



## Description

The NTR2101PT1G uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V.

This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS} = -20V, I_D = -5A$

$R_{DS(ON)} < 45m\Omega @ V_{GS}=4.5V$

## Application

High power and current handing capability

Lead free product is acquired

Surface mount package

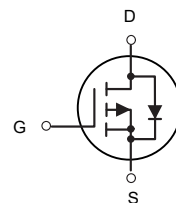
PWM applications

Load switch

Power management



SOT-23



P-Channel MOSFET

## Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
NTR2101PT1G	SOT-23	A5SHB XXXX	3000PCS

## Absolute Maximum Ratings ( $T_A=25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Limit	Unit
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current-Continuous	-5	A
$I_{DM}$	Drain Current-Pulsed (Note 1)	-14	A
$P_D$	Maximum Power Dissipation	1.31	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 150	$^{\circ}C$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2)	120	$^{\circ}C/W$



**Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V$ , $I_D=-250\mu A$	-20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=-1mA$	---	-0.014	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-4.5V$ , $I_D=-4.9A$	---	35	45	$m\Omega$
		$V_{GS}=-2.5V$ , $I_D=-3.4A$	---	45	60	
		$V_{GS}=-1.8V$ , $I_D=-2A$	---	65	85	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$ , $I_D=-250\mu A$	-0.4	---	-1.0	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3.95	---	$mV/^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-16V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$	---	---	-1	$\mu A$
		$V_{DS}=-16V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$	---	---	-5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 12V$ , $V_{DS}=0V$	---	---	$\pm 100$	nA
gfs	Forward Transconductance	$V_{DS}=-5V$ , $I_D=-3A$	---	12.8	---	S
$Q_g$	Total Gate Charge (-4.5V)	$V_{DS}=-15V$ , $V_{GS}=-4.5V$ , $I_D=-3A$	---	10.2	14.3	nC
$Q_{gs}$	Gate-Source Charge		---	1.89	2.6	
$Q_{gd}$	Gate-Drain Charge		---	3.1	4.3	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-10V$ , $V_{GS}=-4.5V$ , $R_G=3.3\Omega$ , $I_D=-3A$	---	5.6	11.2	ns
$T_r$	Rise Time		---	40.8	73	
$T_{d(off)}$	Turn-Off Delay Time		---	33.6	67	
$T_f$	Fall Time		---	18	36	
$C_{iss}$	Input Capacitance	$V_{DS}=-15V$ , $V_{GS}=0V$ , $f=1MHz$	---	857	1200	pF
$C_{oss}$	Output Capacitance		---	114	160	
$C_{rss}$	Reverse Transfer Capacitance		---	108	151	
$I_S$	Continuous Source Current <sup>1,4</sup>	$V_G=V_D=0V$ , Force Current	---	---	-4.9	A
$I_{SM}$	Pulsed Source Current <sup>2,4</sup>		---	---	-14	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^\circ\text{C}$	---	---	-1	V
$t_{rr}$	Reverse Recovery Time	$I_F=-3A$ , $di/dt=100A/\mu s$ ,	---	21.8	---	nS
$Q_{rr}$	Reverse Recovery Charge	$T_J=25^\circ\text{C}$	---	6.9	---	nC

Note :

1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.

2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$

3.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature

4.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.



