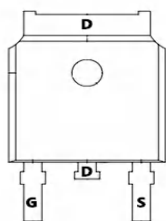


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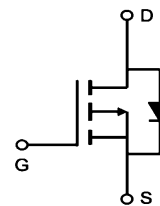
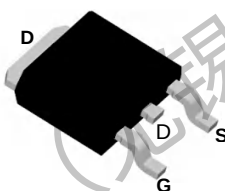
P-Channel Enhancement Mosfet

General Description • Low $R_{DS(ON)}$ • RoHS and Halogen-Free Compliant Applications • Load switch • PWM	General Features $V_{DS} = -40V$ $I_D = -20A$ $R_{DS(ON)} = 36m\Omega (typ.) @ V_{GS} = -10V$ 100% UIS Tested 100% R_g Tested 
--	---

D:TO-252-3L



Marking: 20P04



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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-20	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-12	A
I_{DM}	Pulsed Drain Current ²	-50	A
EAS	Single Pulse Avalanche Energy ³	40.6	mJ
P_D	Total Power Dissipation ³	34	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	---	6.6	$^\circ C/W$



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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Sourtce Breakdown Voltage	V _{GS} =0V, I _D =-250 μ A	-40	---	---	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} =0V, V _{DS} =-40V	---	---	-1	μ A
I _{GSS}	Gate-Source Leakage Current	V _{GS} = ± 20V, V _{DS} =0A	---	---	± 100	nA
On Characteristics						
V _{GS(th)}	GATE-Source Threshold Voltage	V _{GS} =V _{DS} , I _D =-250 μ A	-1.4	-1.75	-2.0	V
R _{DS(ON)}	Static Drain-Source On-Resistance ³	V _{GS} =-10V, I _D =-8A	---	36	48	m Ω
		V _{GS} =-4.5V, I _D =-5A	---	49	60	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =-20V, V _{GS} =0V, f=1MHz	---	1033	---	pF
C _{OSS}	Output Capacitance		---	106	---	
C _{rss}	Reverse Transfer Capacitance		---	79	---	
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} =-20V, I _D =-5A, V _{GS} =-10V, R _G =2.5 Ω	---	7	---	ns
t _r	Rise Time		---	14	---	ns
t _{d(off)}	Turn-Off Delay Time		---	22	---	ns
t _f	Fall Time		---	8	---	ns
Q _g	Total Gate Charge	V _{GS} =-10V, V _{DS} =-20V, I _D =-5A	---	19	---	nC
Q _{gs}	Gate-Source Charge		---	3.4	---	nC
Q _{gd}	Gate-Drain “Miller” Charge		---	4.1	---	nC
Drain-Source Diode Characteristics						
V _{SD}	Drain Diode Forward Voltage ²	V _{GS} =0V, I _S =-10A	---	-0.8	-1.2	V
I _S	Continuous Source Current	V _G =V _D =0V	---	---	-20	A
I _{Sm}	Pulsed Drain Current	V _G =V _D =0V	---	---	-80	A
Q _{rr}	Reverse Recovery Charge	V _G S =0V, I _S =-5A,	---	20	---	nC
t _{rr}	Reverse Recovery Time	di/dt=100A/μs	---	29	---	ns

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=-20V$, $V_G=-10V$, $L=0.5mH$, $R_G=25\Omega$, $I_{AS}=-10.5A$
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

