

## 40V N-Channel Enhancement Mode Power MOSFET

### Description

WMB70N04T1 uses advanced power trench technology that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Features

- $V_{DS} = 40V$ ,  $I_D = 70A$   
 $R_{DS(on)} < 6.5m\Omega @ V_{GS} = 10V$   
 $R_{DS(on)} < 8.5m\Omega @ V_{GS} = 4.5V$
- Green Device Available
- 100% EAS Guaranteed
- Low Gate Charge

### Applications

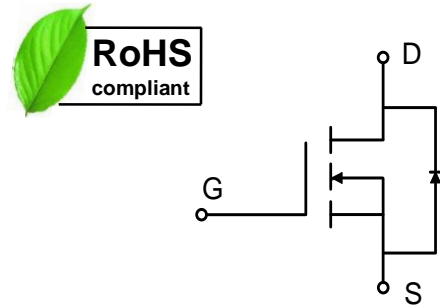
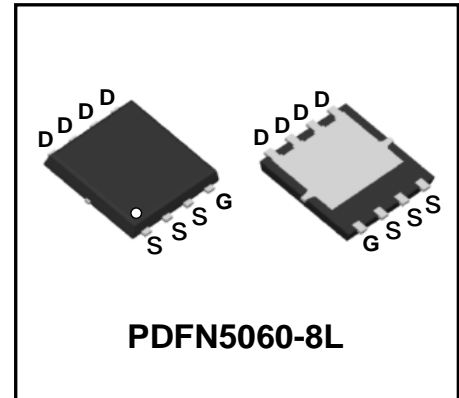
- Battery Management
- Motor Control and Drive
- UPS

### 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 <sup>1</sup>	$T_C=25^\circ C$	$I_D$	70	A
	$T_C=100^\circ C$		56	
Pulsed Drain Current <sup>2</sup>		$I_{DM}$	146	A
Single Pulse Avalanche Energy <sup>3</sup>		<b>EAS</b>	88.2	mJ
Avalanche Current		$I_{AS}$	42	A
Total Power Dissipation <sup>4</sup>	$T_C=25^\circ C$	$P_D$	51	W
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55 to 150	$^\circ C$

### Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Ambient <sup>1</sup>	$R_{\theta JA}$	61	$^\circ C/W$
Thermal Resistance from Junction-to-Case <sup>1</sup>	$R_{\theta JC}$	2.5	$^\circ C/W$



**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	$T_J=25^\circ\text{C}$	$V_{DS} = 32V, V_{GS} = 0V$	-	-	1	$\mu A$
	$T_J=55^\circ\text{C}$		-	-	5	
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.0	1.5	2.5	V
Drain-Source On-Resistance <sup>2</sup>	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 10A$	-	4.7	6.5	m $\Omega$
		$V_{GS} = 4.5V, I_D = 5A$	-	6.2	8.5	
Forward Transconductance <sup>2</sup>	$g_{fs}$	$V_{DS} = 10V, I_D = 5A$	-	26	-	S
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 20V, V_{GS} = 0V, f = 1\text{MHz}$	-	3260	-	pF
Output Capacitance	$C_{oss}$		-	245	-	
Reverse Transfer Capacitance	$C_{rss}$		-	185	-	
<b>Switching Characteristics</b>						
Gate Resistance	$R_g$	$V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$	-	0.65	-	$\Omega$
Total Gate Charge	$Q_g$	$V_{GS} = 4.5V, V_{DS} = 20V, I_D = 10A$	-	21	-	nC
Gate-Source Charge	$Q_{gs}$		-	5.7	-	
Gate-Drain Charge	$Q_{gd}$		-	9.6	-	
Turn-On Delay Time	$t_{d(on)}$		-	15	-	
Rise Time	$t_r$	$V_{GS} = 10V, V_{DD} = 15V,$ $R_G = 3.3\Omega, I_D = 1A$	-	8.7	-	
Turn-Off Delay Time	$t_{d(off)}$		-	73	-	
Fall Time	$t_f$		-	7.2	-	
<b>Drain-Source Body Diode Characteristics</b>						
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$I_S = 1A, V_{GS} = 0V$	-	-	1	V
Continuous Source Current <sup>1,5</sup>	$I_S$	$V_G = V_D = 0V$ , Force Current	-	-	70	A

## Notes:

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- The EAS data shows Max. rating. The test condition is  $V_{DD} = 25V, V_{GS} = 10V, L = 0.1\text{mH}, I_{AS} = 42A$
- The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

