

## 40V N-Channel Enhancement Mode Power MOSFET

### Description

WMQ50N04T1 uses advanced power trench technology that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Features

- $V_{DS} = 40V$ ,  $I_D = 50A$
- $R_{DS(on)} < 7.5m\Omega @ V_{GS} = 10V$   
 $R_{DS(on)} < 14m\Omega @ V_{GS} = 4.5V$
- Green Device Available
- Low Gate Charge
- Low  $R_{DS(ON)}$
- 100% EAS Guaranteed
- Lead Free Product is Acquired

### Applications

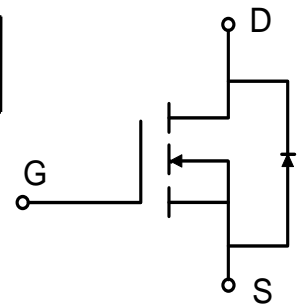
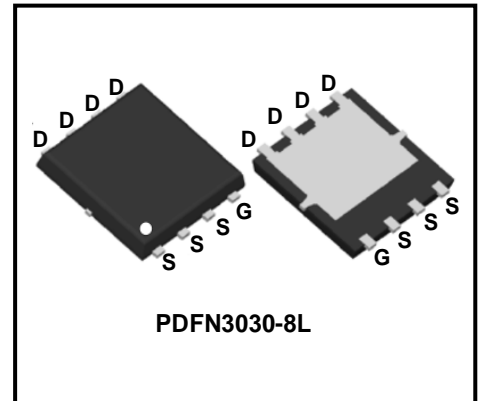
- Load Switch
- PWM Application
- Power Management

### Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Drain-Source Voltage		$V_{DS}$	40	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	V
Continuous Drain Current@10V <sup>1</sup>	$T_C = 25^\circ C$	$I_D$	50	A
	$T_C = 100^\circ C$		28	
Pulsed Drain Current <sup>2</sup>		$I_{DM}$	180	A
Single Pulse Avalanche Energy <sup>3</sup>		<b>EAS</b>	100	mJ
Avalanche Current		$I_{AS}$	20	A
Total Power Dissipation <sup>4</sup>	$T_C = 25^\circ C$	<b>P<sub>D</sub></b>	22.7	W
Operating Junction and Storage Temperature Range		<b>T<sub>J</sub>, T<sub>STG</sub></b>	-55 to 150	$^\circ C$

### Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Case <sup>1</sup>	$R_{\theta JC}$	5.5	$^\circ C/W$



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

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	40	-	-	V
Gate-Body Leakage Current	$I_{GSS}$	$V_{DS} = 0V, V_{GS} = \pm 20V$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$T_J = 25^\circ\text{C}$ $V_{DS} = 40V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.1	1.7	2.4	V
Drain-Source On-Resistance <sup>2</sup>	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 30A$	-	5.6	7.5	m $\Omega$
		$V_{GS} = 4.5V, I_D = 20A$	-	9.8	14	
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 20V, V_{GS} = 0V, f = 1\text{MHz}$	-	2365	-	pF
Output Capacitance	$C_{oss}$		-	185	-	
Reverse Transfer Capacitance	$C_{rss}$		-	153	-	
<b>Switching Characteristics</b>						
Gate Resistance	$R_g$	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$	-	1.65	-	$\Omega$
Total Gate Charge	$Q_g$	$V_{GS} = 10V, V_{DS} = 20V, I_D = 30A$	-	36	-	nC
Gate-Source Charge	$Q_{gs}$		-	5.8	-	
Gate-Drain Charge	$Q_{gd}$		-	6.6	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10V, V_{DD} = 20V, R_G = 3\Omega, R_L = 1\Omega, I_D = 20A$	-	11.5	-	nS
Rise Time	$t_r$		-	11.5	-	
Turn-Off Delay Time	$t_{d(off)}$		-	37	-	
Fall Time	$t_f$		-	8.7	-	
<b>Drain-Source Body Diode Characteristics</b>						
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$I_S = 1A, V_{GS} = 0V$	-	-	1.0	V
Continuous Source Current <sup>1,5</sup>	$I_S$	$V_G = V_D = 0V$ , Force Current	-	-	50	A
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 20A, di/dt = 100A/\mu s$	-	21	-	nS
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	10.5	-	nC

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD} = 20V, V_{GS} = 10V, L = 0.5mH, I_{AS} = 20A$
- 4.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.

