



TM60P02DF

P-Channel Enhancement Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

- Load switch
- PWM

General Features

$V_{DS} = -20V$ $I_D = -60A$

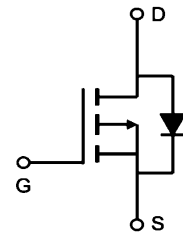
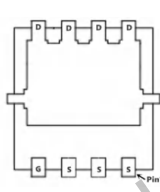
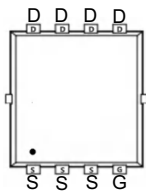
$R_{DS(ON)} = 6 m\Omega (typ.) @ V_{GS} = -4.5V$

100% UIS Tested

100% R_g Tested



DF:PDFN3x3-8L



Marking: 60P02

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-20	V
V_{GS}	Gate-Source Voltage	± 12	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $-V_{GS} @ -4.5V^1$	-60	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $-V_{GS} @ -4.5V^1$	-39	A
I_{DM}	Pulsed Drain Current ²	-220	A
EAS	Single Pulse Avalanche Energy ²	61.25	mJ
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ⁴	39	W
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 175	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	3.6	$^\circ C/W$

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Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics							
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-20	-	-	V
Gate-body Leakage current		I_{GSS}	$V_{DS} = 0V, V_{GS} = \pm 10V$	-	-	± 100	nA
Zero Gate Voltage Drain Current	$T_J=25^{\circ}C$	I_{DSS}	$V_{DS} = -20V, V_{GS} = 0V$	-	-	-1	μA
	$T_J=100^{\circ}C$			-	-	-100	
Gate-Threshold Voltage		$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-0.4	-0.65	-1.0	V
Drain-Source on-Resistance ⁴		$R_{DS(on)}$	$V_{GS} = -4.5V, I_D = -15A$	-	6	8.2	mΩ
			$V_{GS} = -2.5V, I_D = -10A$	-	7.5	10	
			$V_{GS} = -1.8V, I_D = -8A$	-	10.2	15	
Forward Transconductance ⁴		g_{fs}	$V_{DS} = -5V, I_D = -15A$	-	78	-	S
Dynamic Characteristics ⁵							
Input Capacitance		C_{iss}	$V_{DS} = -10V, V_{GS} = 0V, f = 1MHz$	-	3560	-	pF
Output Capacitance		C_{oss}		-	500	-	
Reverse Transfer Capacitance		C_{rss}		-	430	-	
Gate Resistance		R_g	$f = 1MHz$	-	11	-	Ω
Switching Characteristics ⁵							
Total Gate Charge		Q_g	$V_{GS} = -4.5V, V_{DS} = -10V, I_D = -15A$	-	43	-	nC
Gate-Source Charge		Q_{gs}		-	7.9	-	
Gate-Drain Charge		Q_{gd}		-	11.2	-	
Turn-on Delay Time		$t_{d(on)}$	$V_{GS} = -4.5V, V_{DD} = -10V, R_G = 3\Omega, I_D = -15A,$	-	14.5	-	ns
Rise Time		t_r		-	20.2	-	
Turn-off Delay Time		$t_{d(off)}$		-	93	-	
Fall Time		t_f		-	161	-	
Body Diode Reverse Recovery Time		t_{rr}	$I_F = -15A, dI_F/dt = 100A/\mu s$	-	28	-	ns
Body Diode Reverse Recovery Charge		Q_{rr}		-	25.7	-	nC
Drain-Source Body Diode Characteristics							
Diode Forward Voltage ⁴		V_{SD}	$I_S = -1A, V_{GS} = 0V$	-	-	-1.2	V
Continuous Source Current	$T_C=25^{\circ}C$	I_S	-	-	-	-60	A

Notes:

1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 150^\circ\text{C}$.
2. The EAS data shows Max. rating. The test condition is $V_{DD} = -25V, V_{GS} = -10V, L = 0.1mH, I_{AS} = 35A$.
3. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
5. This value is guaranteed by design hence it is not included in the production test.



