

12V P-Channel Enhancement Mode MOSFET

Description

The NP1205VR uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

General Features

- ◆ $V_{DS} = -12V$, $I_D = -5A$
 $R_{DS(ON)}(Typ.) = 30m\Omega$ @ $V_{GS} = -4.5V$
 $R_{DS(ON)}(Typ.) = 38m\Omega$ @ $V_{GS} = -2.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package

Application

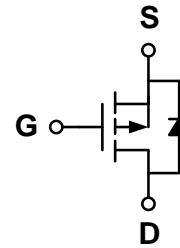
- ◆ PWM applications
- ◆ Load switch

Package

- ◆ SOT-23

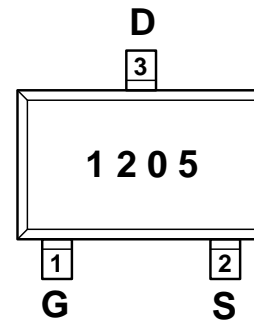


Schematic diagram



Marking and pin assignment

SOT-23
(TOP VIEW)



1205----NP1205

Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP1205VR-G	-55°C to +150°C	SOT-23	3000

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

parameter	symbol	limit	unit
Drain-source voltage	V_{DS}	-12	V
Gate-source voltage	V_{GS}	±12	V
Continuous Drain Current (TJ = 150 °C)	I_D	$T_C = 25^\circ C$	-5
		$T_C = 70^\circ C$	-4
		$T_A = 25^\circ C$	-1.6 ^{b,c}
		$T_A = 70^\circ C$	-1.3 ^{b,c}
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ C$	-2.1
		$T_A = 25^\circ C$	-1 ^{b,c}
Pulsed Drain Current (t = 300 μs)	I_{DM}	-20	A

Maximum power dissipation	$T_C=25^\circ\text{C}$	P_D	2.5	W
	$T_C=70^\circ\text{C}$		1.6	
	$T_A=25^\circ\text{C}$		1.25 ^{b,c}	
	$T_A=70^\circ\text{C}$		0.8 ^{b,c}	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55—150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	$R_{\theta JA}$	100	130	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	$R_{\theta JF}$	60	75	

Notes:

- a: $T_C = 25^\circ\text{C}$. b: Surface mounted on 1" x 1" FR4 board.
 c: $t = 5\text{ s}$. d: Maximum under steady state conditions is 175°C/W .

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu\text{A}$	-12	-16.5	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-12V, V_{GS}=0V$	-	-	-1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-0.4	-0.7	-1.2	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-5A$	-	30	45	m Ω
		$V_{GS}=-2.5V, I_D=-4A$	-	38	60	
Forward transconductance	g_{fs}	$V_{DS}=-10V, I_D=-5A$	8.5	-	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=-6V, V_{GS}=0V$ $f=1.0\text{MHz}$	-	1405	-	pF
Output capacitance	C_{OSS}		-	264	-	
Reverse transfer capacitance	C_{RSS}		-	237	-	
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=-6V$ $I_D=-5A$ $V_{GEN}=-4.5V$ $R_L=1.0\text{ohm}$ $R_{GEN}=1\text{ohm}$	-	12.5	-	ns
Rise time	t_r		-	35	-	
Turn-off delay time	$t_{D(OFF)}$		-	30	-	
Fall time	t_f		-	10	-	
Total gate charge	Q_g	$V_{DS}=-6V, I_D=-5A$ $V_{GS}=-4.5V$	-	15	-	nC
Gate-source charge	Q_{gs}		-	1.74	-	
Gate-drain charge	Q_{gd}		-	5.22	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V_{SD}	$V_{GS}=0V, I_S=-1.25A$	-	-0.81	-1.2	V