## Typical Characteristics

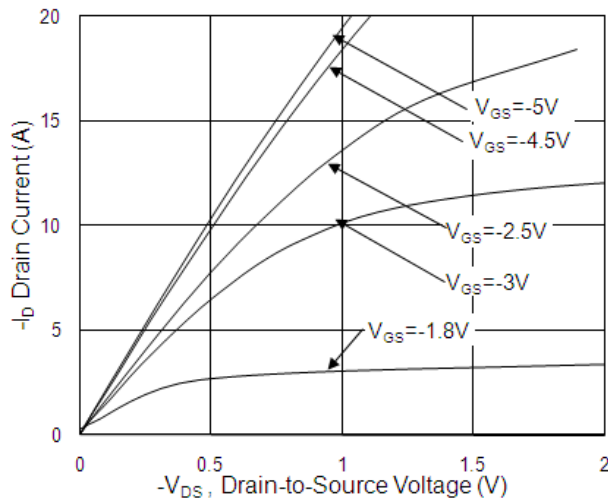


Fig.1 Typical Output Characteristics

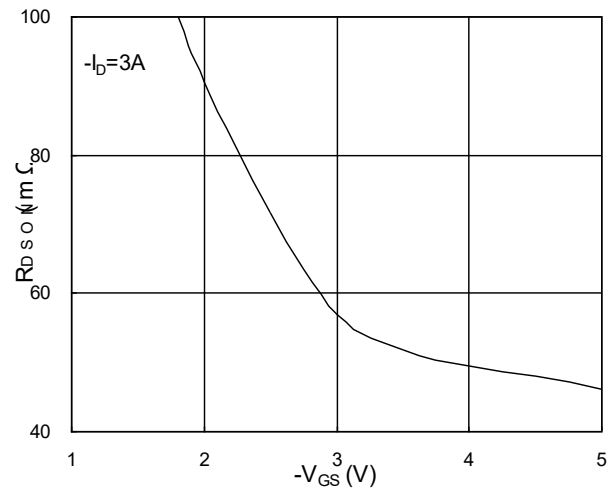


Fig.2 On-Resistance vs. G-S Voltage

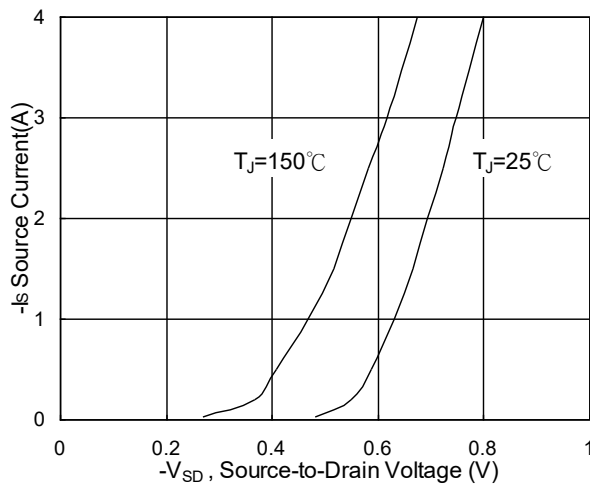


Fig.3 Forward Characteristics of Reverse

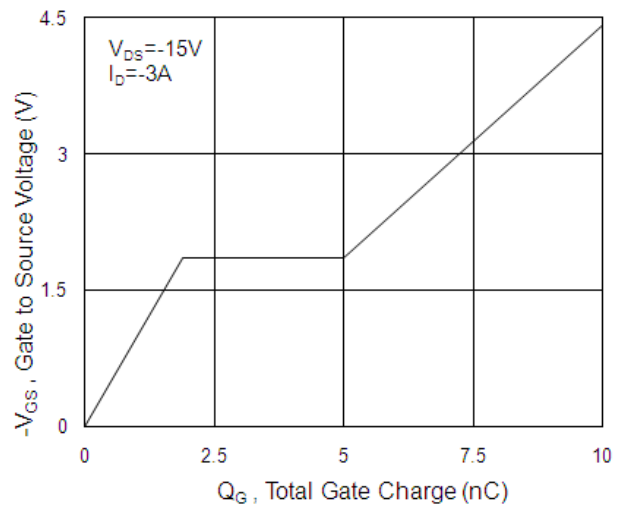


Fig.4 Gate-charge Characteristics

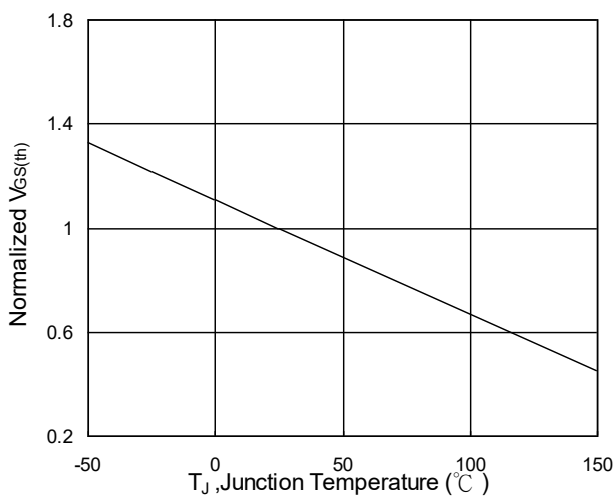


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

