

TM70P02DF

P-Channel Enhancement Mosfet

General Description

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

Applications

- Load switch
- PWM

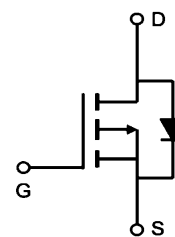
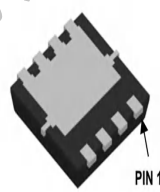
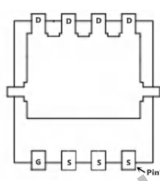
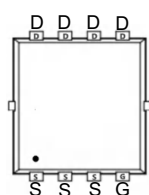
General Features

$V_{DS} = -20V$ $I_D = -70A$
 $R_{DS(ON)} = 4.5 m\Omega (typ.) @ V_{GS} = -4.5V$

100% UIS Tested
100% R_g Tested



DF:PDFN3x3-8L



Marking: 70P02

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, $-V_{GS} @ -4.5V^1$	-70	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $-V_{GS} @ -4.5V^1$	-45.5	A
I_{DM}	Pulsed Drain Current ²	-259	A
EAS	Single Pulse Avalanche Energy ²	68	mJ
P_D	Total Power Dissipation ⁴	23	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)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Sourctce Breakdown Voltage	V _{GS} =0V, I _D =250 μ A	-20	---	---	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} =0V, V _{DS} =-20V	---	---	-1	μ A
I _{GSS}	Gate-Source Leakage Current	V _{GS} =± 12V, V _{DS} =0A	---	---	± 100	nA
On Characteristics						
V _{GS(th)}	GATE-Source Threshold Voltage	V _{GS} =V _{DS} , I _O =250 μ A	-0.4	-0.65	-1.0	V
R _{DS(ON)}	Drain-Source On Resistance ⁴	V _{GS} =-4.5V, I _D =-10A	---	4.5	5.6	m Ω
		V _{GS} =-2.5V, I _D =-10A	---	5.9	7.6	m Ω
Dynamic Characteristics						
C _{iss}	Input Capacitance ⁵	V _{DS} =-10V, V _{GS} =0V, f=1MHz	---	4769	---	pF
C _{oss}	Output Capacitance ⁵		---	664	--	
C _{rss}	Reverse Transfer Capacitance ⁵		---	569	---	
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time ⁵	V _{DS} =-10V, I _D =-10A, R _L =3 Ω, V _{GS} =-4.5V	---	21	---	ns
t _r	Rise Time ⁵		---	37	---	ns
t _{d(off)}	Turn-Off Delay Time ⁵		---	109	---	ns
t _f	Fall Time ⁵		---	61	---	ns
Q _g	Total Gate Charge ⁵	V _{GS} =-4.5V, V _{DS} =-10V, I _D =-10A	---	54	---	nc
Q _{gs}	Gate-Source Charge ⁵		---	5.1	---	nc
Q _{gd}	Gate-Drain “Miller” Charge ⁵		---	9	---	nc
Drain-Source Diode Characteristics						
V _{SD}	Diode Forward Voltage ⁴	V _{GS} =0V, I _{SD} =-10A	---	---	-1.2	V
I _S	Continuous Drain Curren	VD=VG=0V	---	---	-70	A
I _{SM}	Pulsed Drain Current		---	---	-259	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 $V_{DD}=-25V, V_{GS}=-10V, L=0.4mH, I_{AS}=-20A$.
3. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ 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

