

**TM10G04DF**

**N+P-Channel Enhancement Mosfet**

**General Description**

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

**Applications**

- Load switch
- PWM

**General Features**

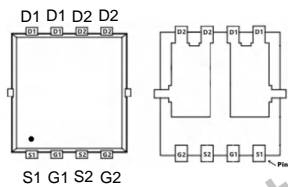
**N Channel**

$V_{DS} = 40V, I_D = 10A$   
 $R_{DS(ON)} = 17m\Omega @ V_{GS} = 10V$

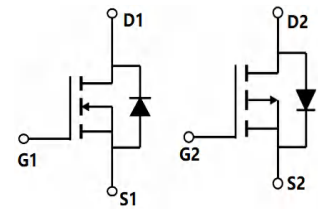
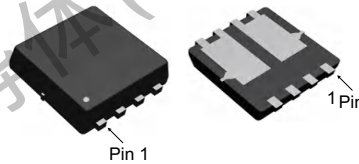
**P Channel**

$V_{DS} = -40V, I_D = -10A$   
 $R_{DS(ON)} = 39m\Omega @ V_{GS} = -10V$

100% UIS Tested  
100%  $R_g$  Tested



DF:DFN3x3-8L



Marking :10G04 OR 40G10

**Absolute Maximum Ratings** ( $T_A = 25^\circ C$  Unless Otherwise Noted)

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
$V_{DS}$	Drain-Source Voltage	40	-40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	10	-10	A
$I_D @ T_A = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	5.2	-3.9	A
$I_{DM}$	Pulsed Drain Current	32	-24	A
EAS	Single Pulsed Avalanche Energy	13	17.6	mJ
$P_D @ T_C = 25^\circ C$	Total Power Dissipation	2.0	3.2	W
$T_{STG}$	Storage Temperature Range	-55 to 175	-55 to 175	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 175	-55 to 175	$^\circ C$

**Thermal Data**

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Cast	---	---	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	62.6	39	$^\circ C/W$



## TM10G04DF

## N+P-Channel Enhancement Mosfet

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=40V, V_{GS}=0V$	-	-	1.0	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.6	2.0	V
$R_{DS(on)}$	Static Drain-Source on-Resistance	$V_{GS}=10V, I_D=8A$	-	17	22	m $\Omega$
		$V_{GS}=4.5V, I_D=5A$	-	25	35	m $\Omega$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=20V, V_{GS}=0V,$ $f=1.0MHz$	-	633	-	pF
$C_{oss}$	Output Capacitance		-	67	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	58	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=20V, I_D=8A,$ $V_{GS}=10V$	-	12	-	nC
$Q_{gs}$	Gate-Source Charge		-	3.2	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	3.1	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=20V, R_L=2.5\Omega$ $V_{GS}=10V, R_{REN}=3\Omega$	-	4	-	ns
$t_r$	Turn-on Rise Time		-	3	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	15	-	ns
$t_f$	Turn-off Fall Time		-	2	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	10	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	32	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=8A$	-	-	1.2	V

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.75	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance	$V_{GS}=-10V, I_D=-6A$	-	39	53	m $\Omega$
		$V_{GS}=-4.5V, I_D=-4A$	-	58	81	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=-20V, V_{GS}=0V,$ $f=1.0MHz$	-	860	-	pF
$C_{oss}$	Output Capacitance		-	87	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	70	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=-20V, I_D=-6A,$ $V_{GS}=-10V$	-	13	-	nC
$Q_{gs}$	Gate-Source Charge		-	3.8	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	3.1	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=-20V, R_L=2,3\Omega$ $V_{GS}=-10V, R_{REN}=6\Omega$	-	7.5	-	ns
$t_r$	Turn-on Rise Time		-	5.5	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	19	-	ns
$t_f$	Turn-off Fall Time		-	7	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	-10	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-24	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=-6A$	-	-	-1.2	V

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Typical Performance Characteristics-N