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Typical Characteristics

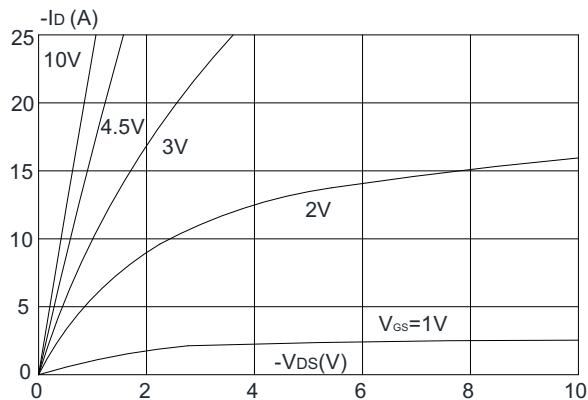


Figure1: Output Characteristics

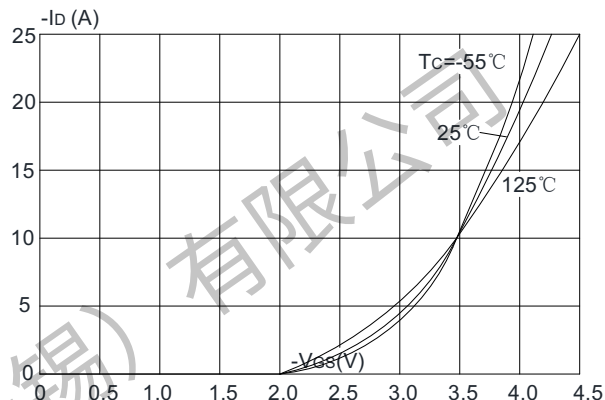


Figure 2: Typical Transfer Characteristics

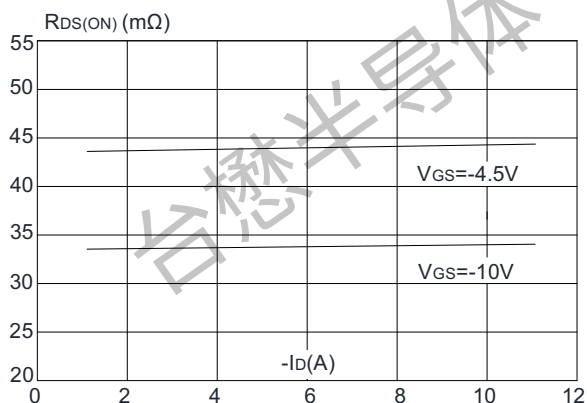


Figure 3: On-resistance vs. Drain Current

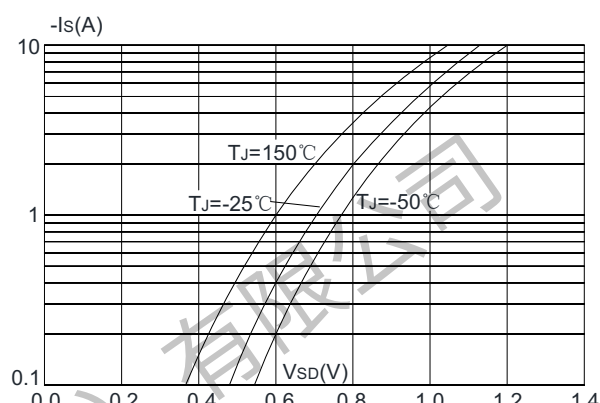


Figure 4: Body Diode Characteristics

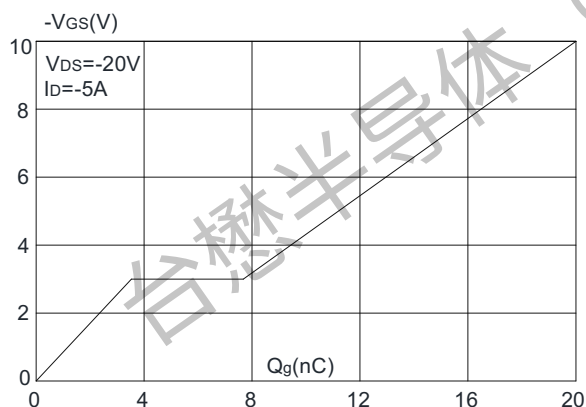


Figure 5: Gate Charge Characteristics

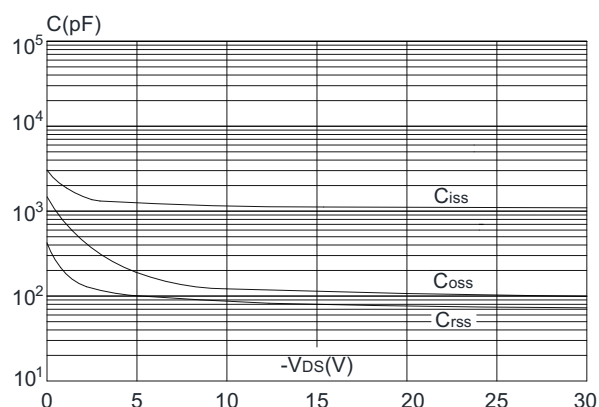


Figure 6: Capacitance Characteristics

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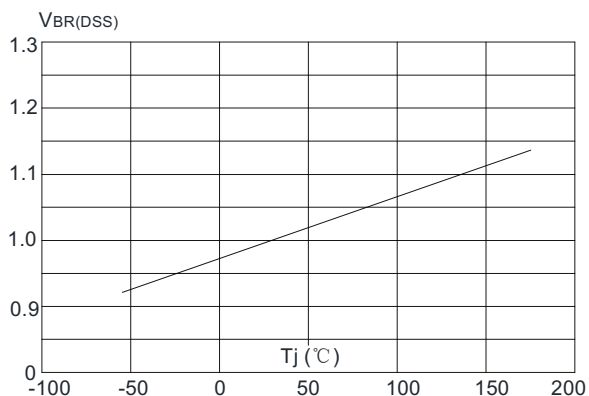