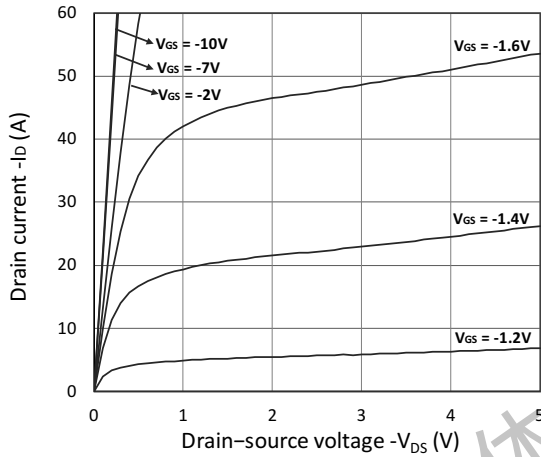


Figure 1. Output Characteristics

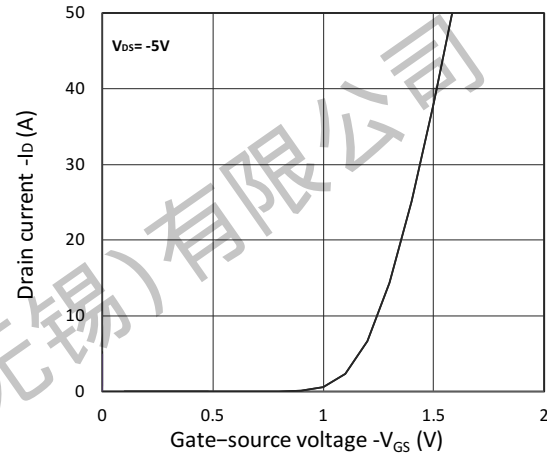


Figure 2. Transfer Characteristics

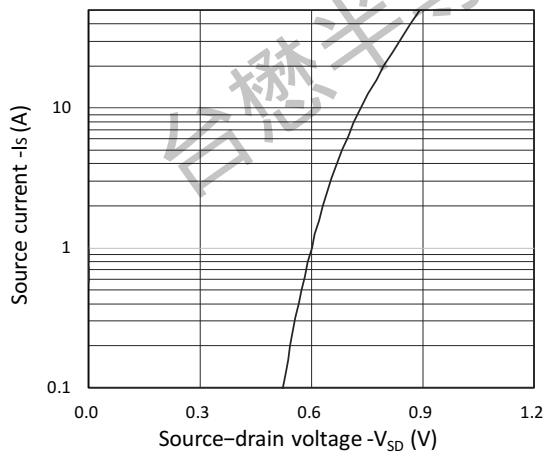


Figure 3. Forward Characteristics of Reverse

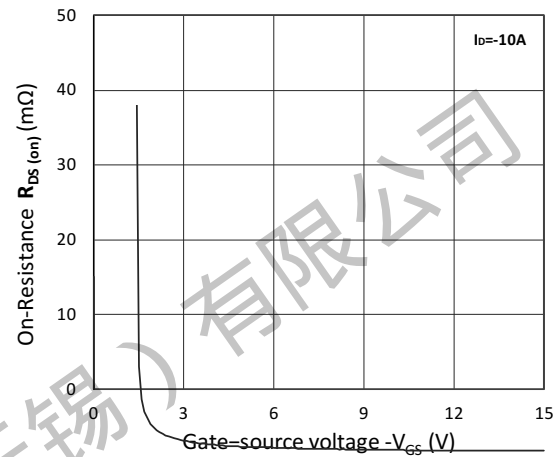


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

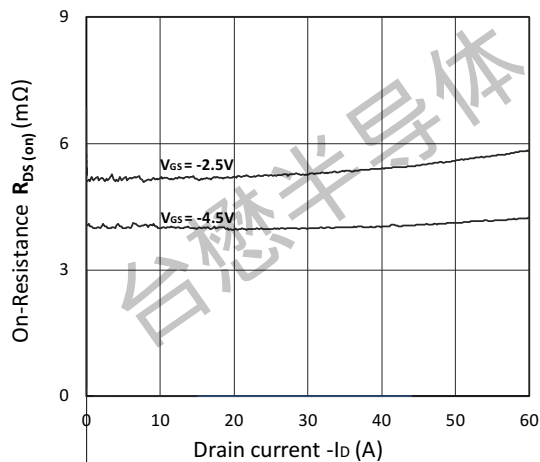


Figure 5. $R_{DS(ON)}$ vs. I_D

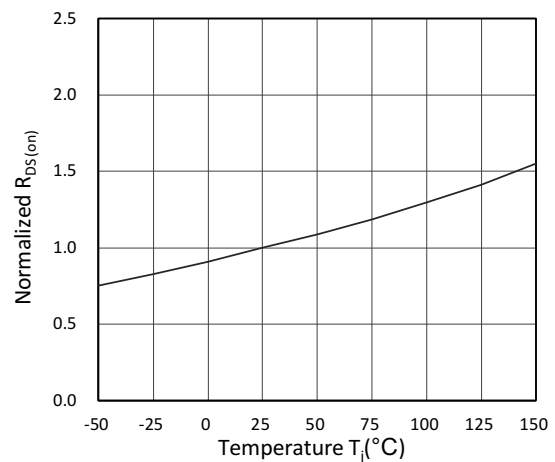


Figure 6. Normalized $R_{DS(ON)}$ vs. Temperature



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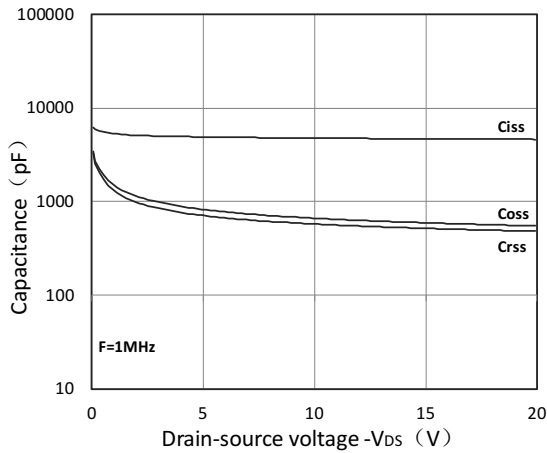