Typical Performance Characteristics

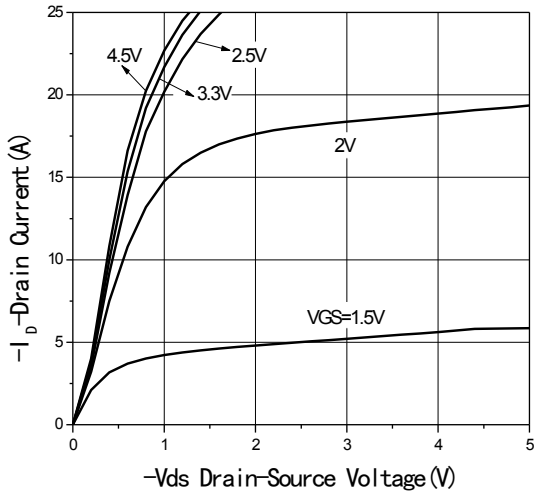


Fig1 Output Characteristics

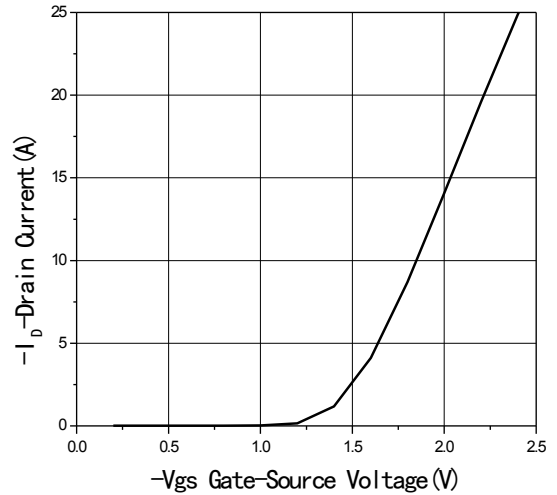


Fig2 Transfer Characteristics

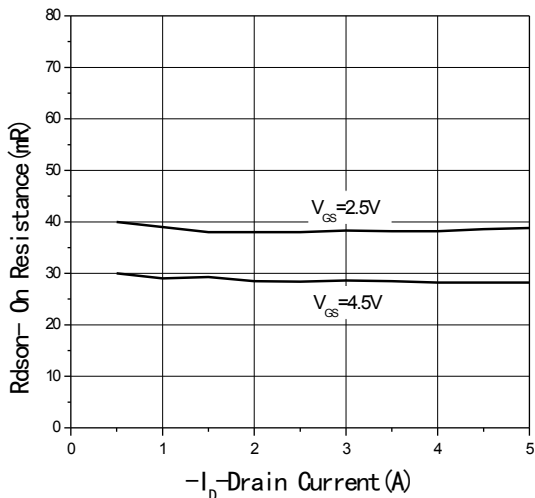