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

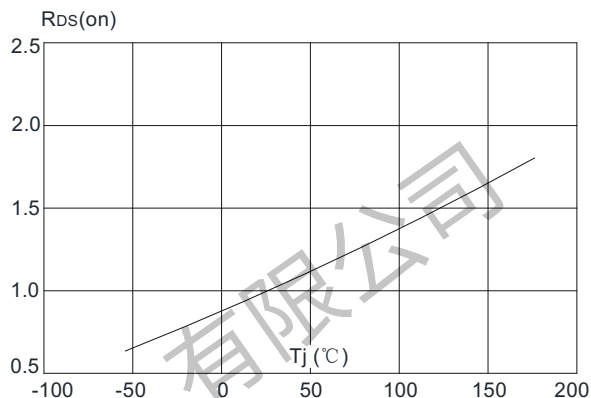


Figure 8: Normalized on Resistance vs. Junction Temperature

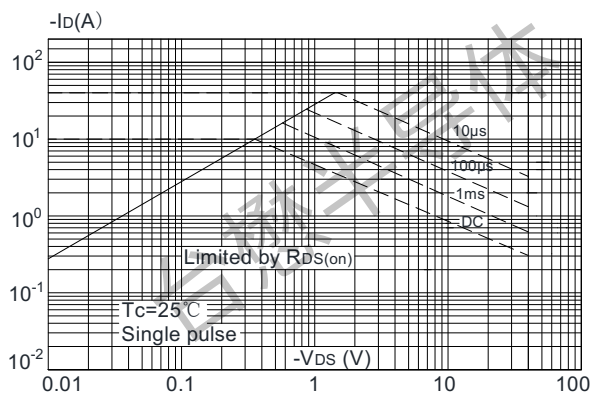


Figure 9: Maximum Safe Operating Area

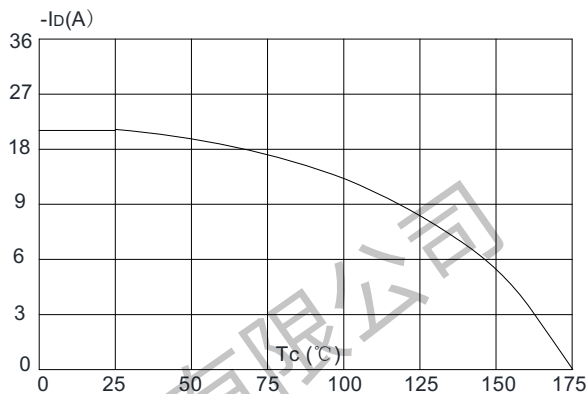


