

## 30V P-Channel Enhancement Mode MOSFET

### Description

The NP3407MR 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 load switch or in PWM applications.

### General Features

- ◆  $V_{DS} = -30V$ ,  $I_D = -4A$   
 $R_{DS(ON)}(Typ.) = 47m\Omega$  @  $V_{GS} = -10V$   
 $R_{DS(ON)}(Typ.) = 60m\Omega$  @  $V_{GS} = -4.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package

### Application

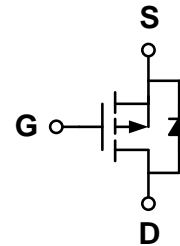
- ◆ PWM applications
- ◆ Load switch

### Package

- ◆ SOT-23-3L

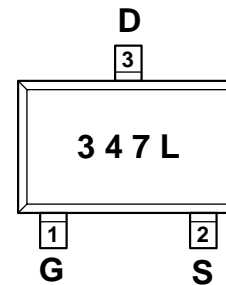


### Schematic diagram



### Marking and pin assignment

SOT-23-3L  
(TOP VIEW)



347—NP3407

L—Package Information

### Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP3407MR-G	-55°C to +150°C	SOT-23-3L	3000

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

parameter	symbol	limit	unit	
Drain-source voltage	$V_{DS}$	-30	V	
Gate-source voltage	$V_{GS}$	±20	V	
Continuous Drain Current	$I_D$	TC=25°C	-4	A
		TC=70°C	-3.0	
Pulsed Drain Current <sup>C</sup>	$I_{DP}$	-16	A	
power dissipation <sup>B</sup>	$P_D$	TC=25°C	1.4	W
		TC=70°C	0.9	
Junction and Storage Temperature Range	$T_J, T_{SGT}$	-55—150	°C	

**Electrical Characteristics** (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	$\mu A$
Gate-body leakage	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.9	-1.3	-2	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-4.2A$	-	47	60	m $\Omega$
		$V_{GS}=-4.5V, I_D=-3A$	-	60	85	
Forward transconductance	$G_{FS}$	$V_{DS}=-5V, I_D=-4.2A$	-	5	-	S
Dynamic Characteristics						
Input capacitance	$C_{ISS}$	$V_{DS}=-10V, V_{GS}=0V$ $f=1.0MHz$	-	600	-	pF
Output capacitance	$C_{OSS}$		-	85	-	
Reverse transfer capacitance	$C_{RSS}$		-	65	-	
Gate resistance	$R_g$	$V_{DS}=15mV, f=1.0MHz$		10		$\Omega$
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=-15V$ $I_D=-4.2A$ $V_{GEN}=-10V$ $R_L=10ohm$ $R_{GEN}=6ohm$	-	3.0	3.5	ns
Rise time	$t_r$		-	31	35	
Turn-off delay time	$t_{D(OFF)}$		-	33	40	
Fall time	$t_f$		-	8	12	
Total gate charge	$Q_g$	$V_{DS}=-15V, I_D=-4.2A$ $V_{GS}=-4.5V$	-	6.2	-	nC
Gate-source charge	$Q_{gs}$		-	1.7	-	
Gate-drain charge	$Q_{gd}$		-	2.5	-	
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F=-4.2A,$ $dI/dt=100A/ms$		24		nS
Body Diode Reverse Recovery Charge	$Q_{rr}$	$I_F=-4.2A,$ $dI/dt=100A/ms$		1.8		nC
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	$V_{SD}$	$V_{GS}=0V, I_S=-4.2A$	-	-0.81	-1.2	V

**Thermal Characteristics**

Parameter	Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	70	90	°C/W
Maximum Junction-to-Ambient <sup>A D</sup>		Steady-State	100	
Maximum Junction-to-Lead	$R_{\theta JL}$	62	80	

A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ C$ . The value in any given application depends on the user's specific board design.

