

## Transistors

## Switching (–20V, –2.0A)

## RTR020P02

## ●Features

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

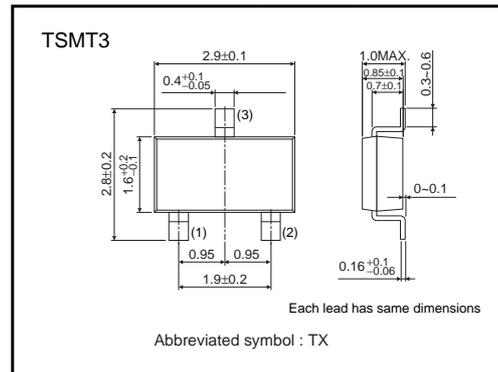
## ●Application

Power switching, DC / DC converter.

## ●Structure

Silicon P-channel  
MOS FET

## ●External dimensions (Unit : mm)



## ●Packaging specifications

Type	Package	Taping
	Code	TL
	Basic ordering unit (pieces)	3000
RTR020P02		○

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

Parameter	Symbol	Limits	Unit	
Drain-source voltage	$V_{DS}$	–20	V	
Gate-source voltage	$V_{GS}$	±12	V	
Drain current	Continuous	$I_D$	±2.0	A
	Pulsed	$I_{DP}$ *1	±8.0	A
Source current (Body diode)	Continuous	$I_S$	–0.8	A
	Pulsed	$I_{SP}$ *1	–3.2	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	

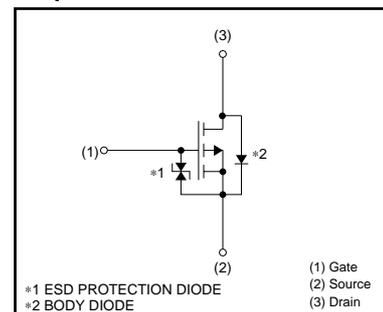
\*1  $P_w \leq 10 \mu s$ , Duty cycle  $\leq 1\%$

\*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



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## ●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> *	–	100	135	mΩ	I <sub>D</sub> = –2.0A, V <sub>GS</sub> = –4.5V
		–	110	150	mΩ	I <sub>D</sub> = –2.0A, V <sub>GS</sub> = –4.0V
		–	180	250	mΩ	I <sub>D</sub> = –1.0A, V <sub>GS</sub> = –2.5V
Forward transfer admittance	Y <sub>fs</sub>   *	1.2	–	–	S	V <sub>DS</sub> = –10V, I <sub>D</sub> = –1.0A
Input capacitance	C <sub>iss</sub>	–	430	–	pF	V <sub>DS</sub> = –10V
Output capacitance	C <sub>oss</sub>	–	80	–	pF	V <sub>GS</sub> =0V
Reverse transfer capacitance	C <sub>rss</sub>	–	55	–	pF	f=1MHz
Turn-on delay time	t <sub>d (on)</sub> *	–	11	–	ns	I <sub>D</sub> = –1.0A
Rise time	t <sub>r</sub> *	–	13	–	ns	V <sub>DD</sub> = –15V
Turn-off delay time	t <sub>d (off)</sub> *	–	38	–	ns	V <sub>GS</sub> = –4.5V
Fall time	t <sub>f</sub> *	–	12	–	ns	R <sub>L</sub> =15Ω
Total gate charge	Q <sub>g</sub>	–	4.9	–	nC	R <sub>GS</sub> =10Ω
Gate-source charge	Q <sub>gs</sub>	–	1.2	–	nC	V <sub>DD</sub> = –15V
Gate-drain charge	Q <sub>gd</sub>	–	1.3	–	nC	V <sub>GS</sub> = –4.5V
						I <sub>D</sub> = –2.0A

\*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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### ●Electrical characteristic curves