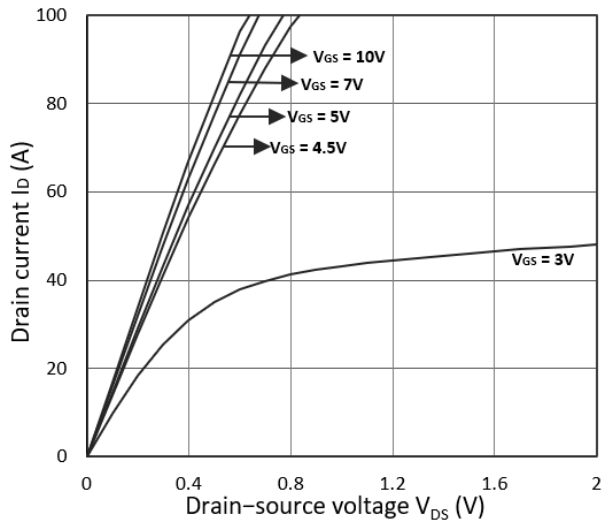


Figure 1. Output Characteristics

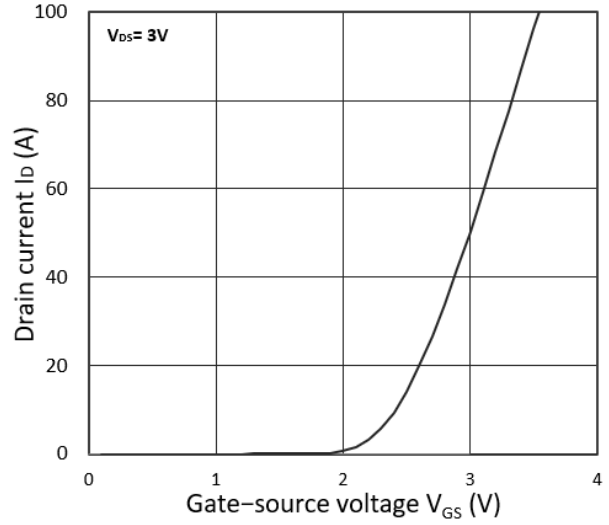


Figure 2. Transfer Characteristics

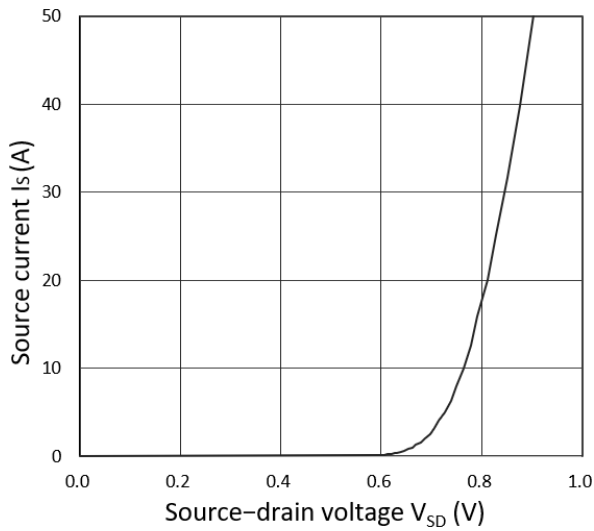


Figure 3. Forward Characteristics of Reverse

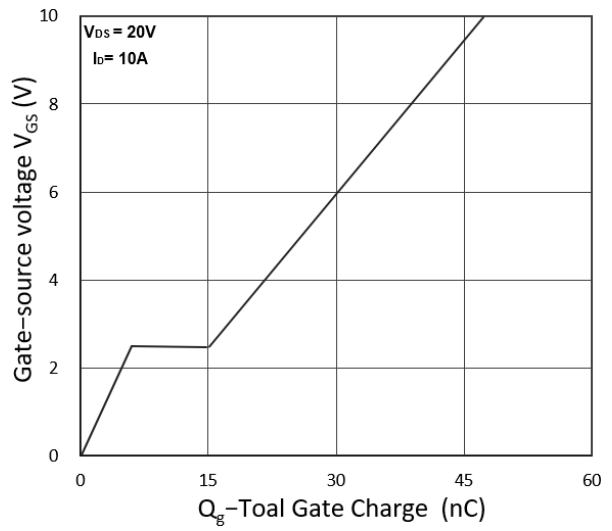


Figure 4. Gate Charge Characteristics

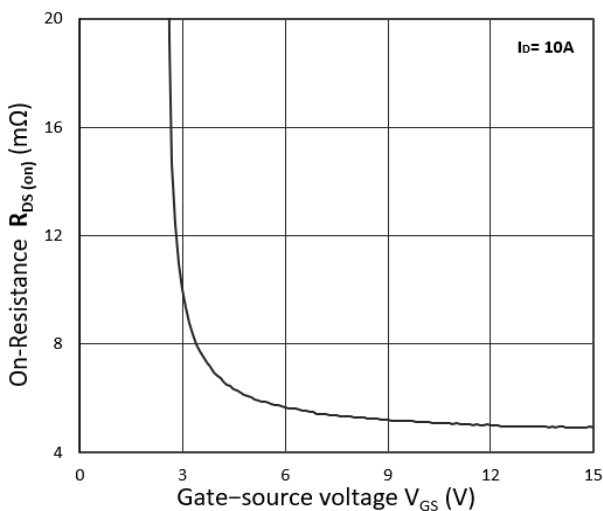


Figure 5.  $R_{DS(on)}$  vs.  $V_{GS}$

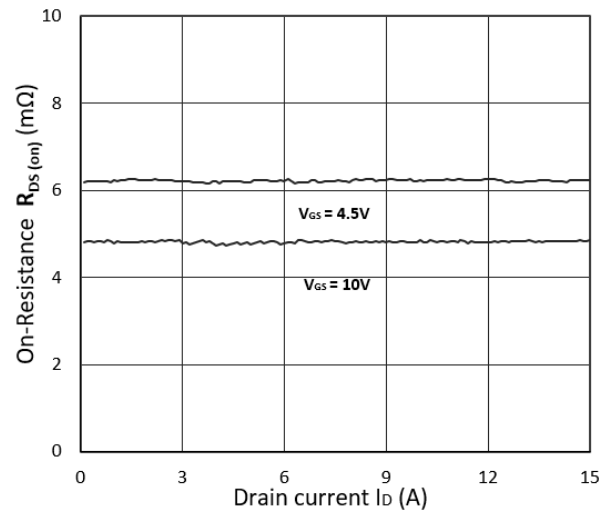


Figure 6.  $R_{DS(on)}$  vs.  $I_D$

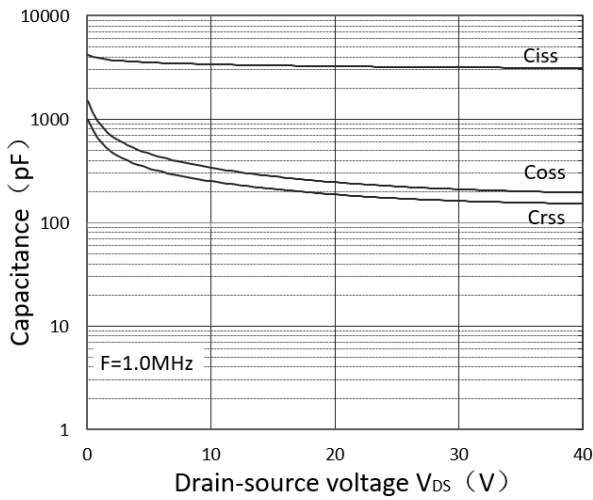