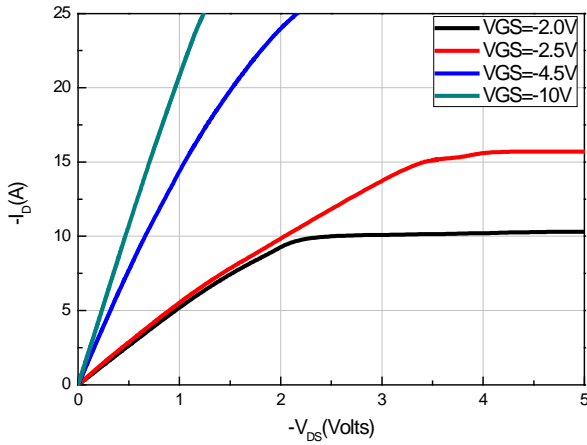
B. The power dissipation PD is based on  $T_{J(MAX)}=150^\circ C$ , using  $\leq 10s$  junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ C$ . Ratings are based on low frequency and duty

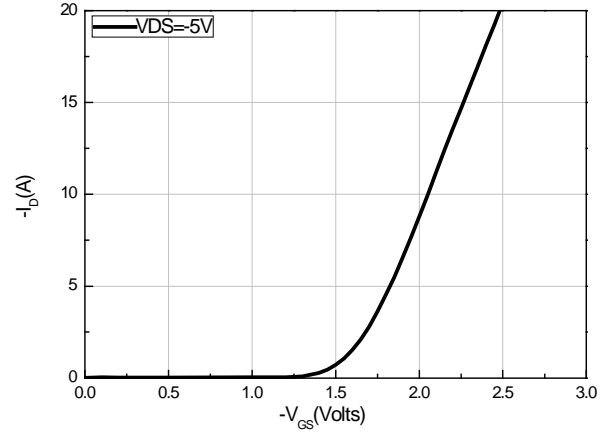
cycles to keep initial  $T_J=25^{\circ}\text{C}$ .