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Typical Characteristics

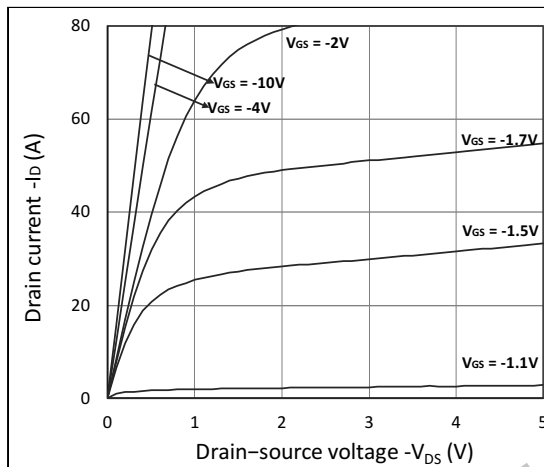


Figure 1. Output Characteristics

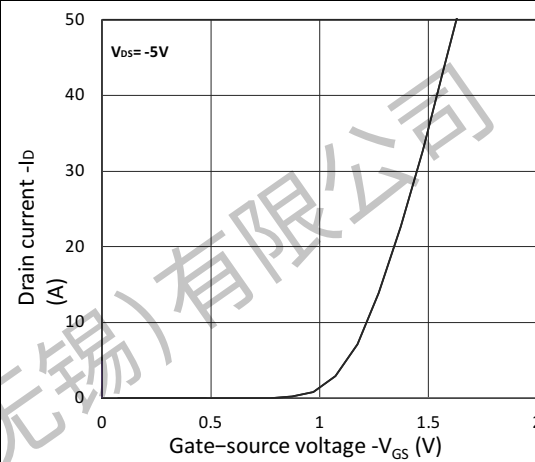


Figure 2. Transfer Characteristics

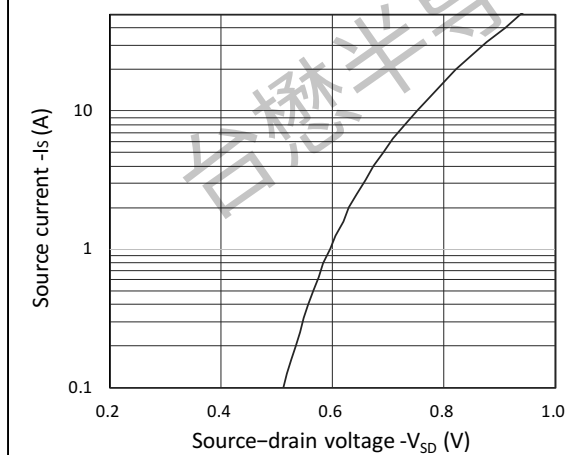


Figure 3. Forward Characteristics of Reverse

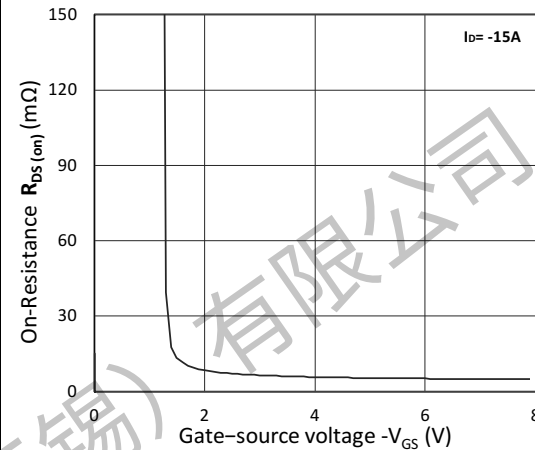


Figure 4. $R_{DS(on)}$ vs. V_{GS}

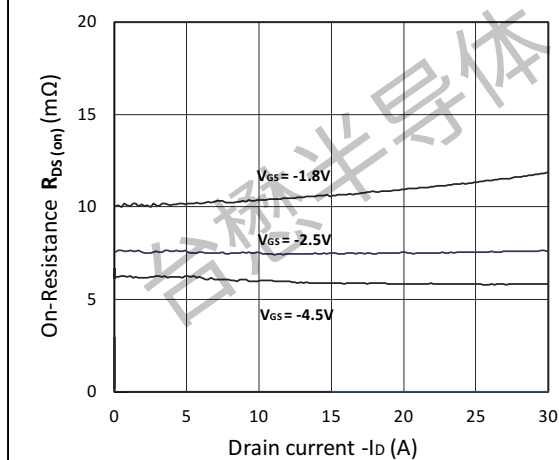