Figure 7. Capacitance Characteristics

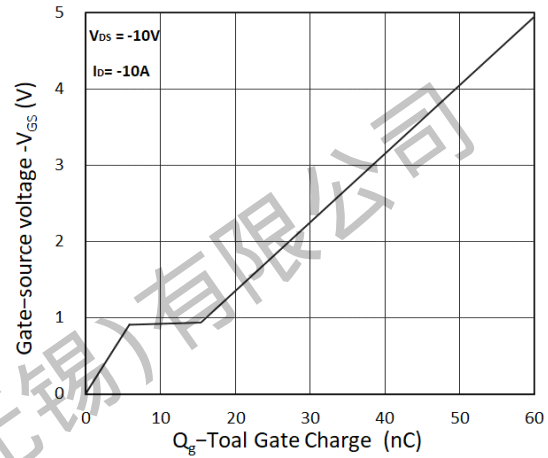


Figure 8. Gate Charge Characteristics

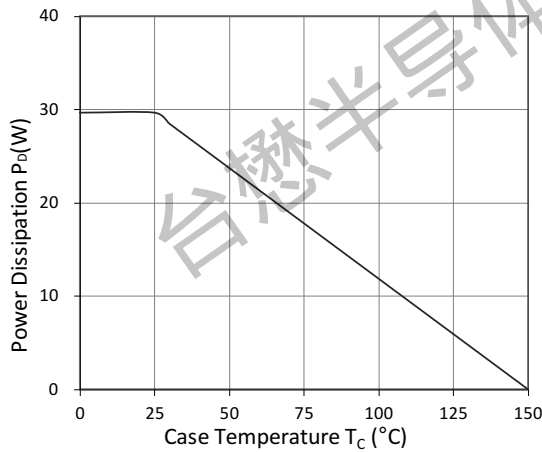


Figure 9. Power Dissipation

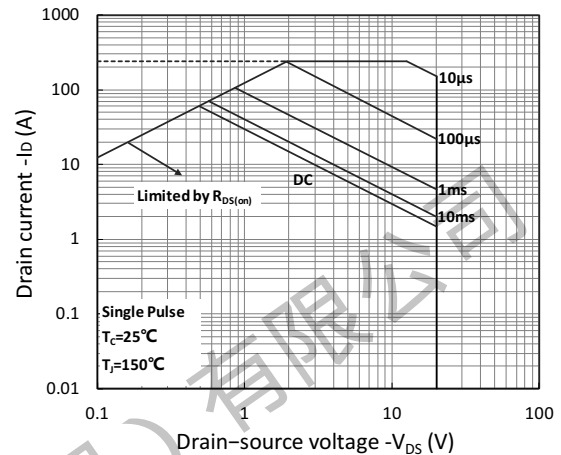


