



### Product Summary

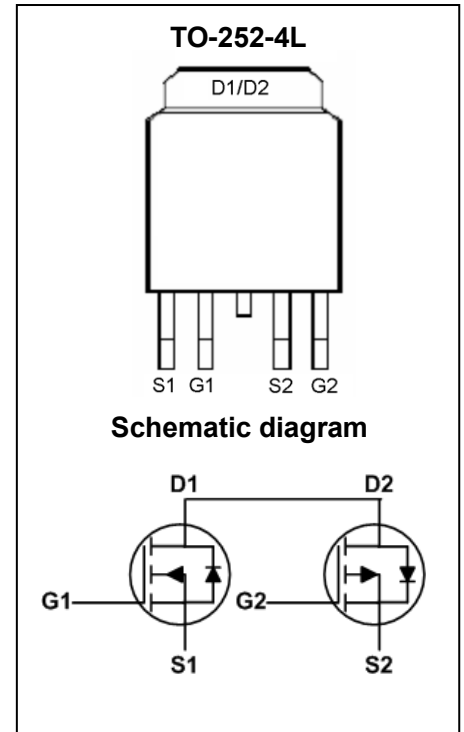
$V_{(BR)DSS}$	$R_{DS(on)TYP}$	$I_D$
40V	7mΩ@10V	50A
	9mΩ@4.5V	
-40V	11mΩ@-10V	-50A
	15mΩ@-4.5V	

### Feature

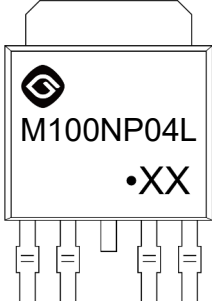
- Trench Technology Power MOSFET
- Low  $R_{DS(ON)}$
- Low Gate Charge
- Low Gate Resistance

### Application

- PWM Applications
- Loas Switch
- Power Management



### MARKING:



M100NP04L = Device Code  
XX = Data Code  
Solid Dot = Green Device Indicator

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	NMOS	PMOS	Unit
Drain - Source Voltage	$V_{DS}$	40	-40	V
Gate - Source Voltage	$V_{GS}$	±20	±20	V
Continuous Drain Current <sup>1</sup>	$I_D$	50	-50	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	200	-200	A
Single Pulsed Avalanche Current <sup>3,4</sup>	$I_{AS}$	24	-24	A
Single Pulsed Avalanche Energy <sup>3,4</sup>	$E_{AS}$	145	145	mJ
Power Dissipation <sup>6</sup>	$P_D$	41.5	41.5	W
Thermal Resistance from Junction to Ambient <sup>7</sup>	$R_{\theta JA}$	55	55	$^\circ\text{C}/\text{W}$
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3	3	$^\circ\text{C}/\text{W}$
Junction Temperature	$T_J$	150	150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55~ +150	-55~ +150	$^\circ\text{C}$

## MOSFET ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

### NMOS:

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Off Characteristics</b>						
Drain - Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	40			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40V, V_{GS} = 0V$			1	$\mu A$
Gate - Body Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 100$	nA
<b>On Characteristics<sup>3</sup></b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.0	1.7	3.0	V
Drain-source On-resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 5A$		7	11	m $\Omega$
		$V_{GS} = 4.5V, I_D = 3A$		9	16	
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 20V, V_{GS} = 0V, f = 1MHz$		2825		pF
Output Capacitance	$C_{oss}$			195		
Reverse Transfer Capacitance	$C_{rss}$			154		
Gate Resistance	$R_g$	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$		1.9		$\Omega$
<b>Switching Characteristics</b>						
Total Gate Charge	$Q_g$	$V_{DS} = 20V, V_{GS} = 10V, I_D = 5A$		50.9		nC
Gate-source Charge	$Q_{gs}$			7.4		
Gate-drain Charge	$Q_{gd}$			9.1		
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 20V, V_{GS} = 10V, R_G = 1.5\Omega, R_G = 3\Omega$		9		ns
Turn-on Rise Time	$t_r$			22		
Turn-off Delay Time	$t_{d(off)}$			45		
Turn-off Fall Time	$t_f$			22		
<b>Source - Drain Diode Characteristics</b>						
Diode Forward Voltage <sup>3</sup>	$V_{SD}$	$V_{GS} = 0V, I_S = 3A$			1.2	V