Figure 5. $R_{DS(on)}$ vs. I_D

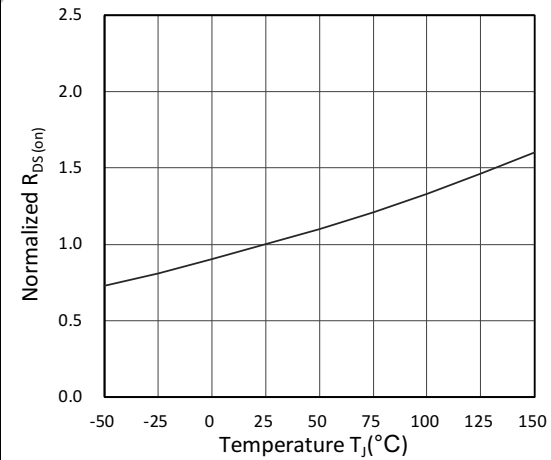


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature



TM60P02DF

P-Channel Enhancement Mosfet

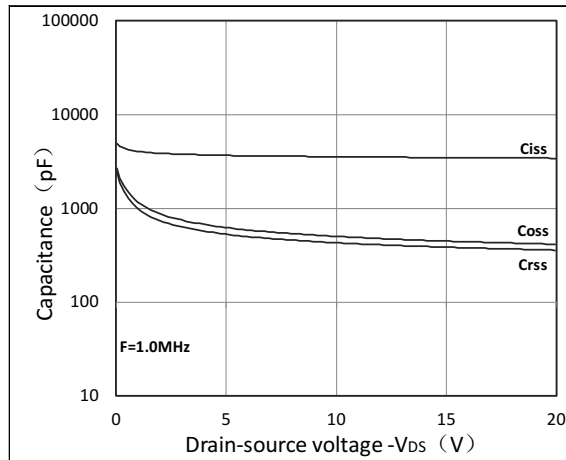


Figure 7. Capacitance Characteristics

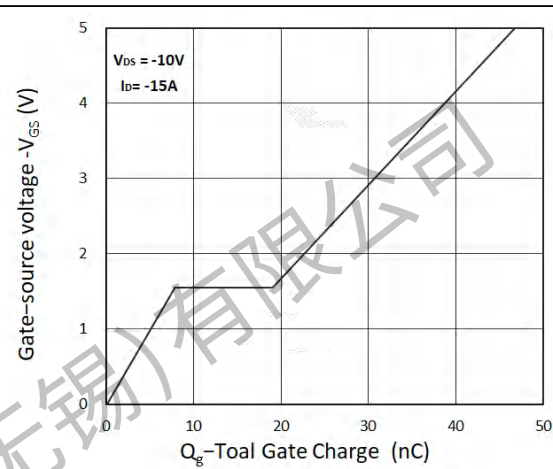


Figure 8. Gate Charge Characteristics

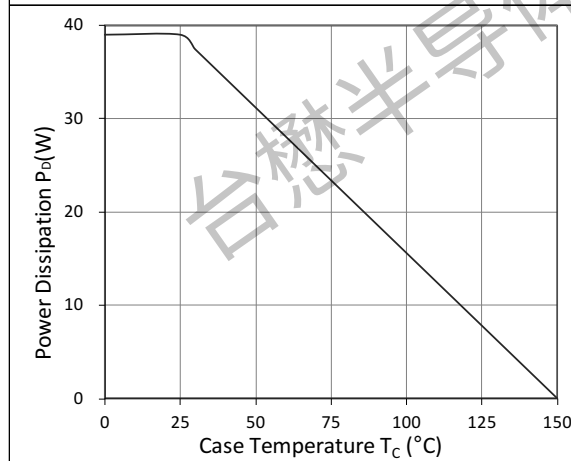


Figure 9. Power Dissipation

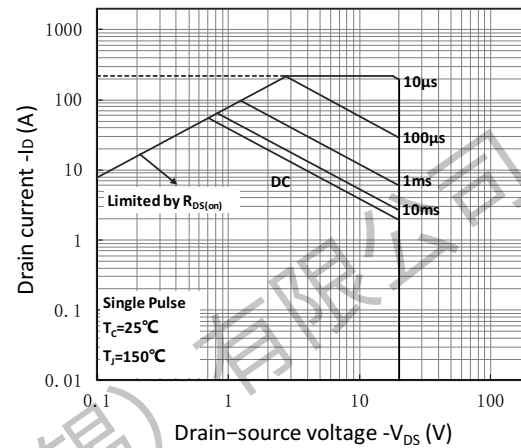


Figure 10. Safe Operating Area