Figure 1: Output Characteristics

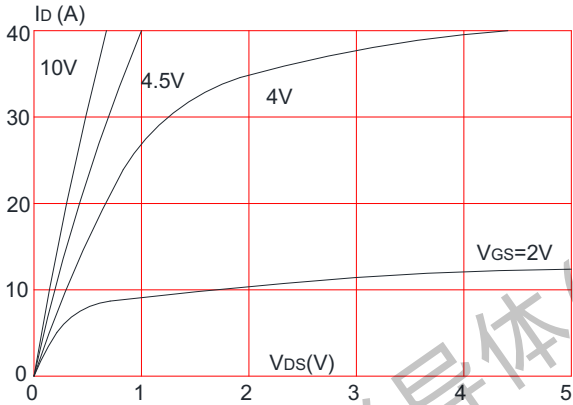


Figure 2: Typical Transfer Characteristics

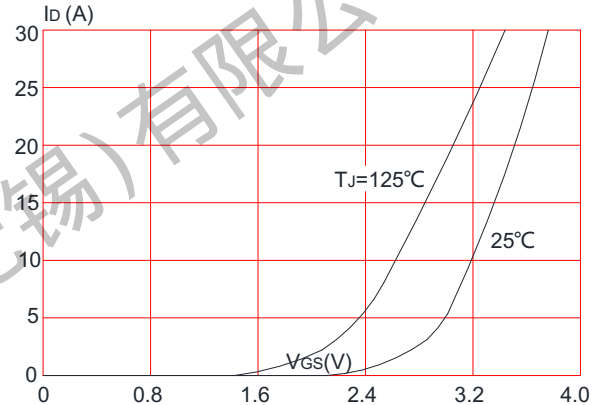


Figure 3: On-resistance vs. Drain Current

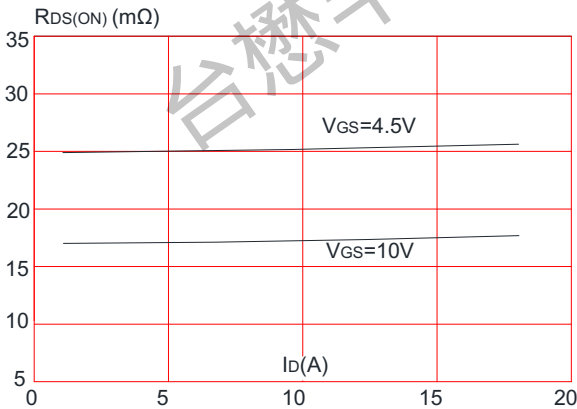


Figure 4: Body Diode Characteristics

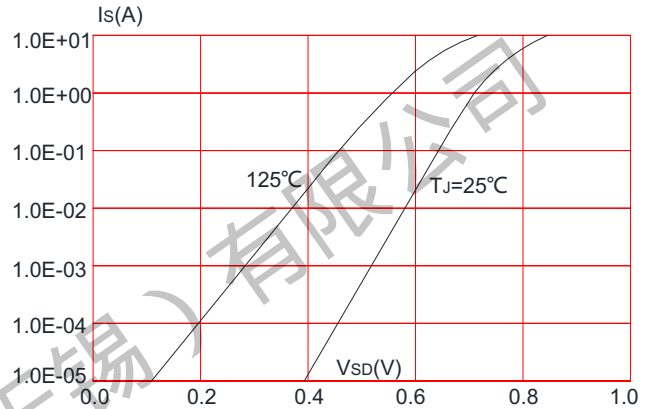


Figure 5: Gate Charge Characteristics

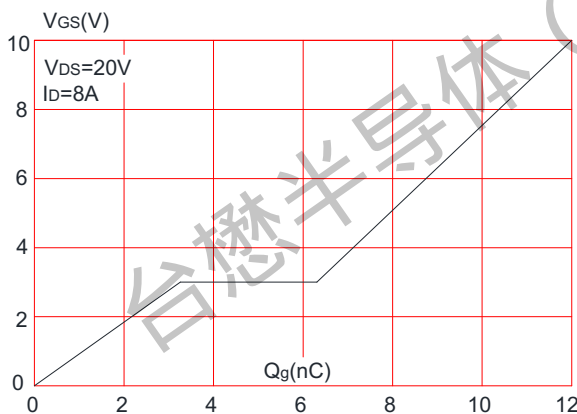
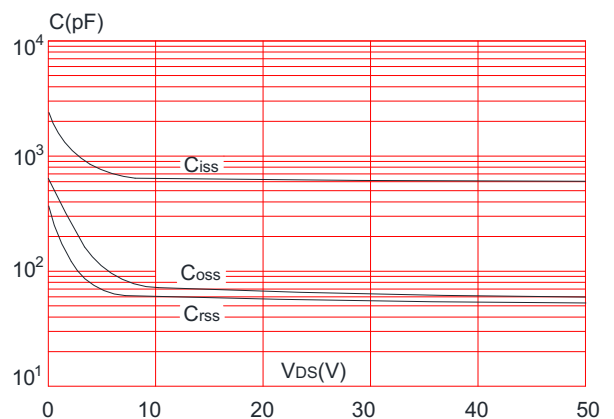


