Features

- 100% EAS Guaranteed
- Green Device Available
- Fast Switching Speed
- Advanced high cell density Trench technology

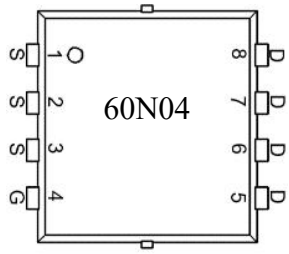
Bvdss	Rdson	ID
40V	6.9mΩ	60A

Application

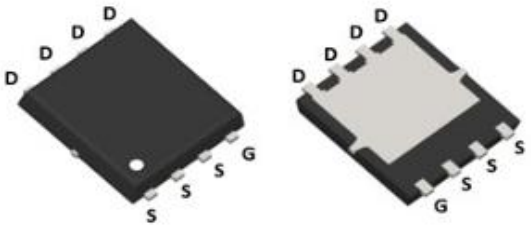
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

RoHS

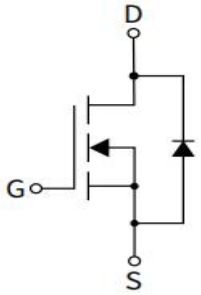
Package



Marking and pin assignment



PDFN3x3-8L top view



Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Quantity
60N04	60N04D	PDFN3x3-8L	5000

Absolute Maximum Ratings (T_C=25℃unless otherwise specified)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current[1]	T_C=25℃	I_D	60	A
	T_C=100℃	I_D	35	A
Pulsed Drain Current[2]		I_{DM}	130	A
Single Pulsed Avalanche Energy[3]		EAS	48	mJ
Avalanche Current		I_{AS}	35	A
Total Power Dissipation[4]		P_D	39	W
Operating Junction Temperature Range		T_J	-55 ~ 150	℃
Storage Temperature Range		T_{STG}	-55 ~ 150	℃

Thermal Resistance Ratings

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	--	3.2	℃/W
Thermal Resistance Junction-to-Ambient[1]	$R_{\theta JA}$	--	60	℃/W

Ordering Information

Ordering Number	Package	Pin Assignment			Packing
Halogen Free		G	D	S	
HL60N04D	PDFN3x3-8L	4	5,6,7,8	1,2,3	Tape Reel

Electrical Characteristics (T_J=25℃,unless otherwise specified)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V,I_D=250μA	40	-	-	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=32V,V_{GS}=0V,T_J=25℃	-	-	1	uA
		V_{DS}=32V,V_{GS}=0V,T_J=55℃	-	-	5	uA
Gate-Source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.35	-	3	V
Static Drain-Source On-Resistance[2]	$R_{DS(on)}$	V_{GS}=10V, I_D=12A	-	6.9	8.5	mΩ
		V_{GS}=4.5V, I_D=10A	-	10	15	
Forward Transconductance	gfs	-	-	-	-	S
Gate Resistance	R_g	V_{DS}=0V,V_{GS}=0V,f=1MHz	-	1.7	-	Ω
Input Capacitance	C_{iss}	V_{DS}=15V,V_{GS}=0V, f=1MHz	-	690	-	pF
Output Capacitance	C_{oss}		-	193	-	
Reverse Transfer Capacitance	C_{rss}		-	38	-	
Total Gate Charge	Q_g	V_{DS}=20V,V_{GS}=4.5V, I_D=12A	-	5.8	-	nC
Gate-Source Charge	Q_{gs}		-	3	-	
Gate-Drain Charge	Q_{gd}		-	1.2	-	
Turn-on Delay Time	$T_{d(on)}$	V_{GS}=10V,V_{DD}=15V, R_G=3.3Ω,I_D=1A	-	14.3	-	nS
Turn-on Rise Time	T_r		-	5.6	-	
Turn-Off Delay Time	$T_{d(off)}$		-	20	-	
Turn-Off Fall Time	T_f		-	11	-	
Continuous Source Current[1,5]	I_S	V_G=V_D=0V,Force Current	-	-	60	A
Pulsed Source Current	I_{SM}		-	-	-	A
Diode Forward Voltage[2]	V_{SD}	V_{GS}=0V,I_S=1A,T_J=25℃	-	-	1	V

Notes:

1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3.The EAS data shows Max. rating . The test condition is V_{DD}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=31A