Fig3 R_{dson} -Drain current

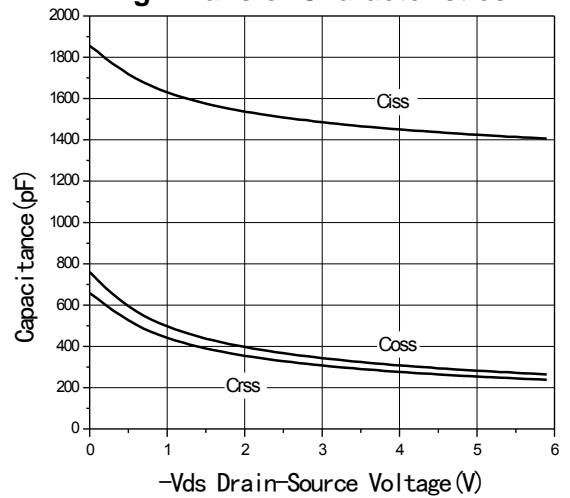


Fig4 Capacitance vs V_{DS}

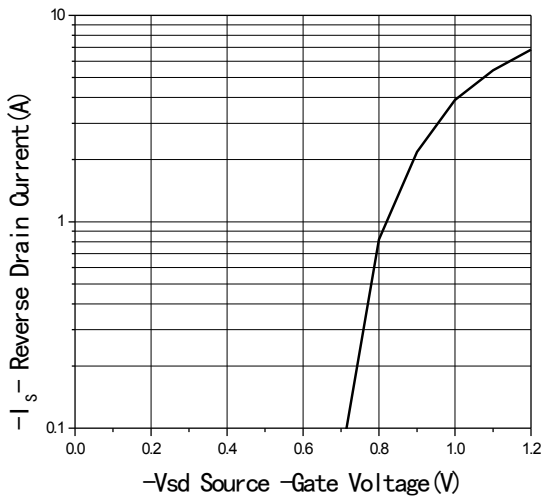


Fig5 Source-Drain Diode Forward

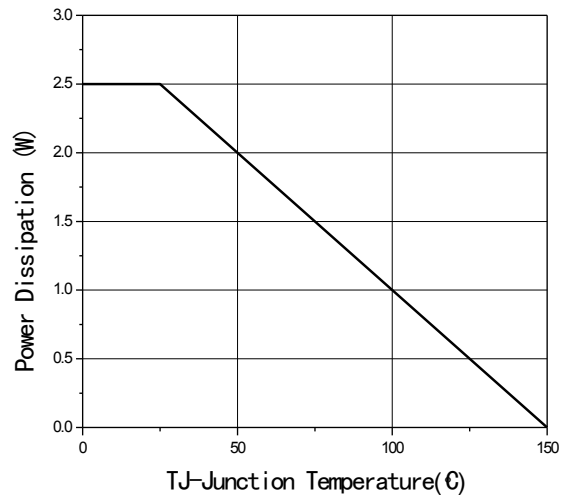


Fig6 Power De-rating

