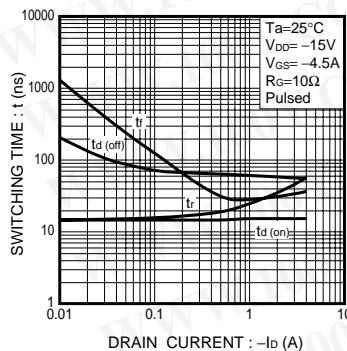


Fig.8 Switching Characteristics

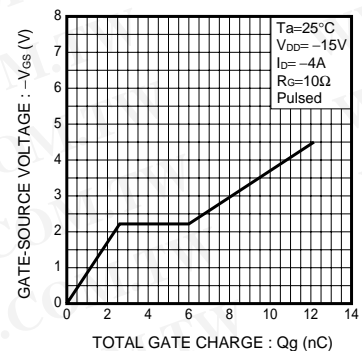


Fig.9 Dynamic Input Characteristics

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●Measurement circuits

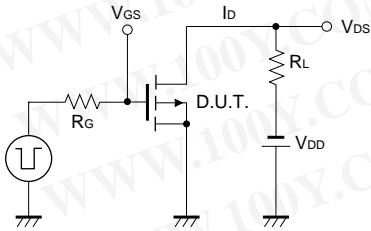


Fig.10 Switching Time Measurement Circuit

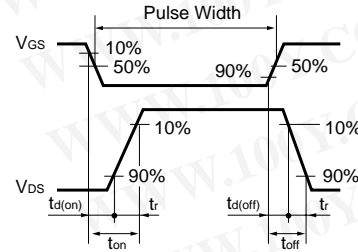


Fig.11 Switching Waveforms

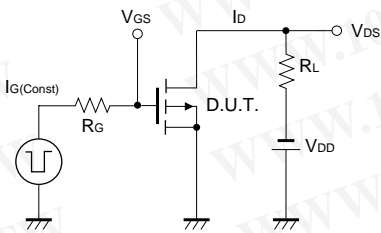


Fig.12 Gate Charge Measurement Circuit

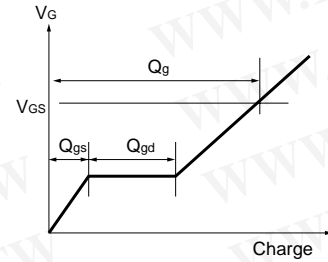


Fig.13 Gate Charge Waveforms

## Appendix

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