4.The power dissipation is limited by 150℃ junction temperature

5.The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

Typical Performance Characteristics

Fig.1 Typical Output Characteristics

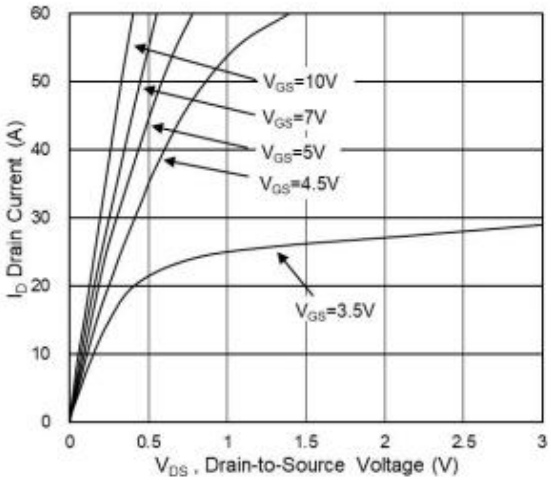


Fig.2 On-Resistance vs G-S Voltage

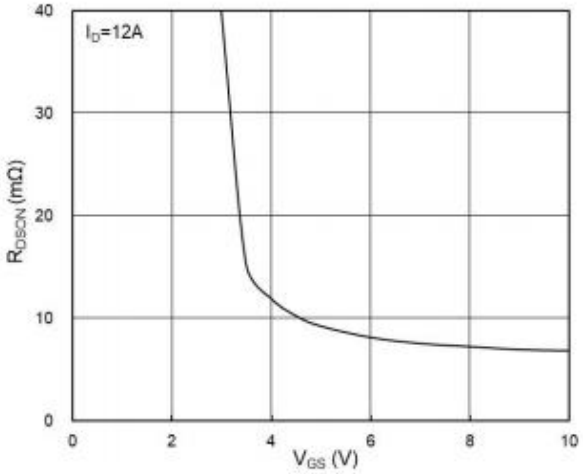


Fig.3 Source Drain Forward Characteristics

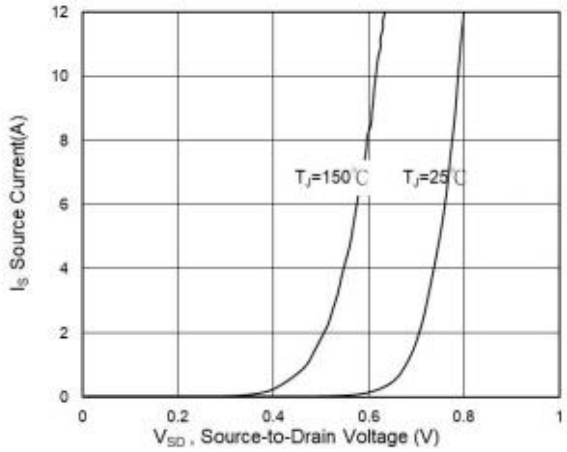


Fig.4 Gate-Charge Characteristics