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

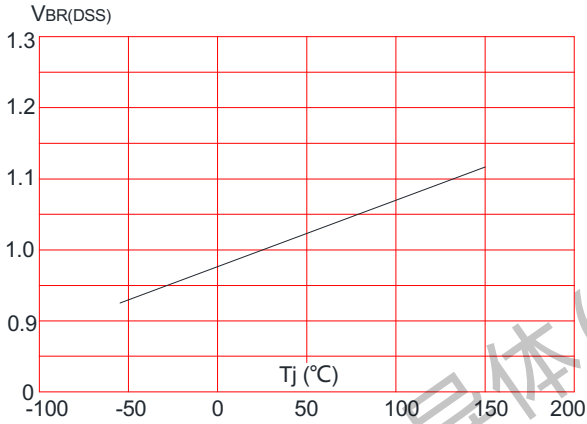


Figure 8: Normalized on Resistance vs. Junction Temperature

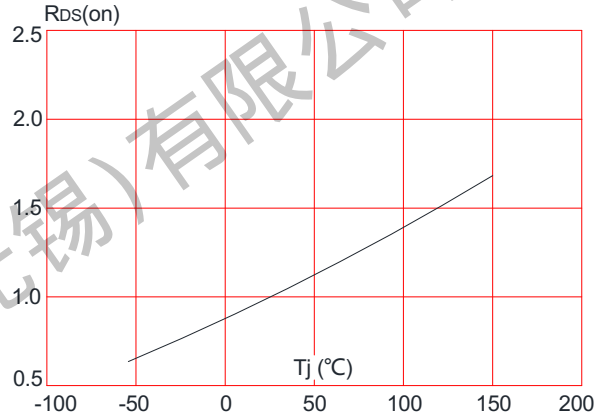


Figure 9: Maximum Safe Operating Area

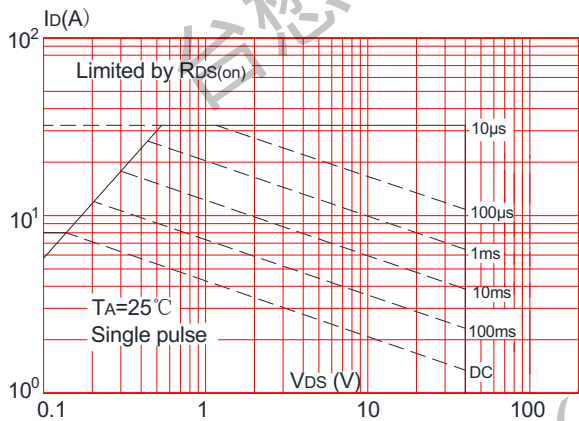


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

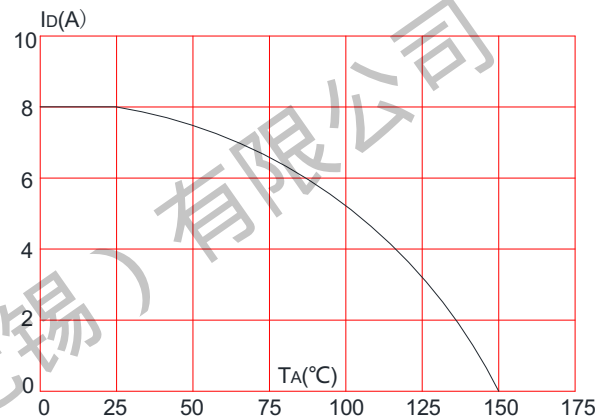
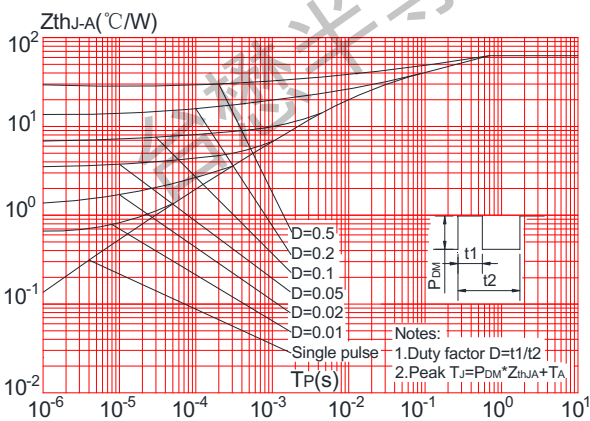