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

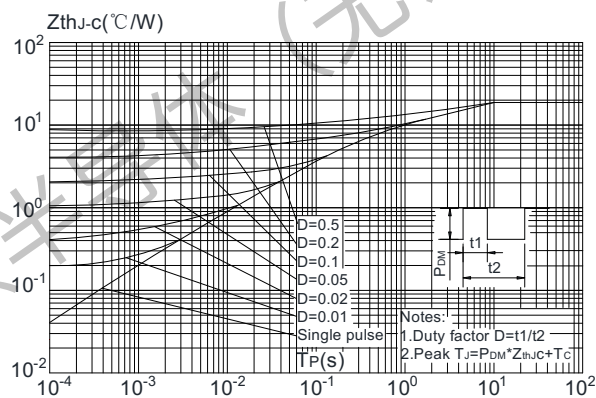
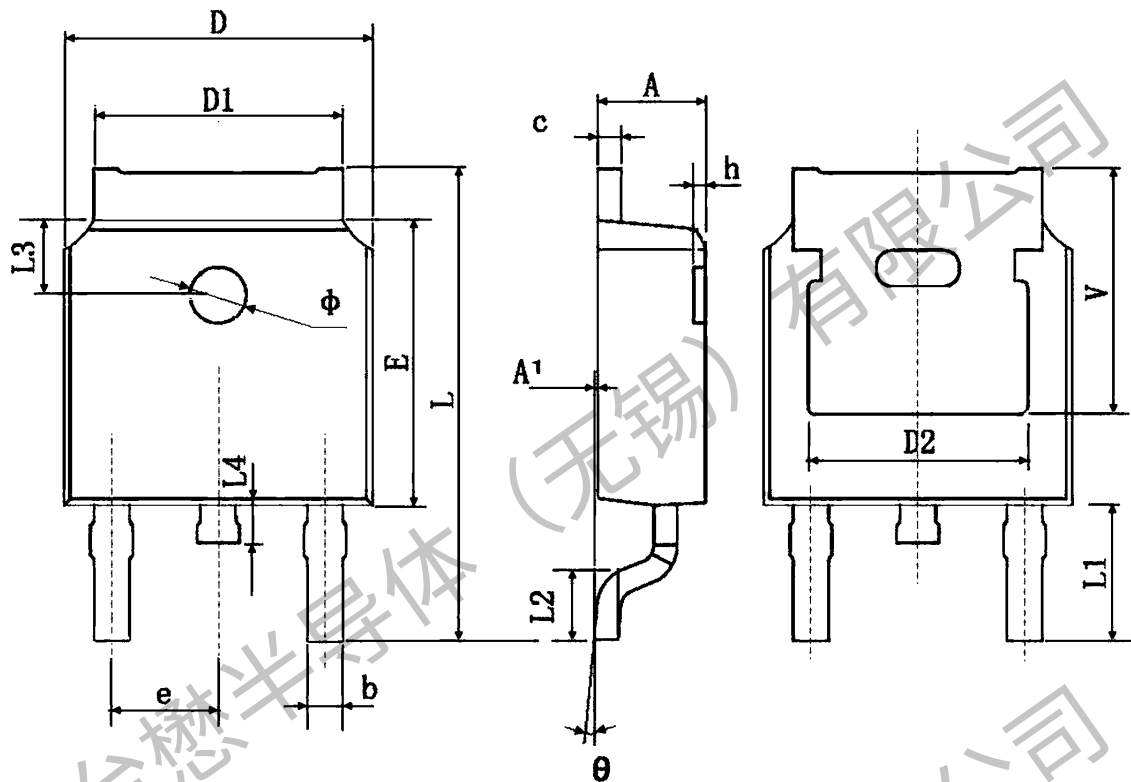


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

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P-Channel Enhancement Mosfet

