



TM60N04D

N-Channel Enhancement Mosfet

General Description

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

Applications

- Load switch
- PWM

General Features

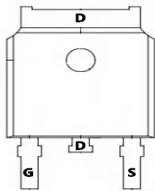
$V_{DS} = 40V$ $I_D = 60A$

$R_{DS(ON)} = 7.8m\Omega$ (Typ.) @ $V_{GS} = 10V$

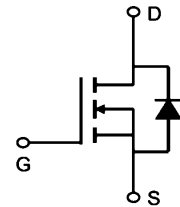
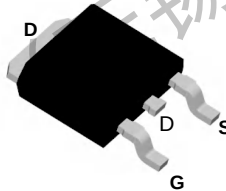
100% UIS Tested
100% R_g Tested



D:TO-252-3L



Marking: 60N04



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, $V_{GS} @ 10V^1$	60	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	48	A
I_{DM}	Pulsed Drain Current ²	180	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ³	60	W
$P_D @ T_C = 100^\circ C$	Total Power Dissipation ³	30	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_J=25°C unless otherwise specified)

Symbol	Parameter	Test Conditions				Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =32V, V _{GS} =0V T _J =85°C	-	-	1	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1.2	1.6	2.0	
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^a	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =20A	-	7.8	12	mΩ
		V _{GS} =4.5V, I _{DS} =10A	-	13	17	
Diode Characteristics						
V _{SD} ^a	Diode Forward Voltage	I _{SD} =20A, V _{GS} =0V	-	0.8	1.1	V
t _{rr}	Reverse Recovery Time	I _{DS} =40A, dI _{SD} /dt=100A/μs	-	28	-	ns
Q _{rr}	Reverse Recovery Charge		-	24	-	nC
Dynamic Characteristics ^b						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	1.4	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =20V, Frequency=1.0MHz	-	1260	-	pF
C _{oss}	Output Capacitance		-	180	-	
C _{rss}	Reverse Transfer Capacitance		-	146	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =20V, R _L =20Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	11	21	ns
t _r	Turn-on Rise Time		-	13	24	
t _{d(OFF)}	Turn-off Delay Time		-	37	67	
t _f	Turn-off Fall Time		-	11	21	
Gate Charge Characteristics ^b						
Q _g	Total Gate Charge	V _{DS} =20V, V _{GS} =10V, I _{DS} =40A	-	31.2	44	nC
Q _{gs}	Gate-Source Charge		-	3.8	-	
Q _{gd}	Gate-Drain Charge		-	9	-	

Note a : Pulse test ; pulse width≤300μs, duty cycle≤2%.

Note b : Guaranteed by design, not subject to production testing.

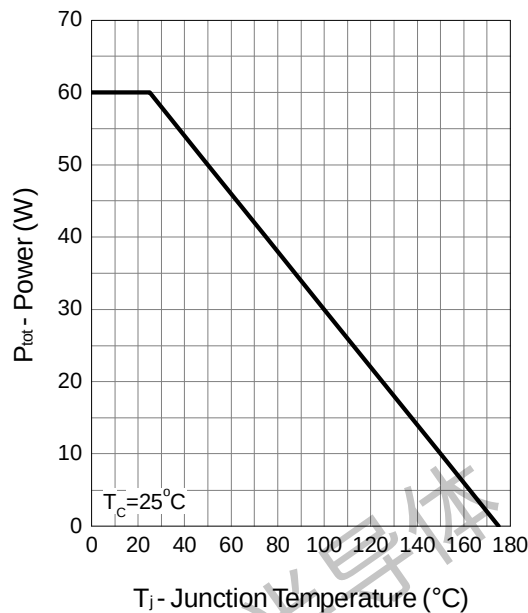


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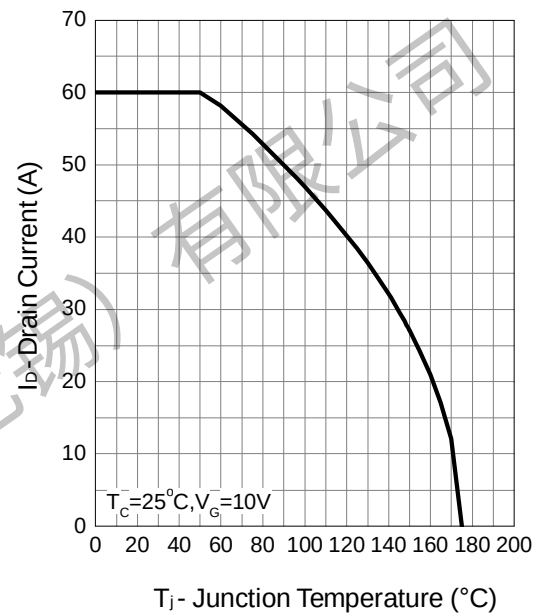
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Typical Performance Characteristics