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



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Typical Performance Characteristics-P

Figure 1: Output Characteristics

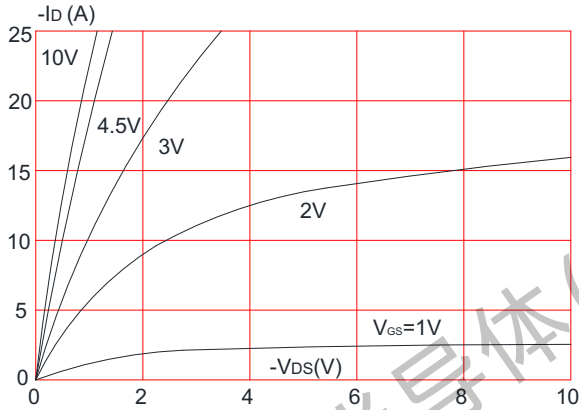


Figure 2: Typical Transfer Characteristics

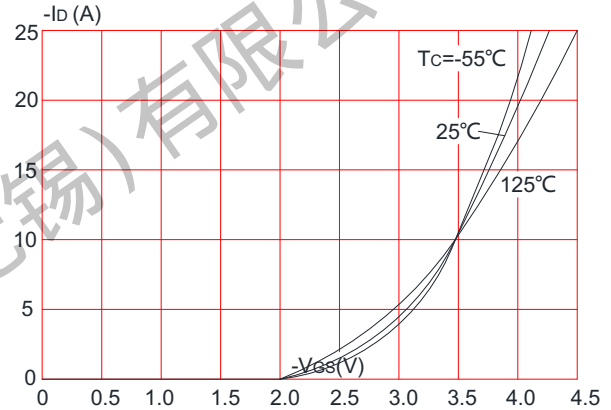


Figure 3: On-resistance vs. Drain Current

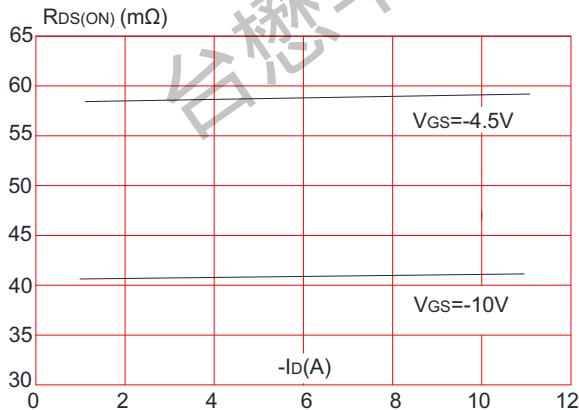


Figure 4: Body Diode Characteristics