**PMOS:**

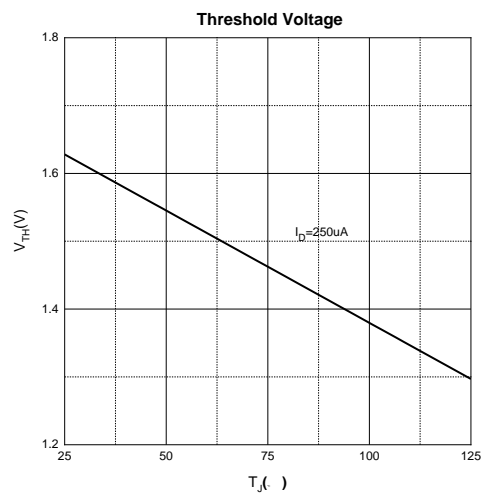
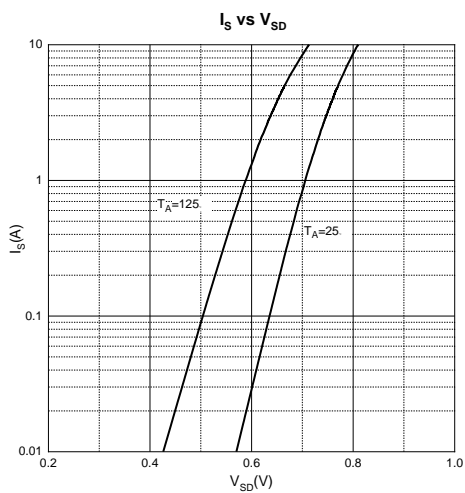
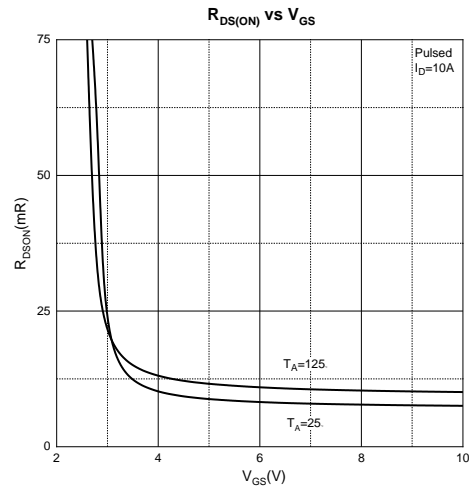
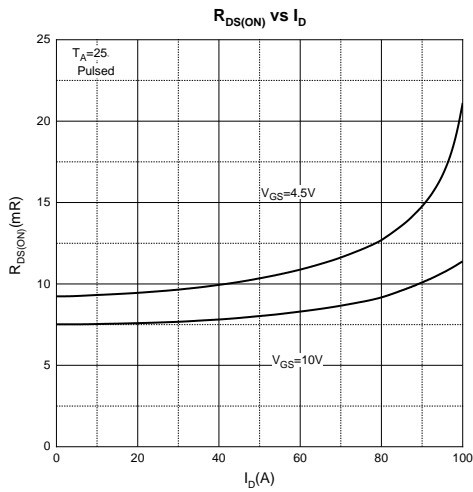
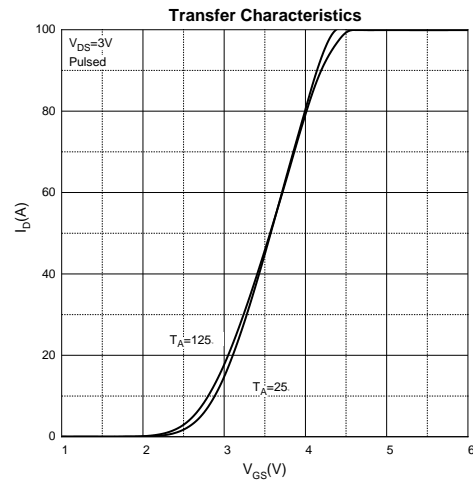
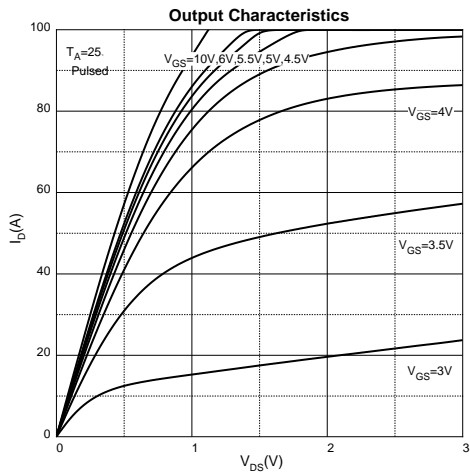
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Off Characteristics</b>						
Drain - Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-40			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -40V, V_{GS} = 0V$			-1	$\mu A$
Gate - Body Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 100$	nA
<b>On Characteristics<sup>3</sup></b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1.0	-1.6	-2.5	V
Drain-source On-resistance	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -5A$		11	15	m $\Omega$
		$V_{GS} = -4.5V, I_D = -4A$		15	21	
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -20V, V_{GS} = 0V, f = 1MHz$		2629		pF
Output Capacitance	$C_{oss}$			259		
Reverse Transfer Capacitance	$C_{rss}$			222		
Gate Resistance	$R_g$	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$		10		$\Omega$
<b>Switching Characteristics</b>						
Total Gate Charge	$Q_g$	$V_{DS} = -20V, V_{GS} = -10V, I_D = -5A$		51.2		pC
Gate-source Charge	$Q_{gs}$			6.5		
Gate-drain Charge	$Q_{gd}$			10.5		
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = -15V, V_{GS} = -10V,$ $R_G = 1.5\Omega, R_G = 3\Omega$		15		ns
Turn-on Rise Time	$t_r$			21		
Turn-off Delay Time	$t_{d(off)}$			33		
Turn-off Fall Time	$t_f$			21		
<b>Source - Drain Diode Characteristics</b>						
Diode Forward Voltage <sup>3</sup>	$V_{SD}$	$V_{GS} = 0V, I_S = -4A$			-1.2	V