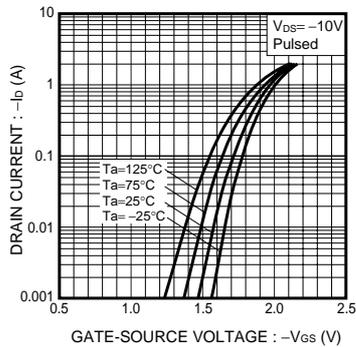


Fig.1 Typical Transfer Characteristics

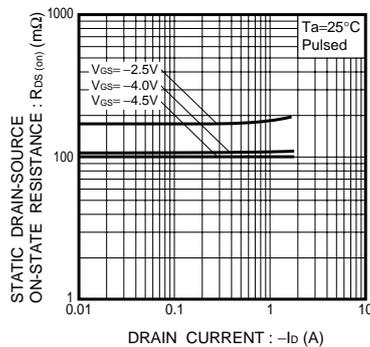


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

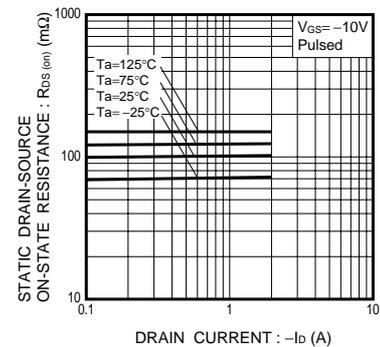


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

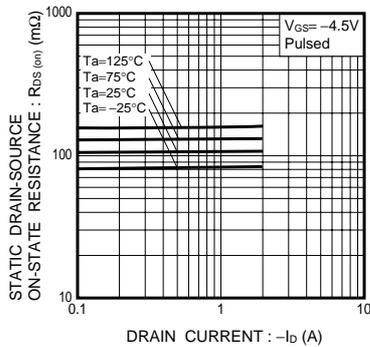


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

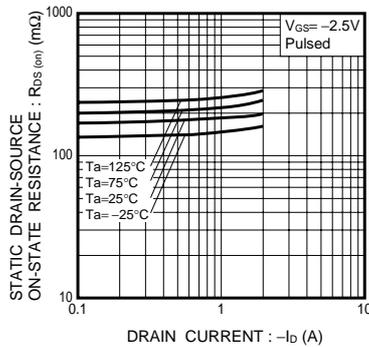


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

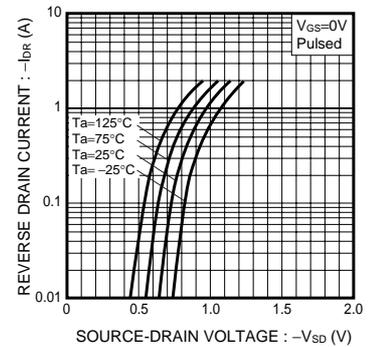


Fig.6 Reverse Drain Current vs. Source-Drain Voltage

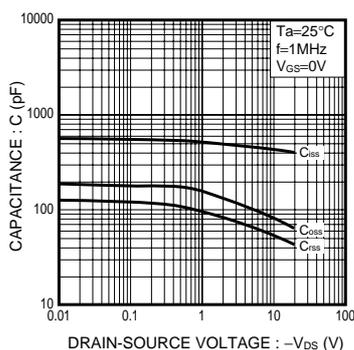


Fig.7 Typical Capacitance vs. Drain-Source Voltage

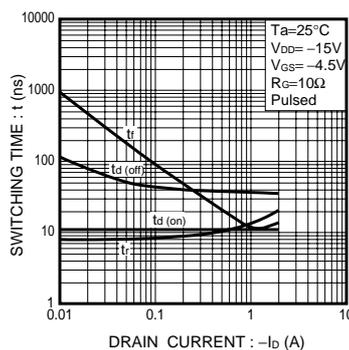


Fig.8 Switching Characteristics

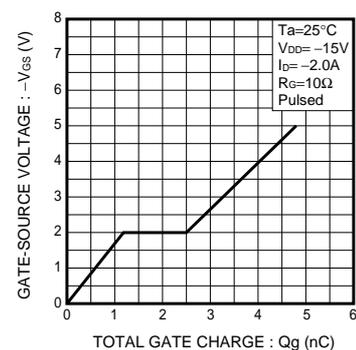


Fig.9 Dynamic Input Characteristics

Transistors

● Measurement circuits

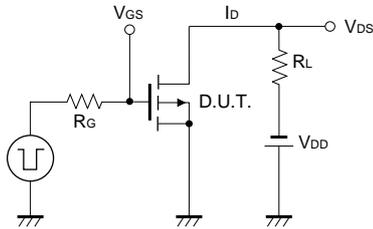


Fig.10 Switching Time Test Circuit

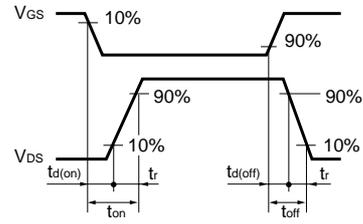


Fig.11 Switching Time Waveforms

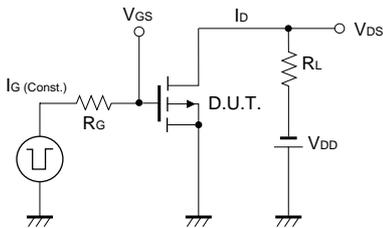


Fig.12 Gate Charge Test Circuit

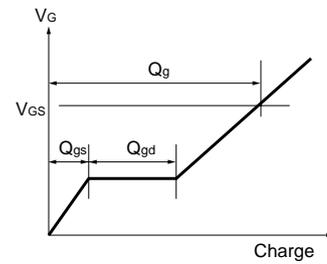


Fig.13 Gate Charge Waveform

## Appendix

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