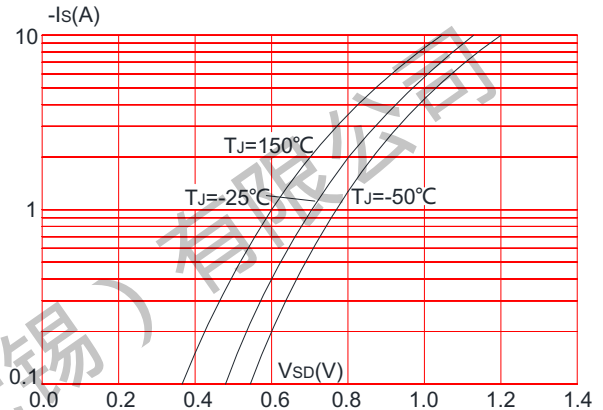


Figure 5: Gate Charge Characteristics

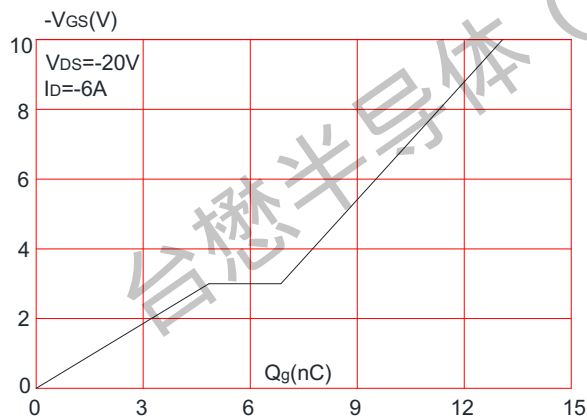
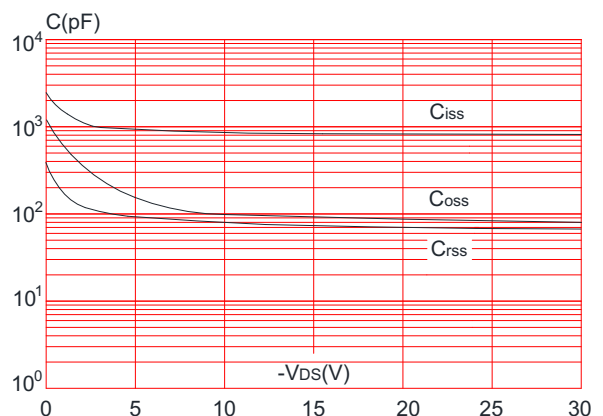


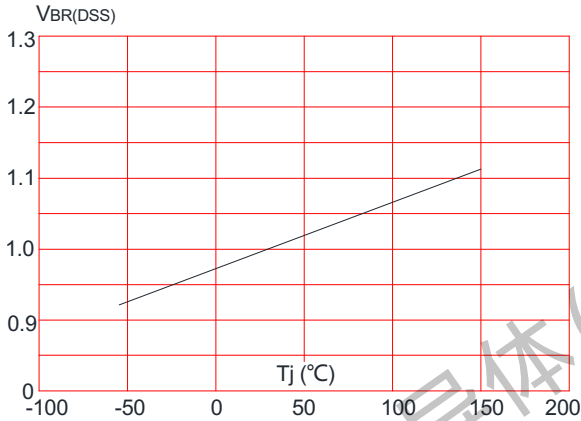
Figure 6: Capacitance Characteristics



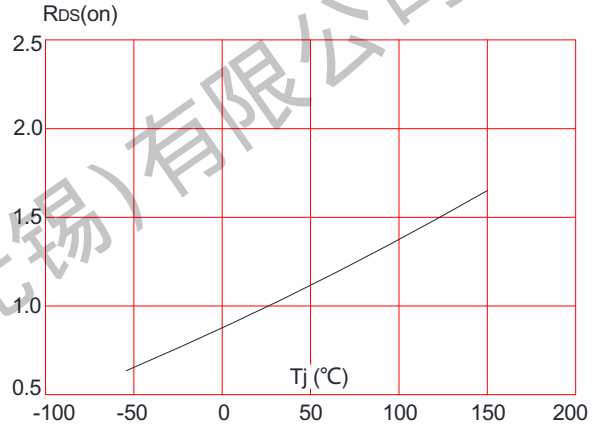
**TM10G04DF**

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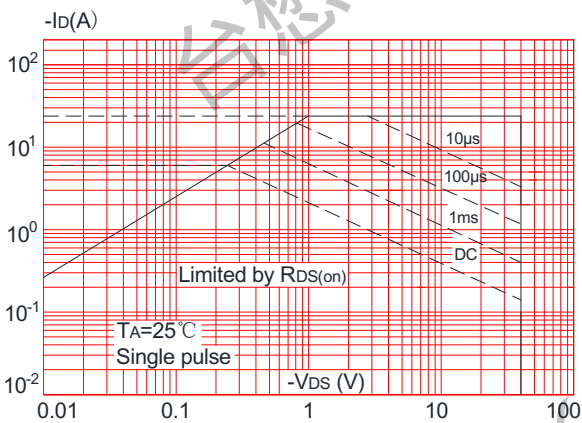
**Figure 7: Normalized Breakdown Voltage vs. Junction Temperature**