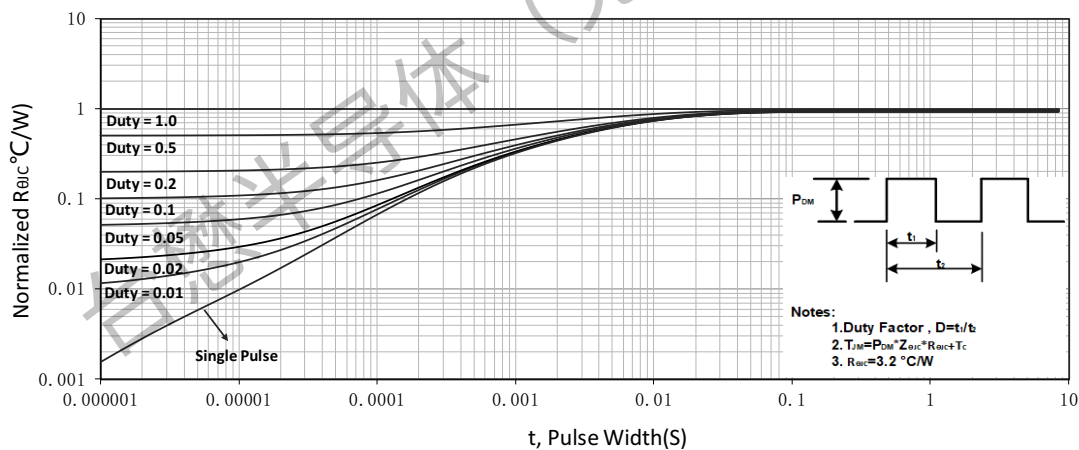
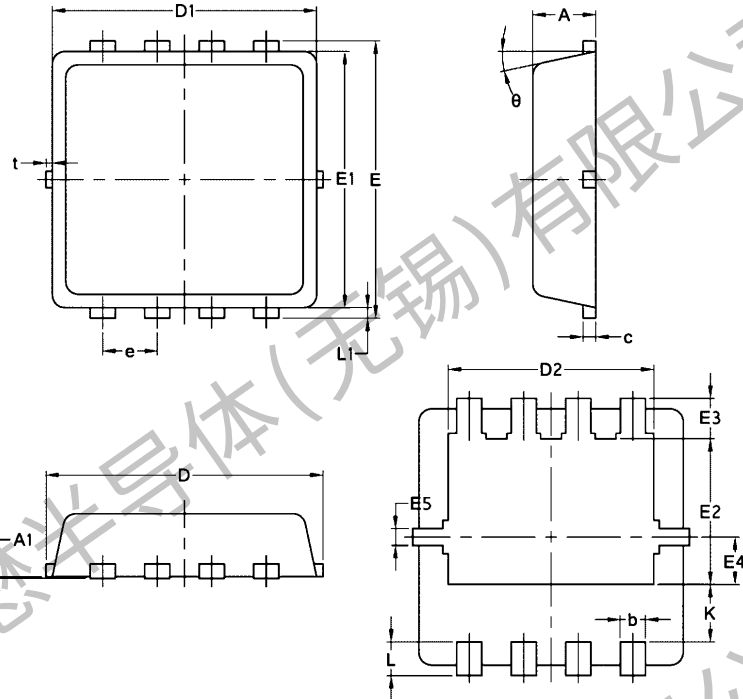


Figure 11. Normalized Maximum Transient Thermal Impedance

TM60P02DF

P-Channel Enhancement Mosfet

Package Mechanical Data:DFN3x3-8L

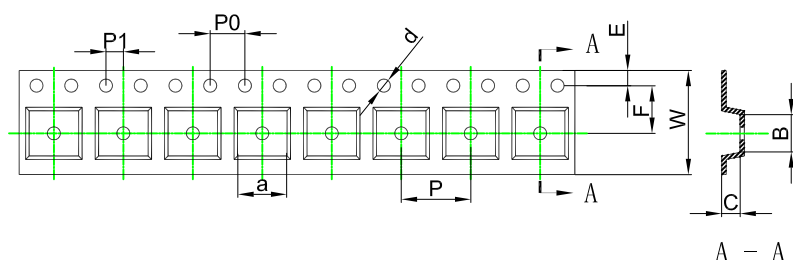


Symbol	Common		
	mm		
	Mim	Nom	Max
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.59	0.69	0.89
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	0	0.075	0.13
Φ	10	12	14