Figure 10. Safe Operating Area

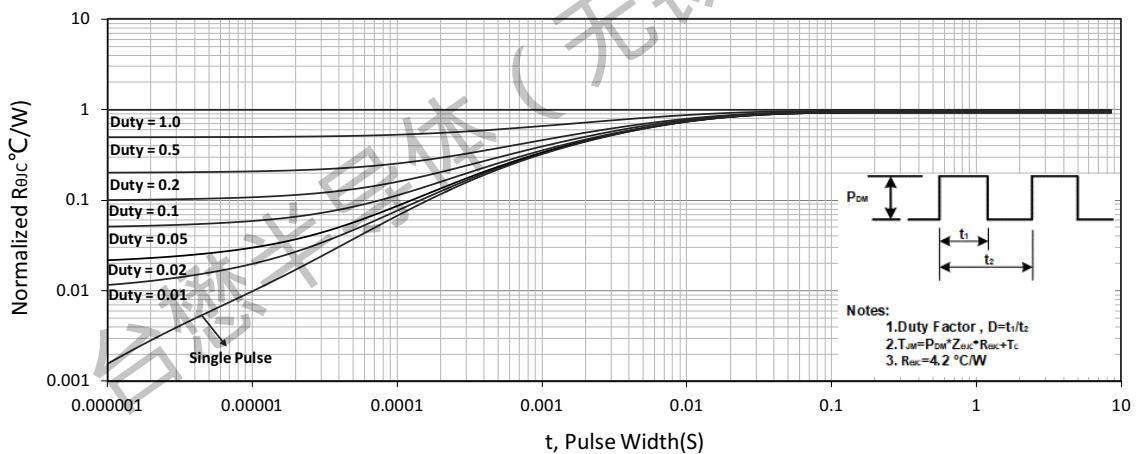
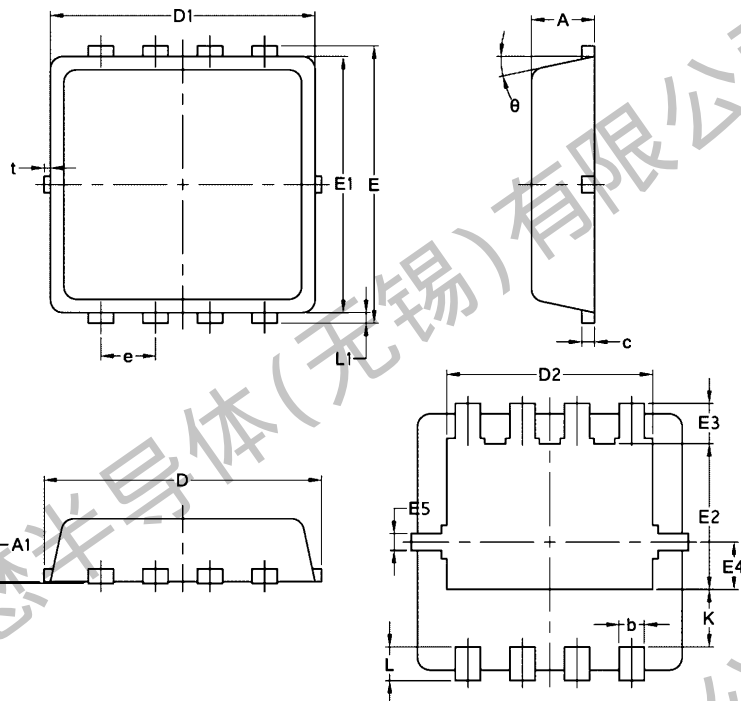


Figure 11. Normalized Maximum Transient Thermal Impedance

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Package Mechanical Data:DFN3x3-8L