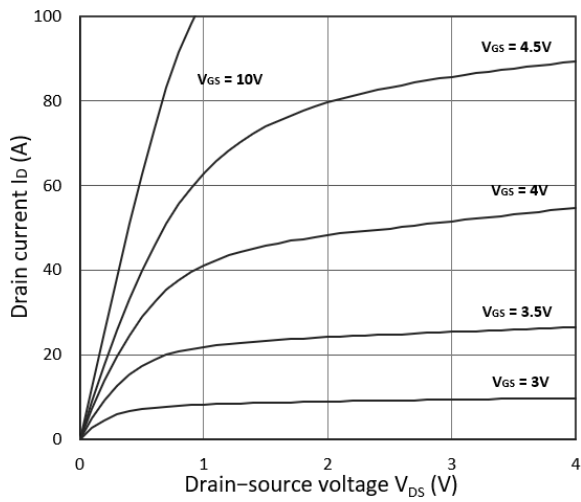


Figure 1. Output Characteristics

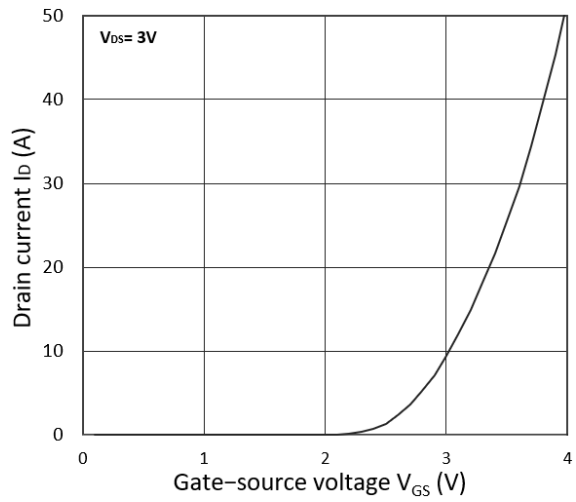


Figure 2. Transfer Characteristics

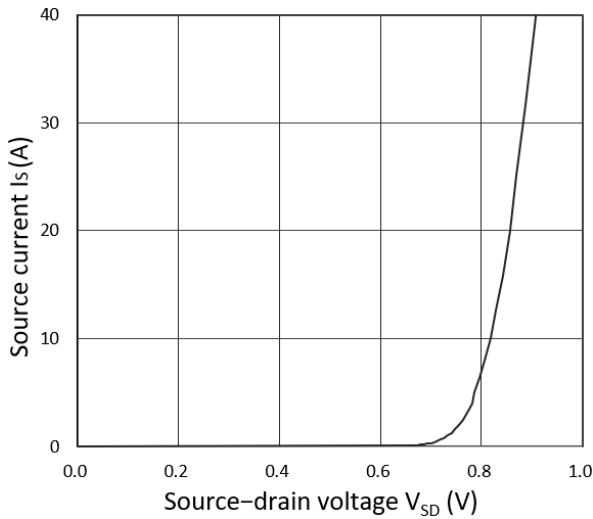


Figure 3. Forward Characteristics of Reverse

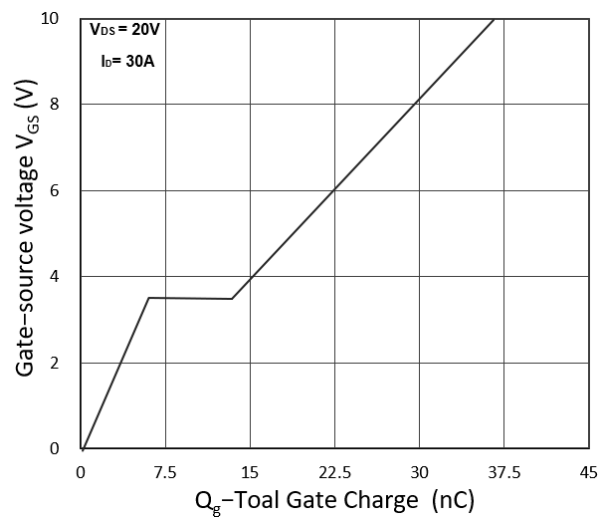


Figure 4. Gate Charge Characteristics

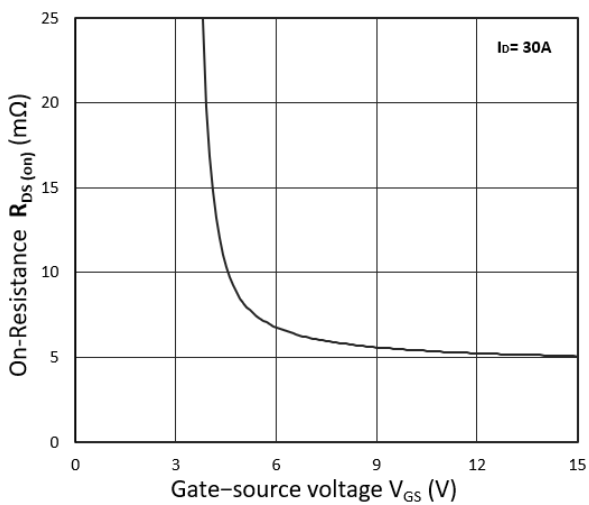