Figure 7. Capacitance Characteristics

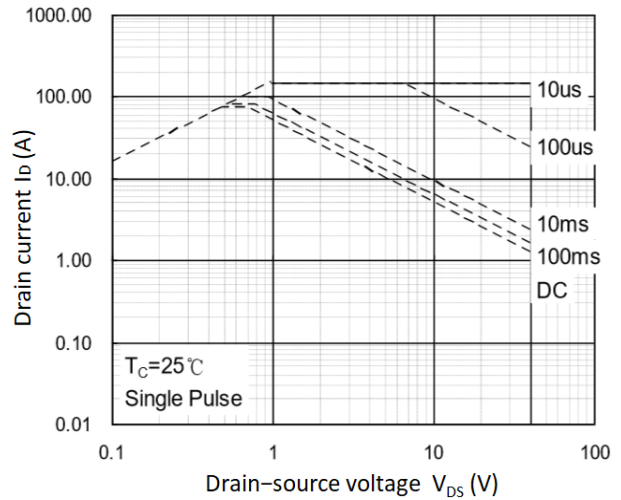


Figure 8. Safe Operating Area

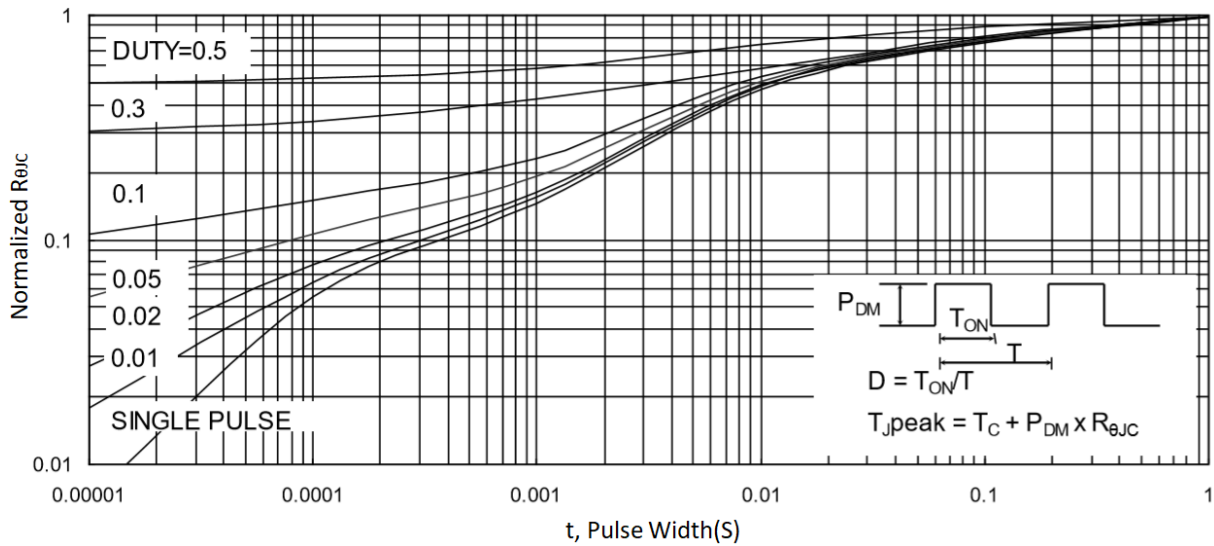


Figure 9. Normalized Maximum Transient Thermal Impedance

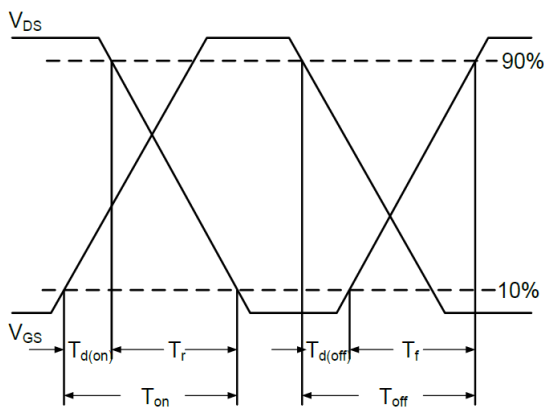


Figure 10. Switching Time Waveform

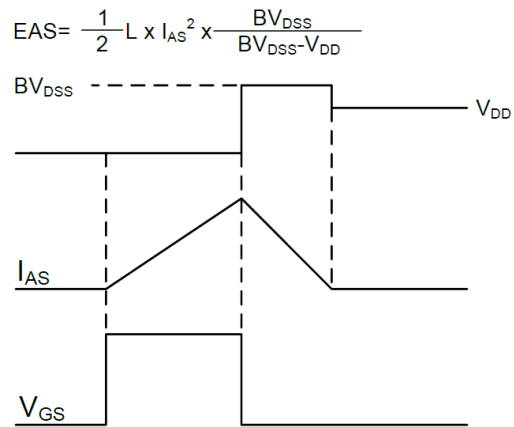
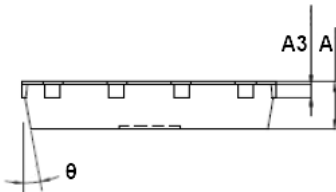
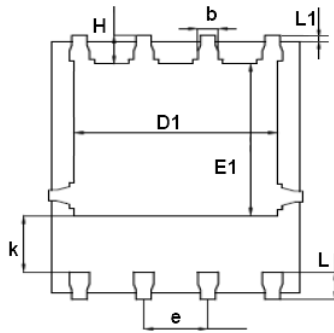
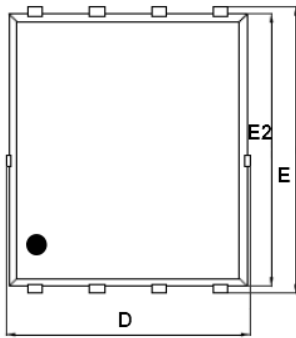


Figure 11. Unclamped Inductive Switching Waveform

## Mechanical Dimensions for PDFN5060-8L

## COMMON DIMENSIONS

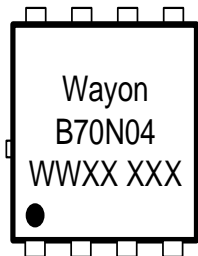


SYMBOL	MM	
	MIN	MAX
A	0.90	1.20
A3	0.15	0.35
D	4.80	5.40
E	5.90	6.35
D1	3.61	4.31
E1	3.30	3.92
E2	5.65	6.06
k	1.10	-
b	0.30	0.51
e	1.27BSC	
L	0.38	0.71
L1	0.05	0.36
H	0.38	0.61
$\theta$	0°	12°

## Ordering Information

Part	Package	Marking	Packing method
WMB70N04T1	PDFN5060-8L	B70N04	Tape and Reel

## Marking Information



B70N04= Device code

WWXX XXX= Date code

## Contact Information

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