**Notes :**

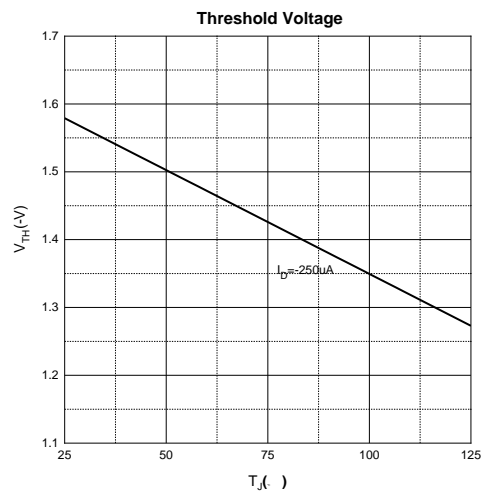
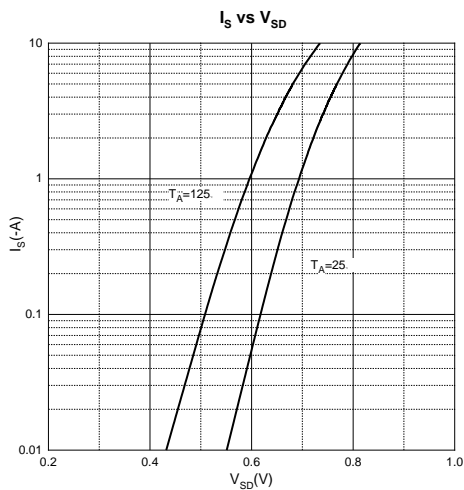
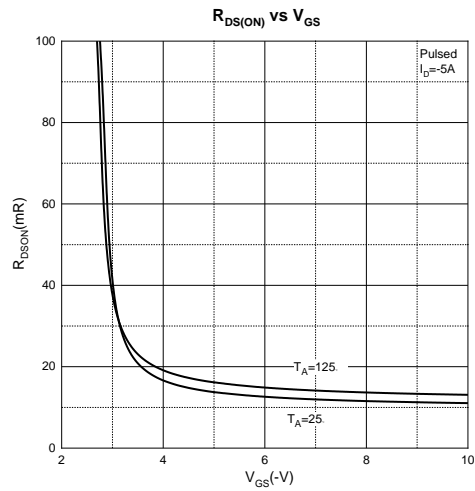
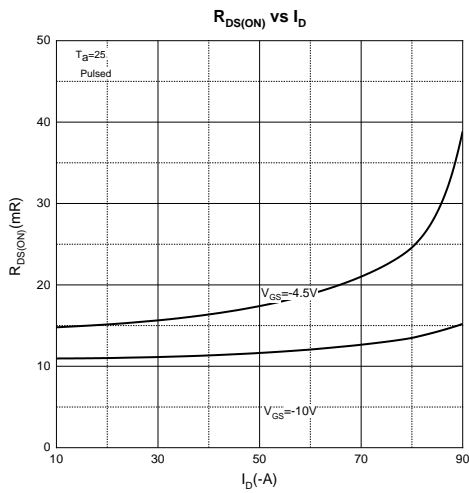
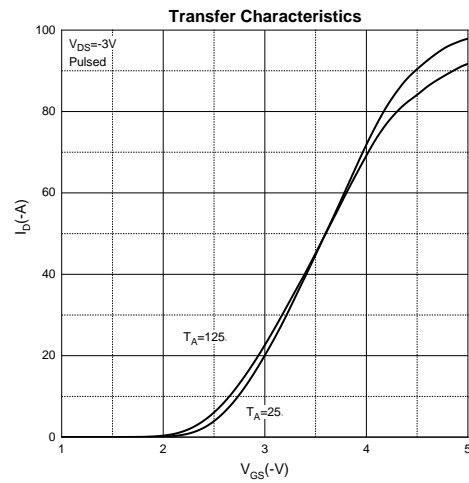
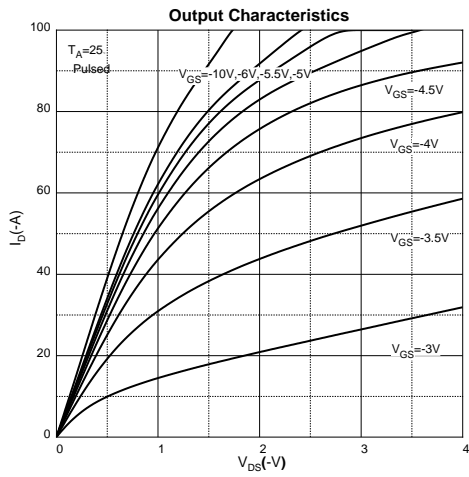
- The maximum current rating is limited by package. And device mounted on a large heatsink
- Pulse Test : Pulse Width  $\leq 10\mu s$ , duty cycle  $\leq 1\%$ .
- $E_{AS}$  condition:  $V_{DD} = 20V, V_{GS} = 10V, L = 0.5mH, R_G = 25\Omega$  Starting  $T_J = 25^\circ C$ .
- $E_{AS}$  condition:  $V_{DD} = -20V, V_{GS} = -10V, L = 0.5mH, R_G = 25\Omega$  Starting  $T_J = 25^\circ C$ .
- Pulse Test : Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- The power dissipation  $P_D$  is limited by  $T_{J(MAX)} = 150^\circ C$ . And device mounted on a large heatsink
- Device mounted on  $1in^2$  FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ C$ .