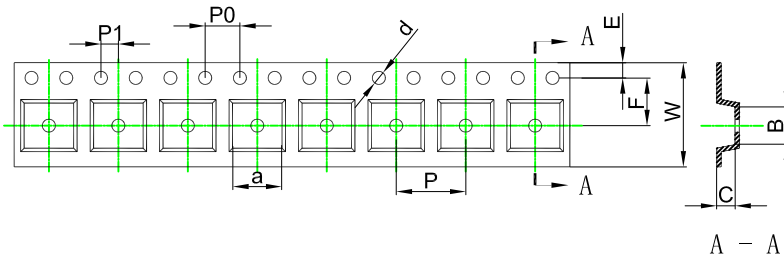


Symbol	Common		
	mm		
	Mim	Nom	Max
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.59	0.69	0.89
L	0.30	0.40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



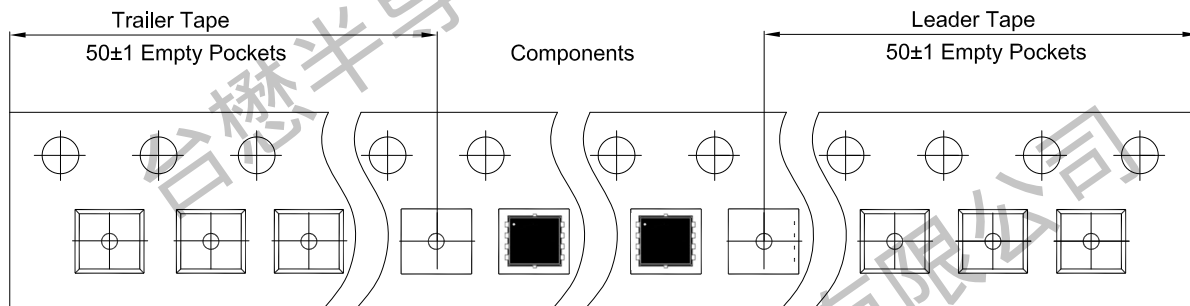
Packaging Description:

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).

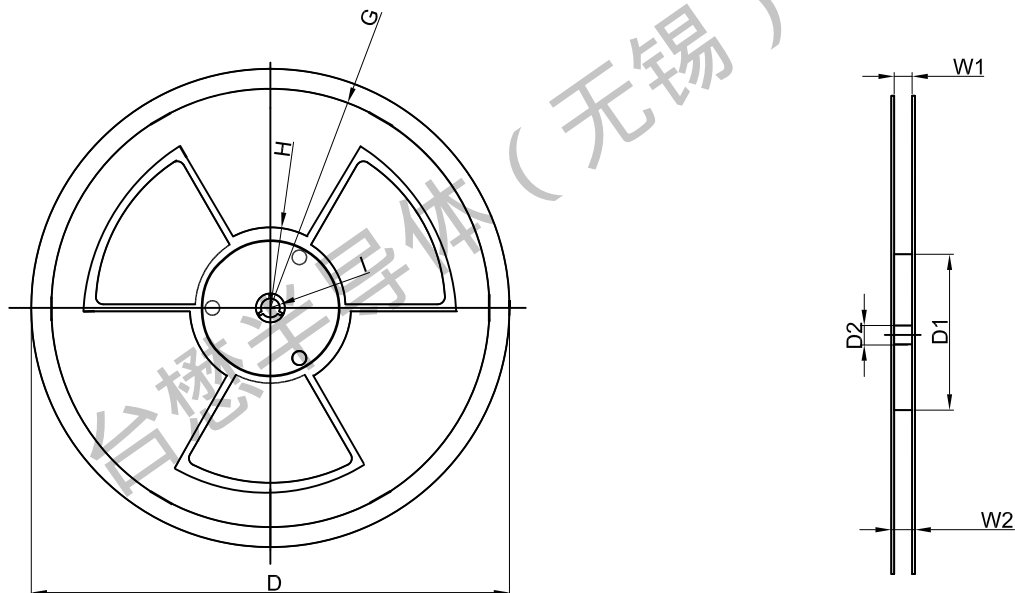
ALL DIM IN mm

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
2023.09.19	23.09	Original	