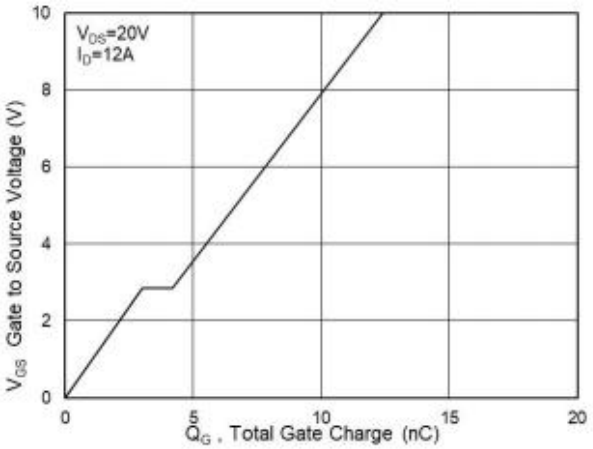


Fig.5 Normalized $V_{GS(th)}$ vs T_J

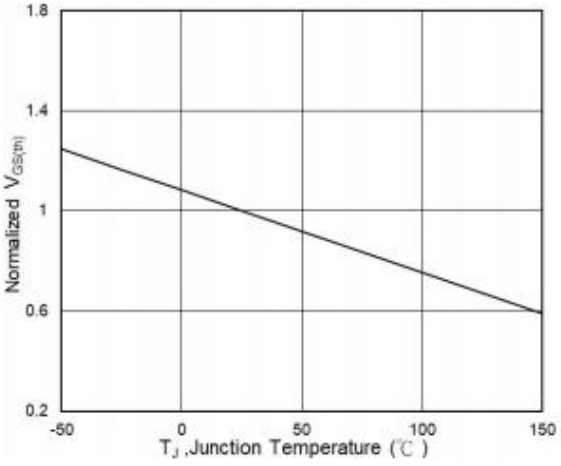


Fig.6 Normalized R_{DSON} vs T_J

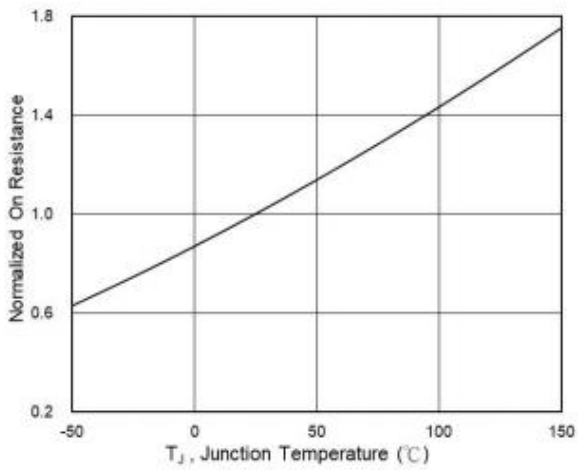


Fig.7 Capacitance

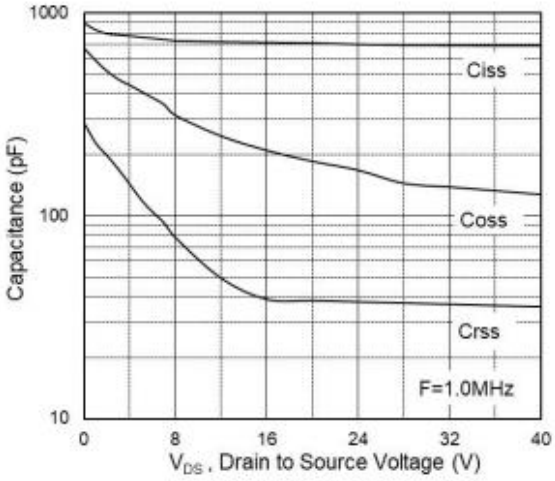


Fig.8 Safe Operating Area

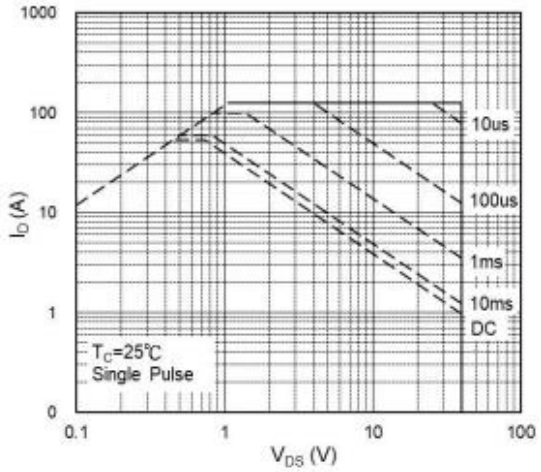
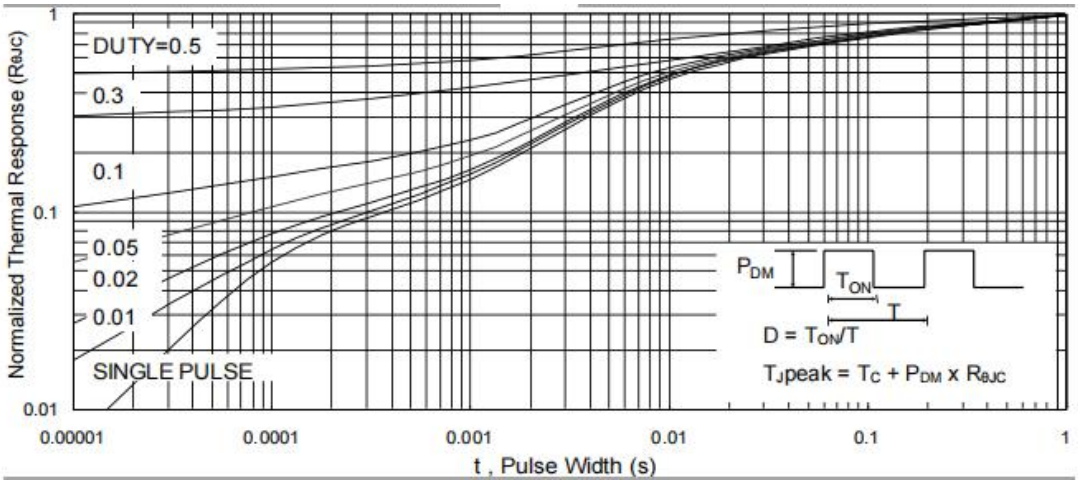
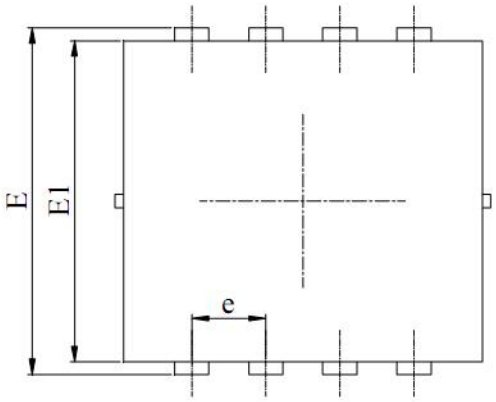