Package Mechanical Data: TO-252-3L

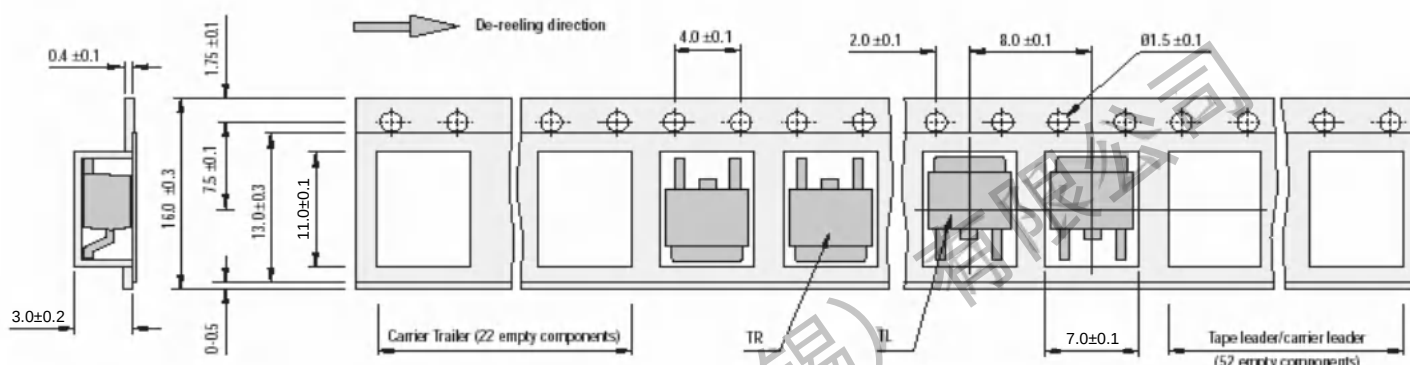


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

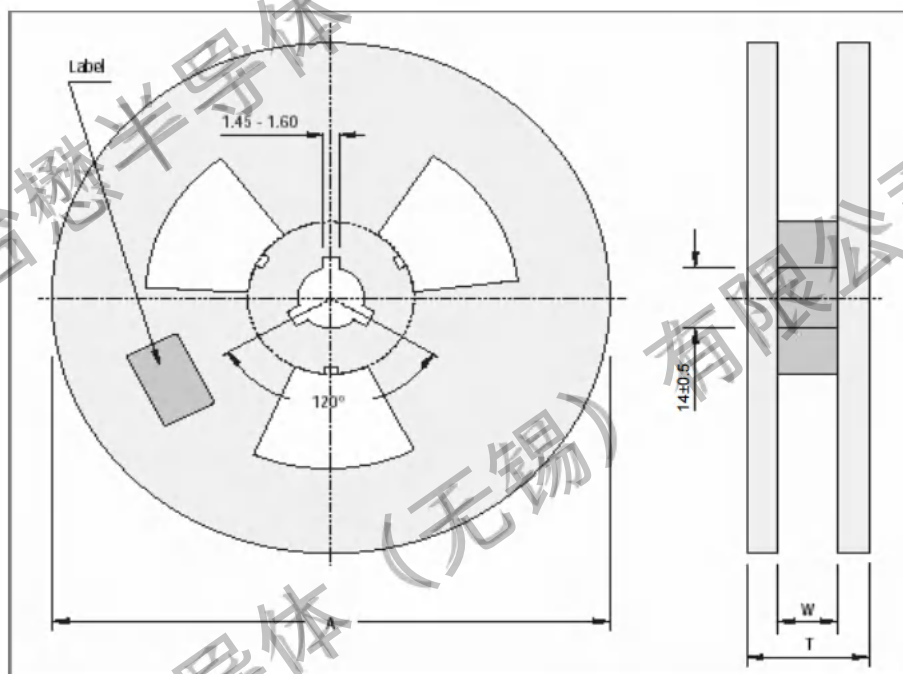
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P-Channel Enhancement Mosfet

TO-252-3L Embossed Carrier Tape



TO-252-3L Reel



All Dimensions are in mm.

Reel Specifications				
Package	Tape Width	Reel Dia. A - Max	Inside Thickness W	Reel Thickness T - max
TO-252-3L	16	330	18.0 ± 1.5	20

Packaging Information

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
2,500 pcs	13 inch	5,000 pcs	355×370×50	25,000 pcs	380×275×380	

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Revision history:

Date	Rev	Description	Page
2023.05.24	23.05	Original	