Figure 5.  $R_{DS(on)}$  vs.  $V_{GS}$

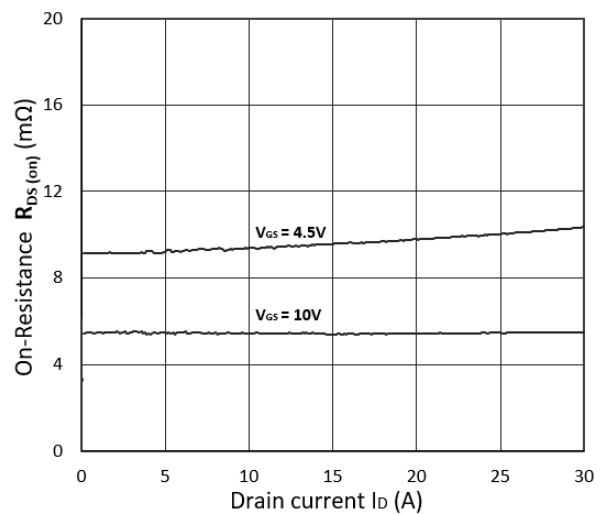


Figure 6.  $R_{DS(on)}$  vs.  $I_D$

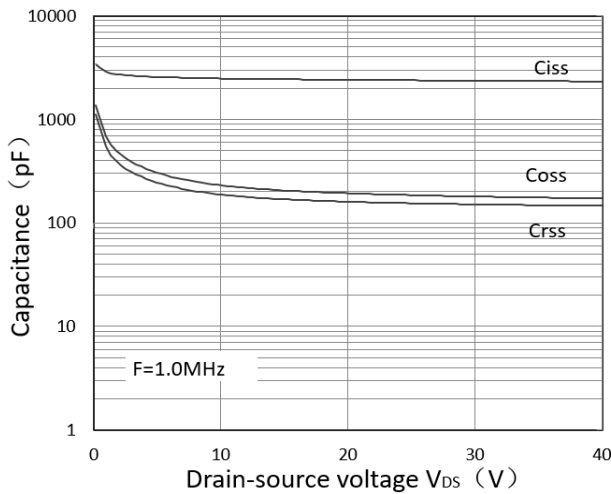


Figure 7. Capacitance Characteristics

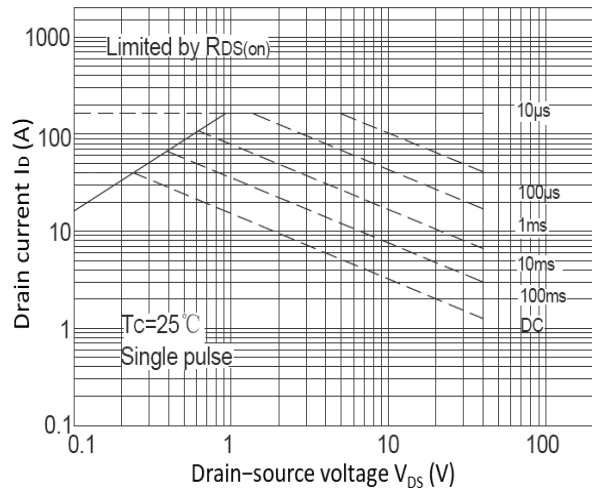


Figure 8. Safe Operating Area

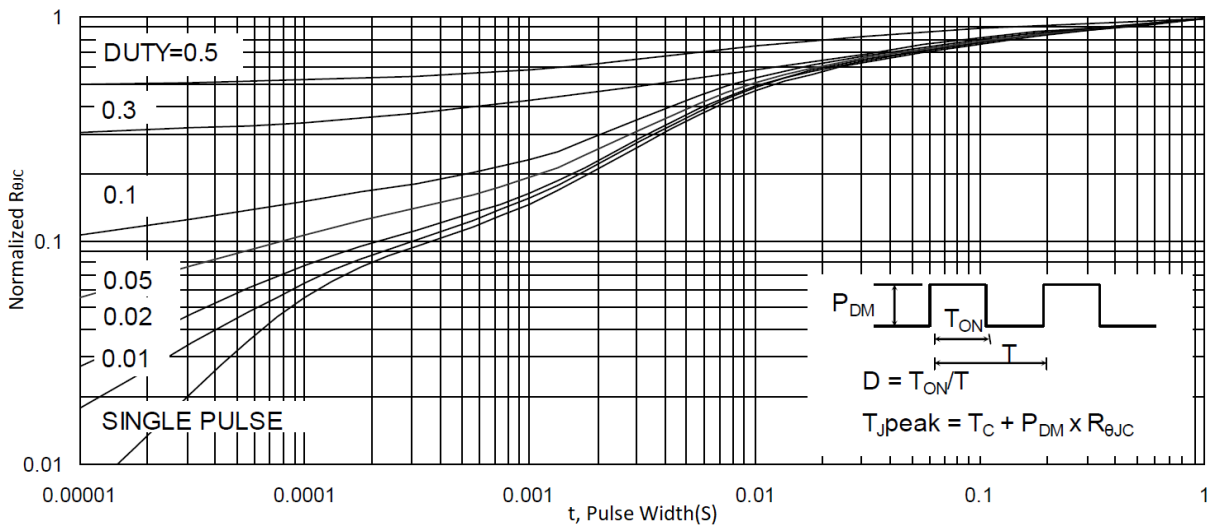


Figure 9. Normalized Maximum Transient Thermal Impedance