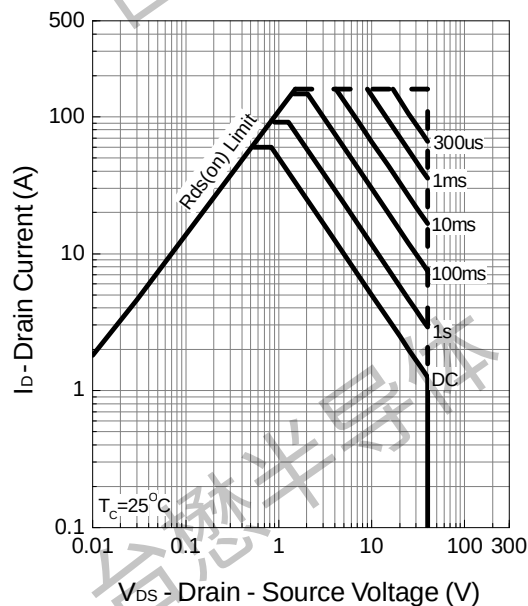
Power Dissipation



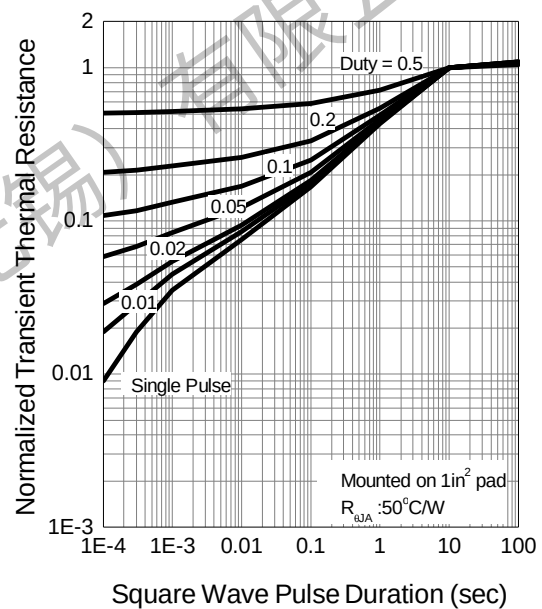
Drain Current



Safe Operation Area



Thermal Transient Impedance

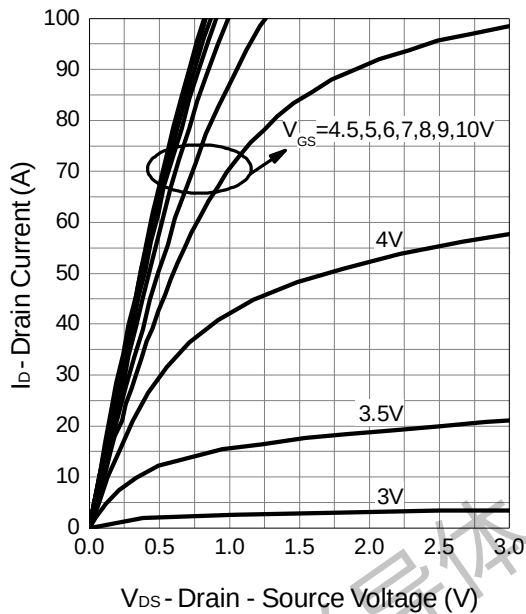




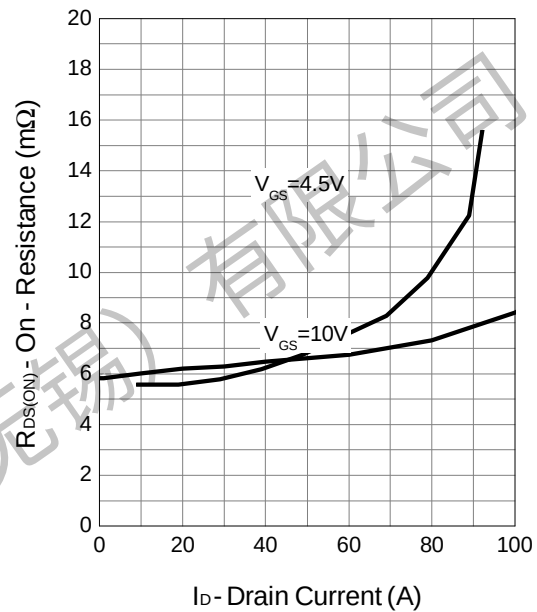
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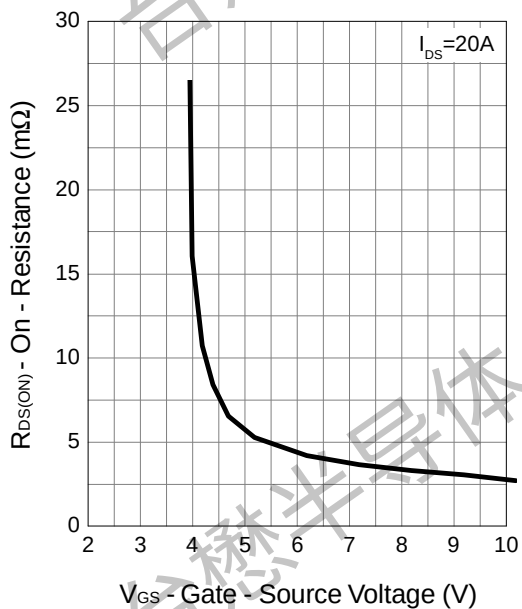
Output Characteristics