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PDFN3×3-8L Embossed Carrier Tape



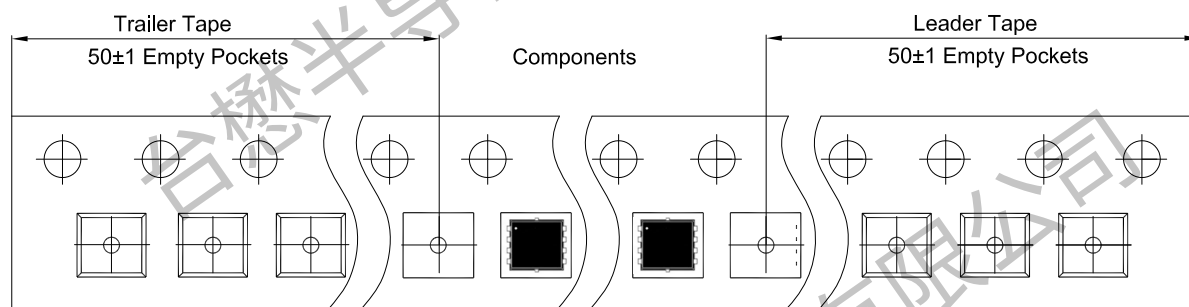
Packaging Description:

SOP-8L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2,500 units per 13" or 33cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

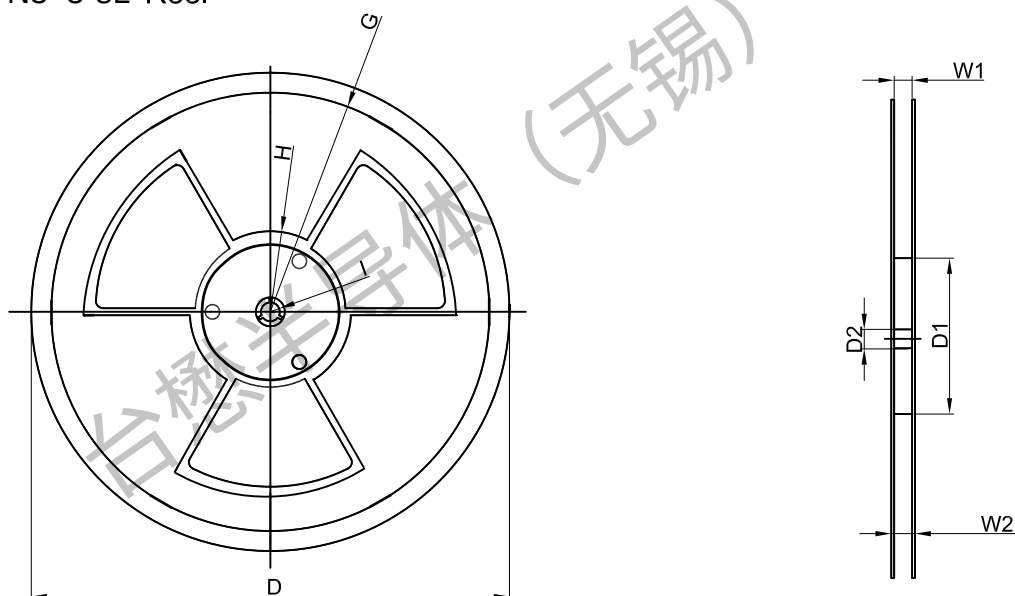
ALL DIM IN mm

Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
PDFN3×3-8L	6.40	5.40	2.10	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

PDFN3×3-8L Tape Leader and Trailer



PDFN3×3-8L Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
13"Dia	Ø330.00	100.00	13.00	R135.00	R55.00	R6.50	12.00	14.00

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
5,000 pcs	13 inch	10,000 pcs	370×355×52	50,000 pcs	400×360×368	

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Revision history:

Date	Rev	Description	Page
2023.05.19	23.05	Original	