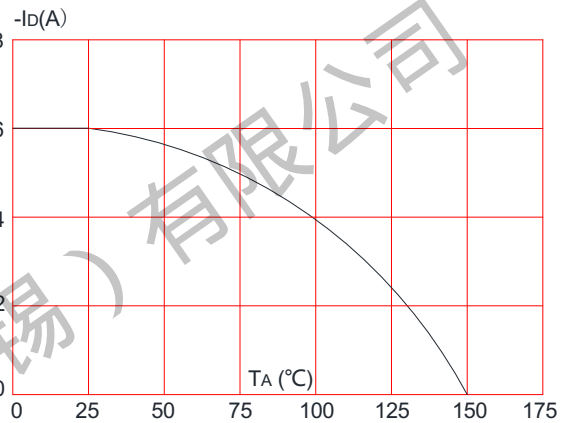
**Figure 8: Normalized on Resistance vs. Junction Temperature**



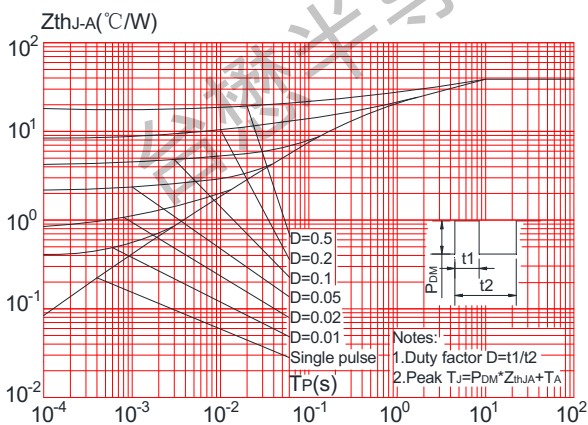
**Figure 9: Maximum Safe Operating Area**



**Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature**



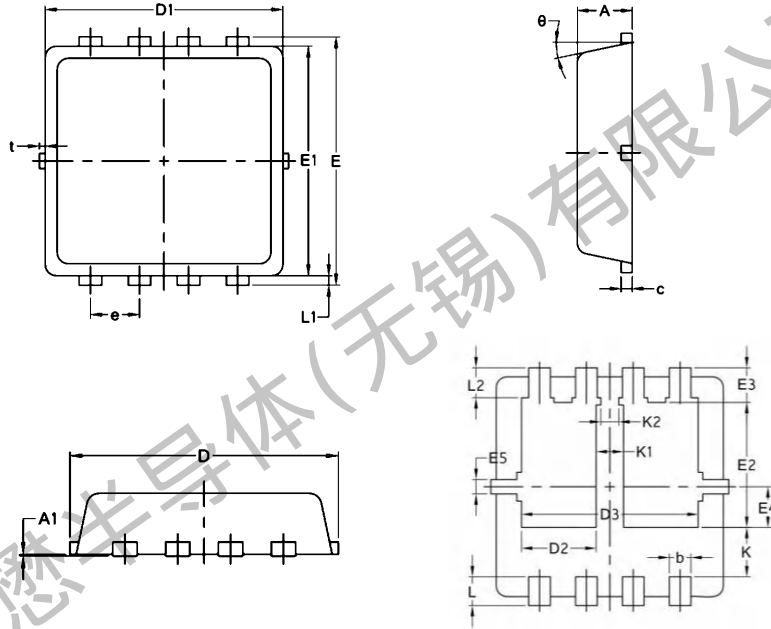
**Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient**



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Package Mechanical Data:DFN3x3-8L