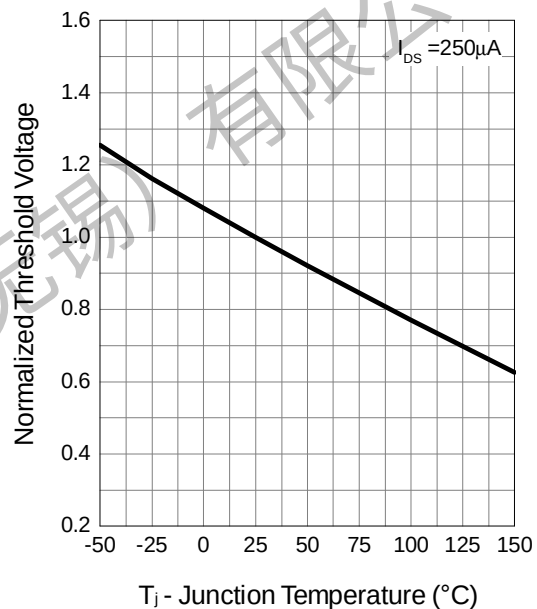
Drain-Source On Resistance



Gate-Source On Resistance



Gate Threshold Voltage

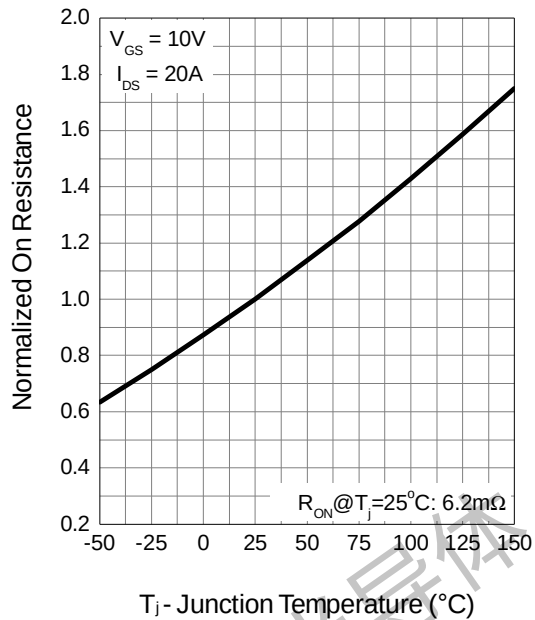




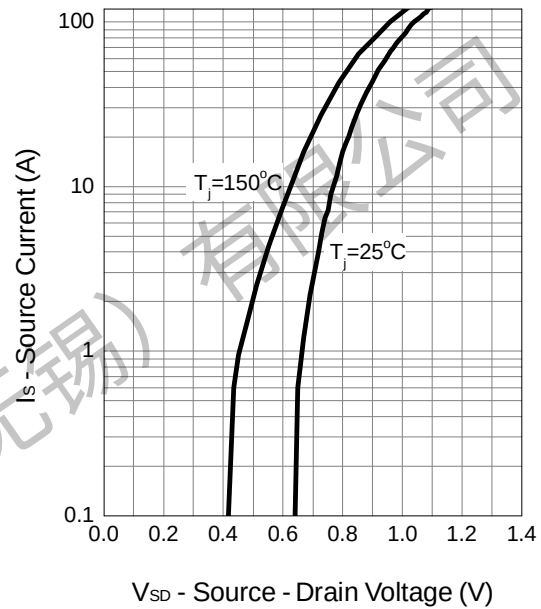