## Typical Characteristics

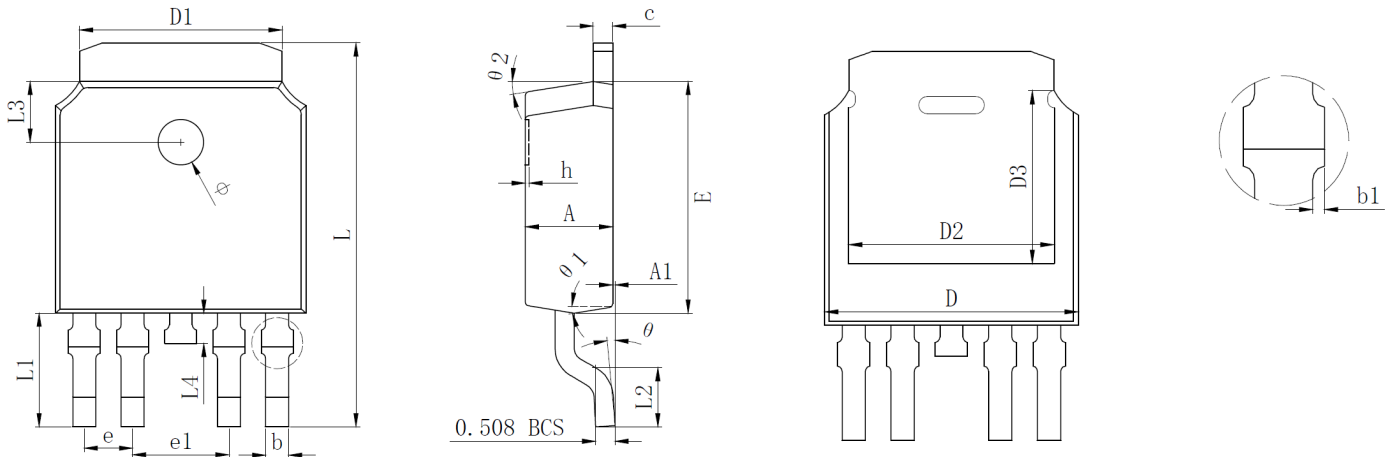
### NMOS:



## PMOS:



## TO-252-4L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.550	0.650	0.022	0.026
b1	0.000	0.120	0.000	0.005
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.334REF		0.210REF	
D2	5.346REF		0.210REF	
D3	4.490REF		0.177REF	
E	6.000	6.200	0.236	0.244
e	1.270TYP		0.050TYP	
e1	2.540TYP		0.100TYP	
h	0.000	0.200	0.000	0.008
L	9.900	10.300	0.390	0.406
L1	2.988REF		0.118REF	
L2	1.400	1.700	0.055	0.067
L3	1.600REF		0.063REF	
L4	0.700	0.900	0.028	0.035
$\phi$	1.100	1.300	0.043	0.051
$\theta$	0°	8°	0°	8°
$\theta_1$	9°TYP		9°TYP	
$\theta_2$	9°TYP		9°TYP	