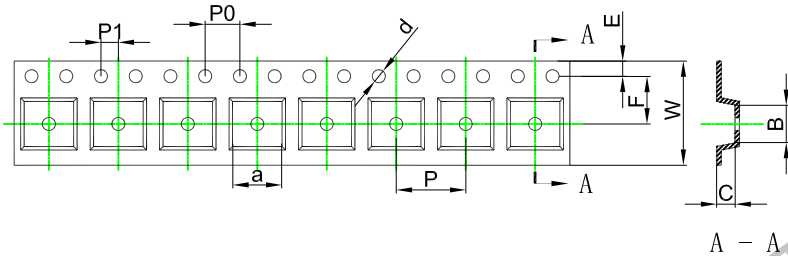


Symbol	Common		
	Min	Mm	Max
		Nom	
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.25	0.30	0.39
c	0.14	0.152	0.20
D	3.20	3.30	3.45
D1	3.05	3.15	3.25
D2	0.84	1.04	1.24
D3	2.30	2.45	2.60
E	3.20	3.30	3.40
E1	2.95	3.05	3.15
E2	1.60	1.74	1.90
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.50	0.69	0.80
K1	0.30	0.38	0.53
K2	0.15	0.25	0.35
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
L2	0.27	0.42	0.57
t	0	0.075	0.13
Φ	10°	12°	14°

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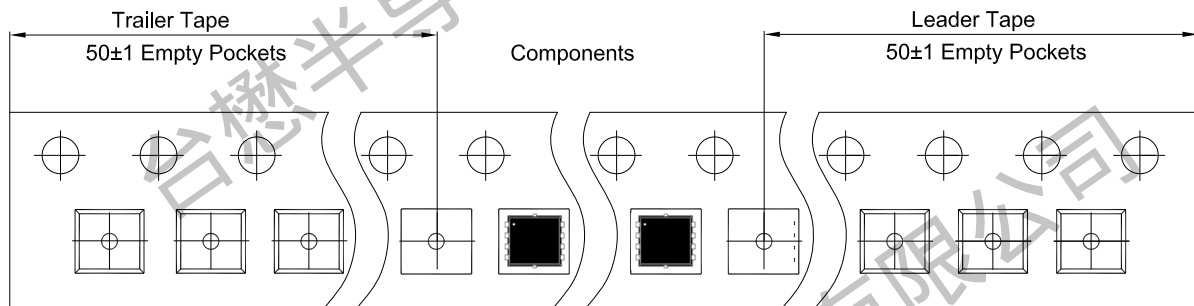
PDFN3x3-8L Embossed Carrier Tape



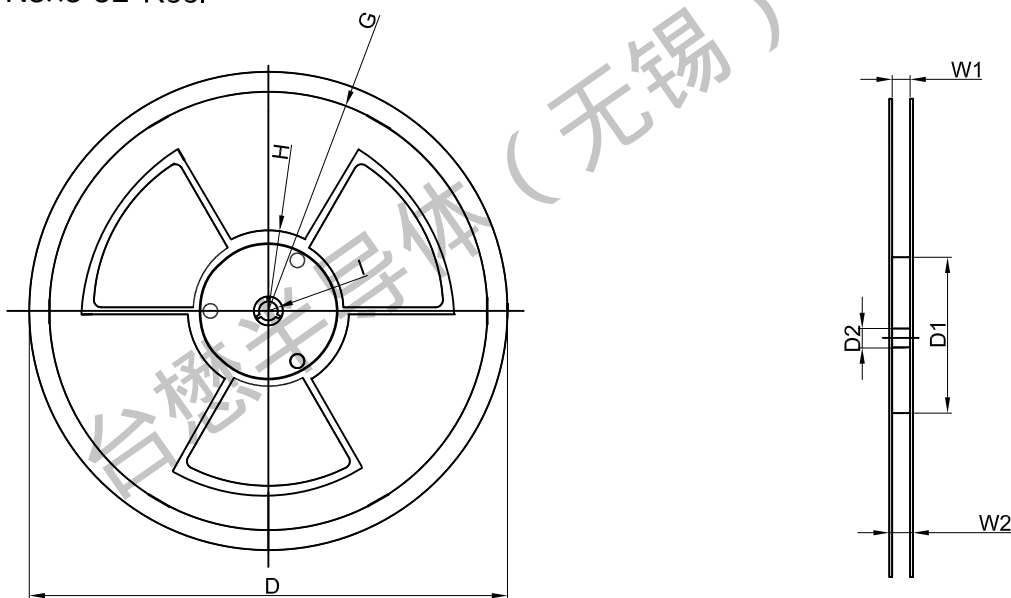
**Packaging Description:**  
SOP-8L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed 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
PDFN3x3-8L	6.40	5.40	2.10	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

PDFN3x3-8L Tape Leader and Trailer



PDFN3x3-8L 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
2023.08.11	23.08	Original	