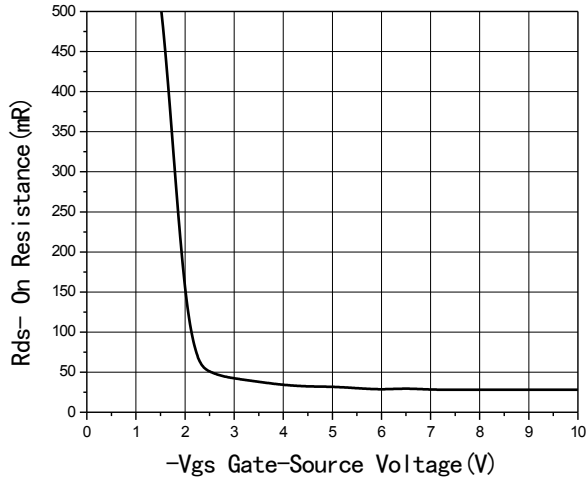


Fig7 Rdson-Gate Drain voltage

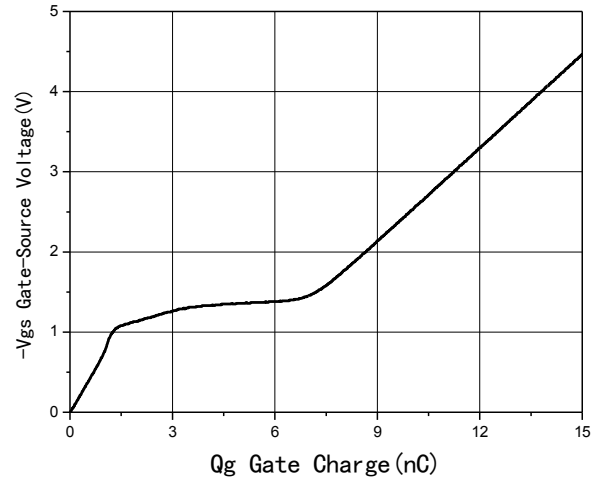
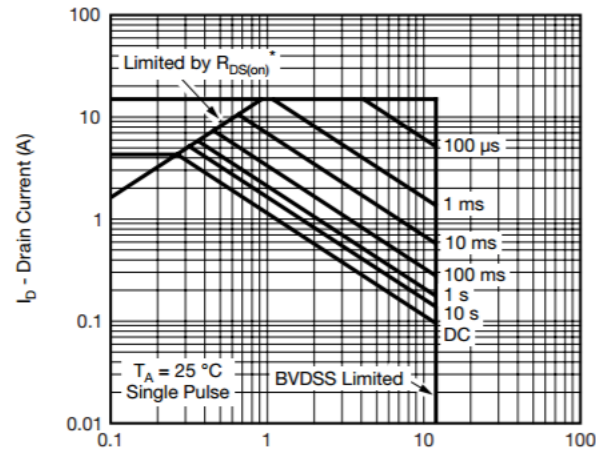
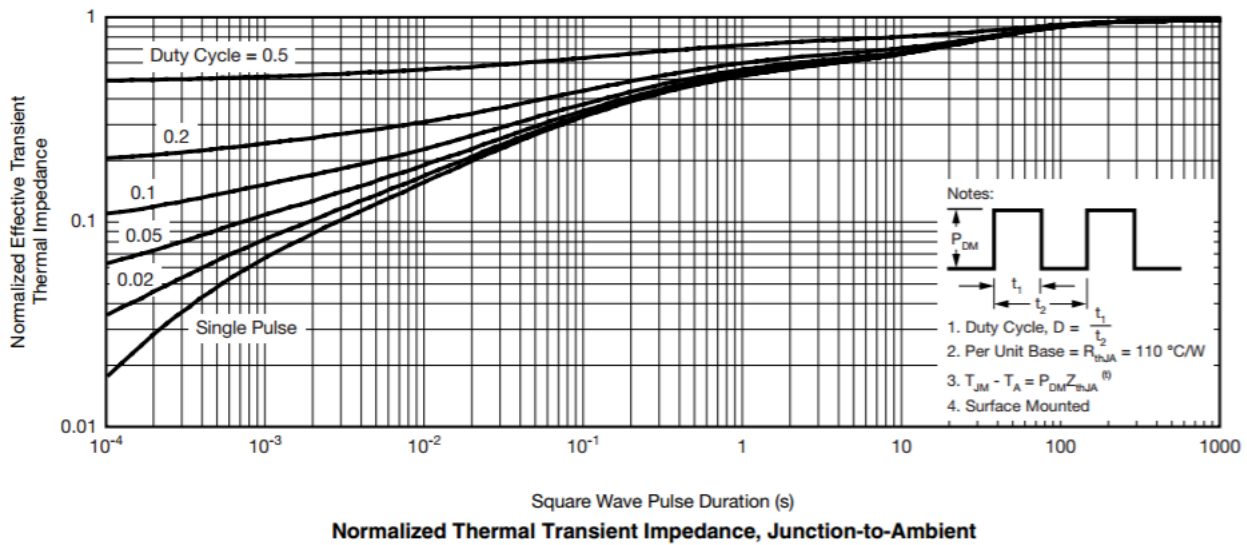
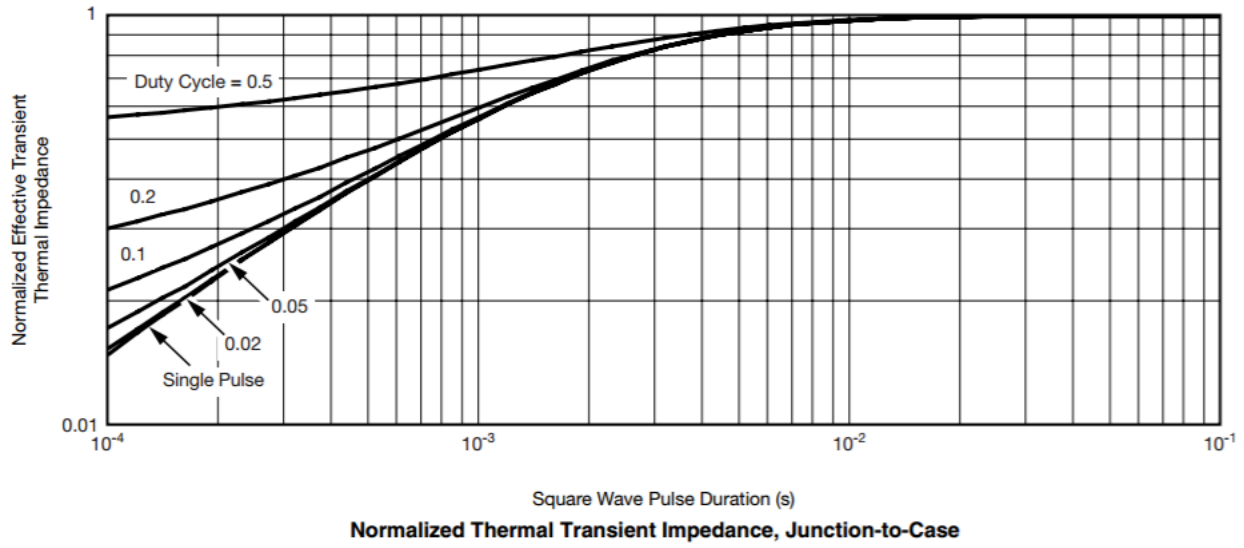