D. The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

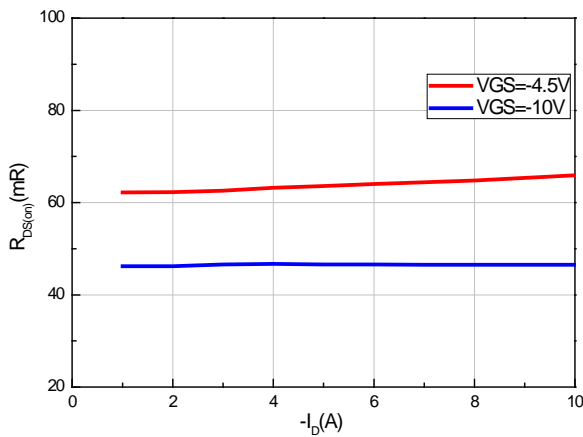
## Typical Performance Characteristics



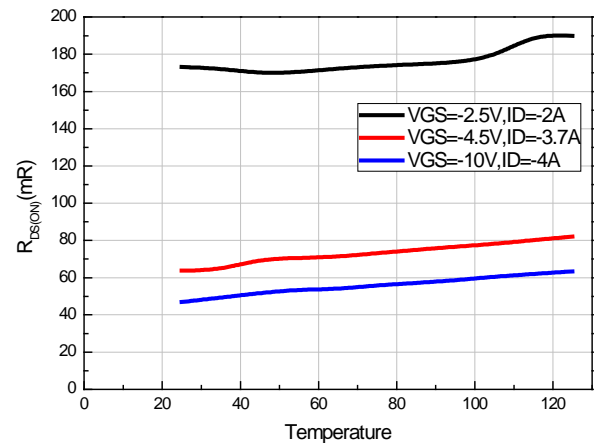
**Fig 1: On-Region Characteristics**



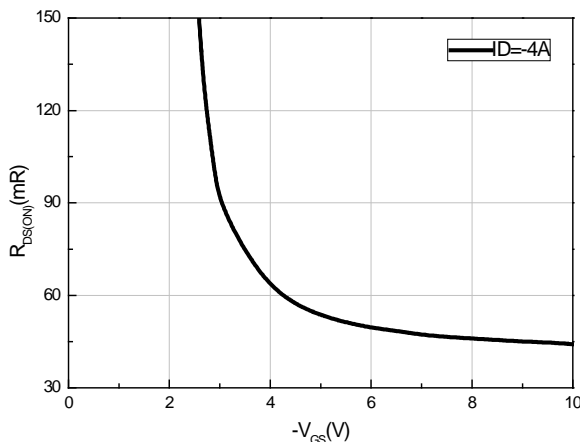
**Fig 2: Transfer Characteristics**



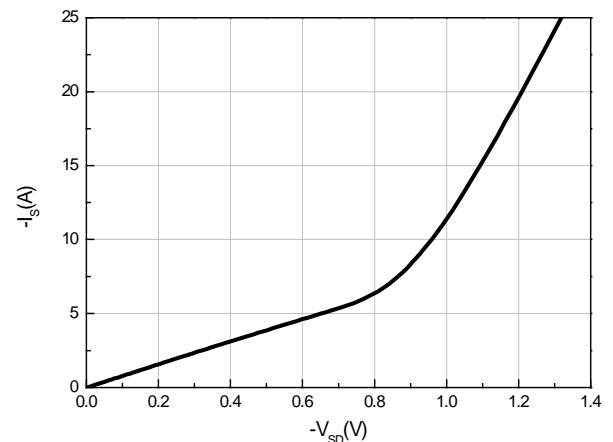
**Fig 3: On-Resistance vs. Drain Current and Gate Voltage**



**Fig 4: On-Resistance vs. Junction Temperature**



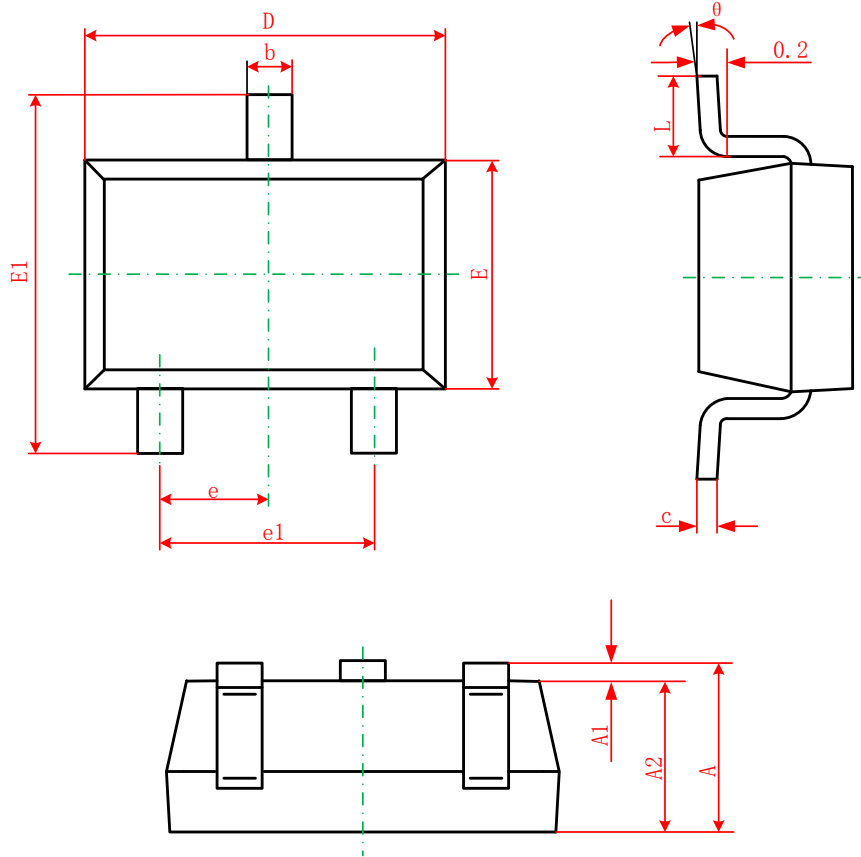
**Fig 5: On-Resistance vs. Gate-Source Voltage**



**Fig 6: Body-Diode Characteristics**

## Package Information

- SOT-23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°