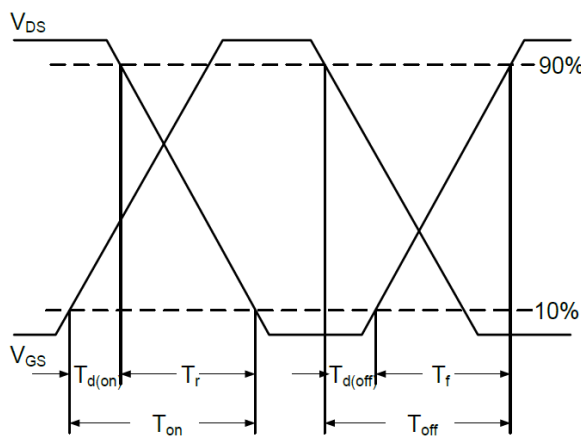


Figure 10. Switching Time Waveform

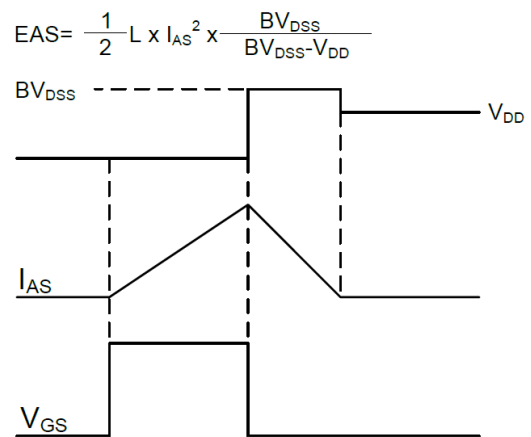
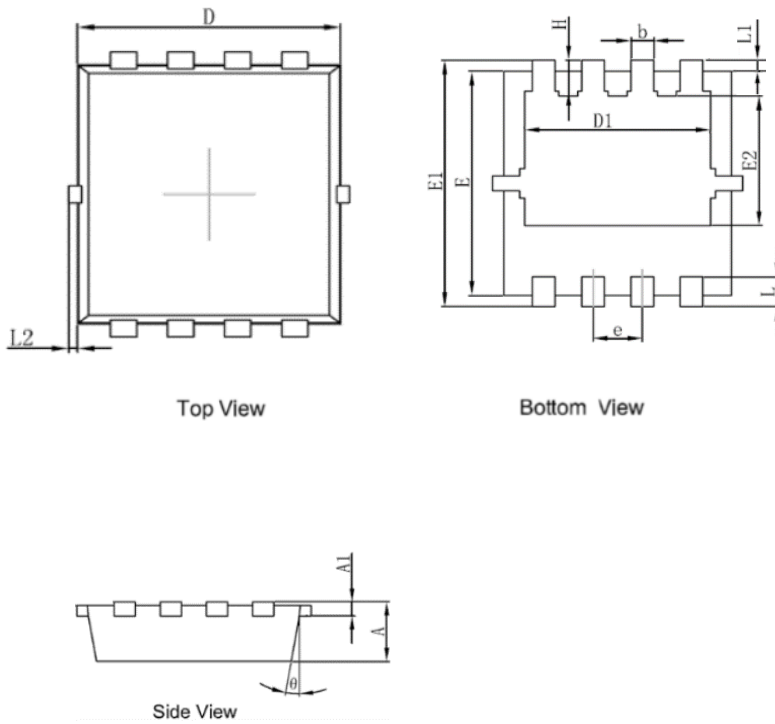


Figure 11. Unclamped Inductive Switching Waveform

Mechanical Dimensions for PDFN3030-8L



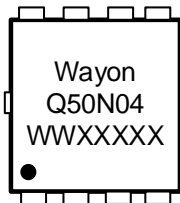
COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	0.70	0.85
A1	0.10	0.25
D	2.90	3.25
D1	2.25	2.65
E	2.90	3.20
E1	3.10	3.45
E2	1.54	1.98
b	0.20	0.40
e	0.60	0.70
L	0.30	0.50
L1	0.13BSC	
L2	0.00	0.15
H	0.20	0.65
$\theta$	0°	14°

## Ordering Information

Part	Package	Marking	Packing method
WMQ50N04T1	PDFN3030-8L	Q50N04	Tape and Reel

## Marking Information



Q50N04 = Device code  
 WWXXXXX= Date code

## Contact Information

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