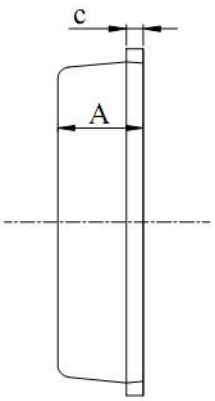
Fig.9 Normalized Maximum Transient Thermal Impedance



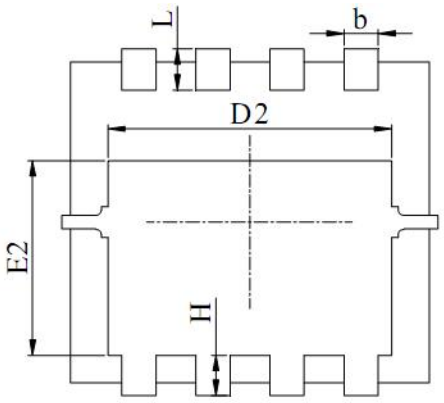
Package Mechanical Data PDFN3x3-8L



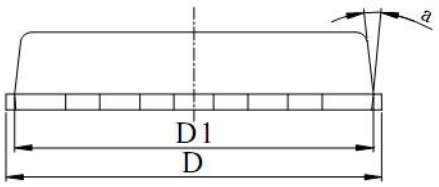
Top View



Side View



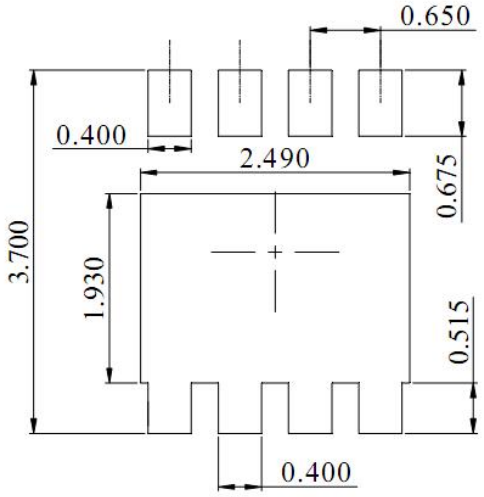
Bottom View



Front View

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. ALL DIMNESIONS IN MILLIMETER (ANNGLE IN DEGREE).
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.20	0.25
D	3.00	3.15	3.25
D1	2.95	3.05	3.15
D2	2.39	2.49	2.59
E	3.20	3.30	3.40
E1	2.95	3.05	3.15
E2	1.70	1.80	1.90
e	0.65 BSC		
H	0.30	0.40	0.50
L	0.25	0.40	0.50
a	---	---	15°



DIMENSIONS:MILLIMETERS

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