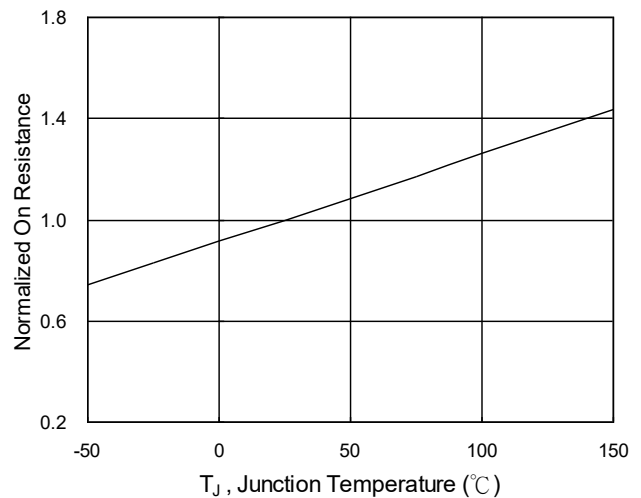


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

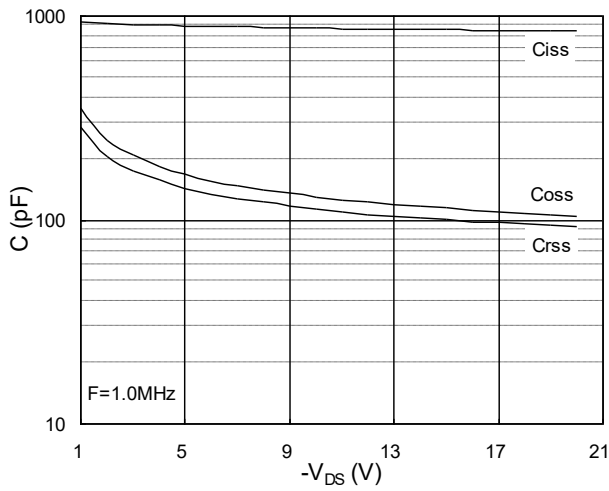


Fig.7 Capacitance

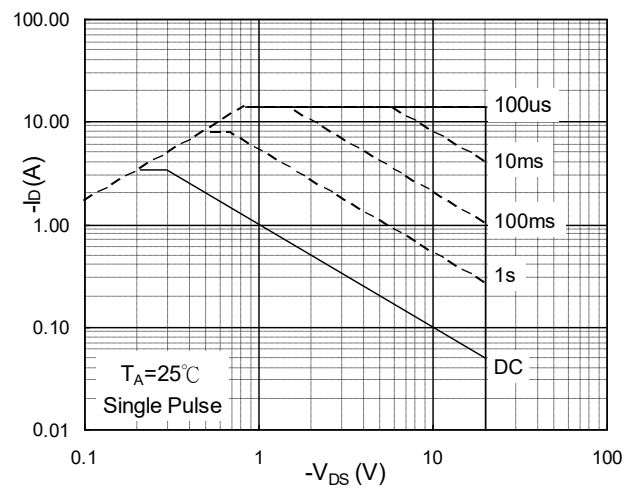


Fig.8 Safe Operating Area

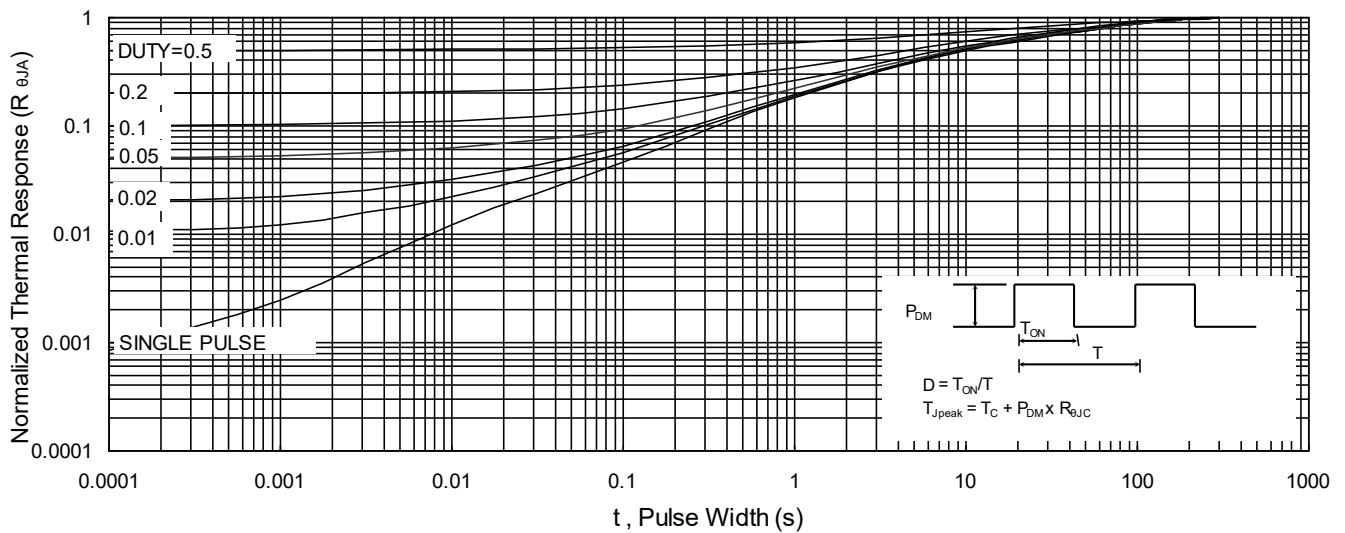


Fig.9 Normalized Maximum Transient Thermal Impedance

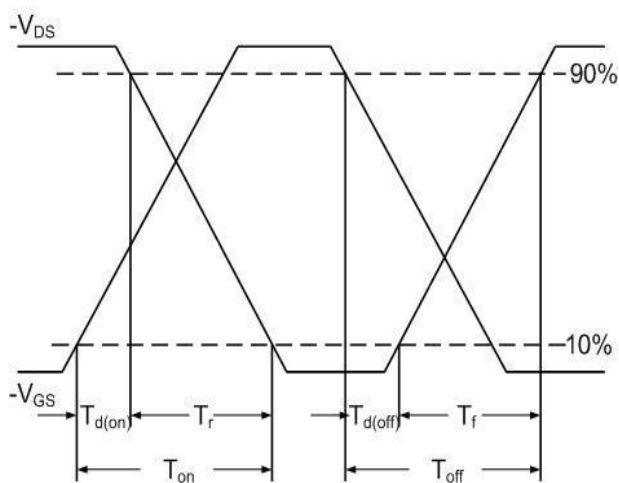


Fig.10 Switching Time Waveform

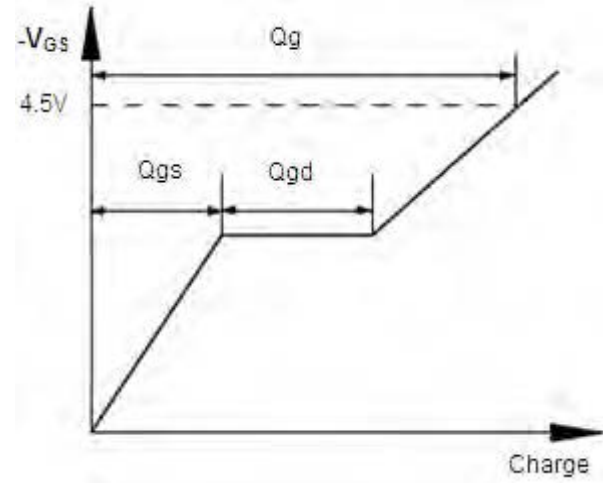
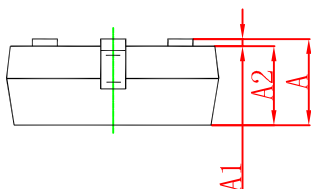
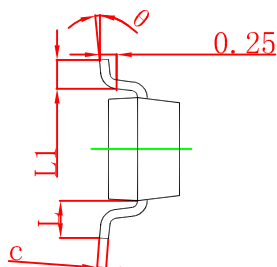
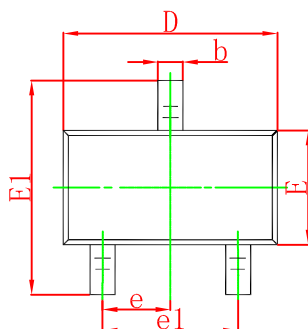


Fig.11 Gate Charge Waveform

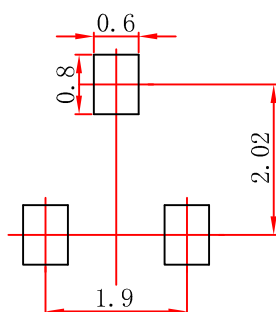


## SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

## SOT-23 Suggested Pad Layout



Note:  
1. Controlling dimension: in millimeters.  
2. General tolerance:  $\pm 0.05\text{mm}$ .  
3. The pad layout is for reference purposes only.



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