Fig8 Gate Charge



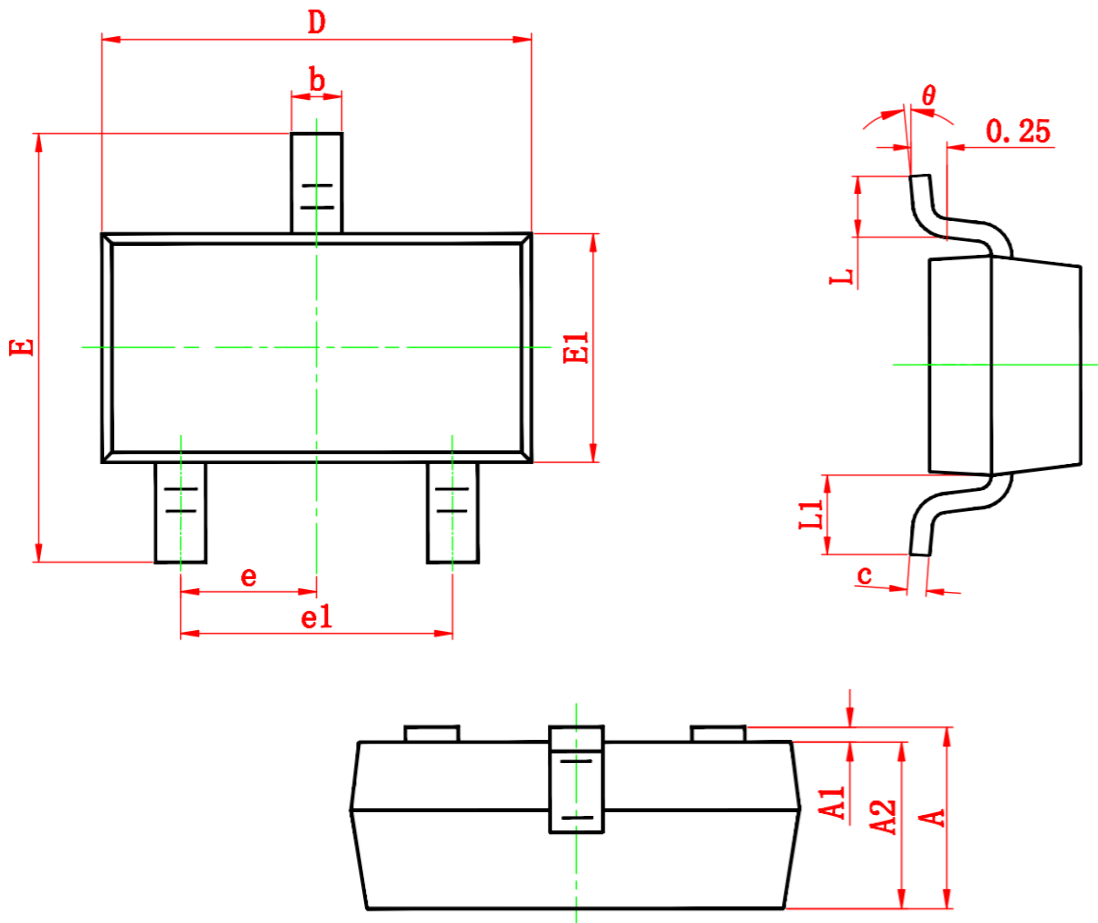
V_{DS} - Drain-to-Source Voltage (V)
 * $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient





Package Information

- SOT-23



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	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
L1	0.550 REF.		0.022 REF.	
θ	0°	8°	0°	8°