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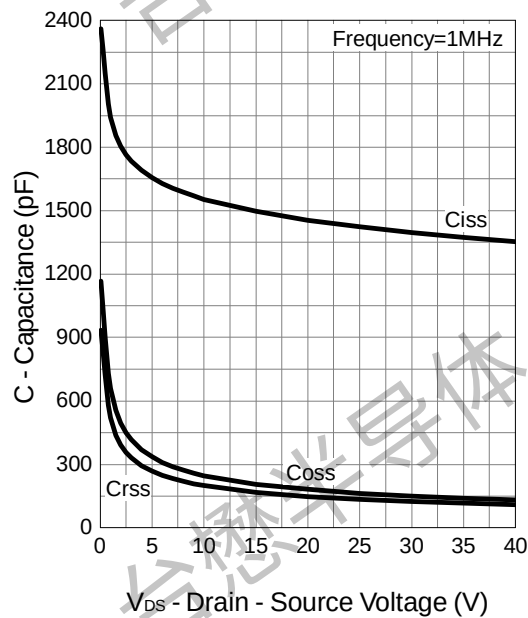
Drain-Source On Resistance



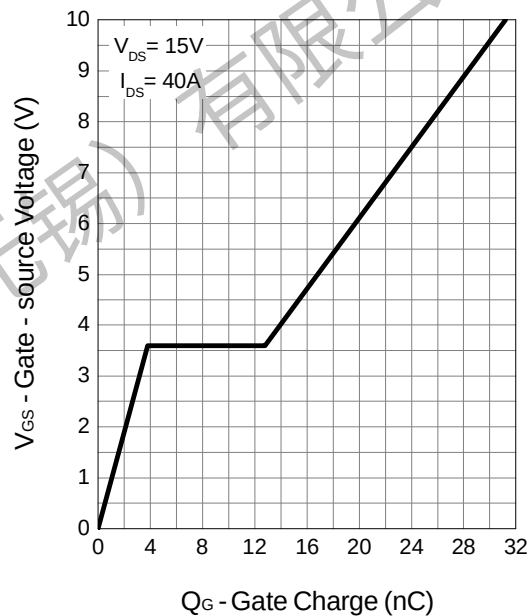
Source-Drain Diode Forward



Capacitance



Gate Charge

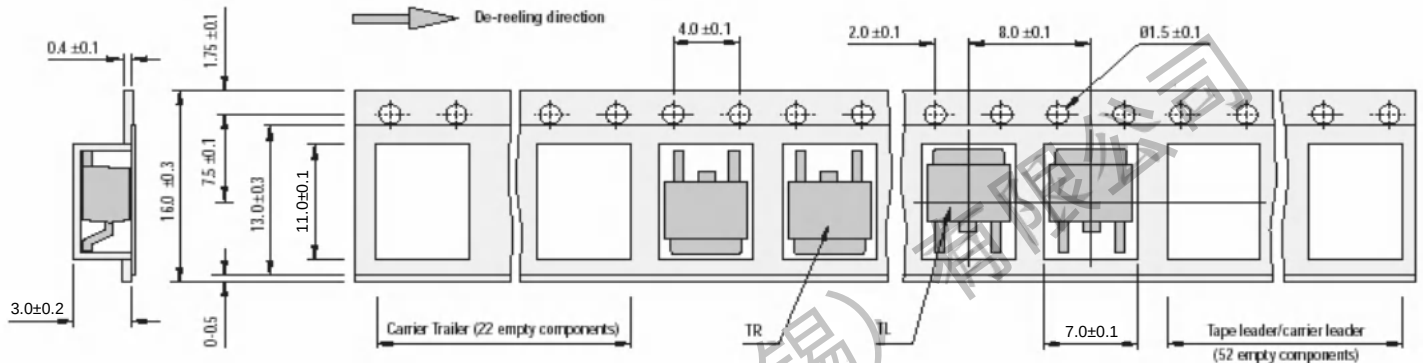




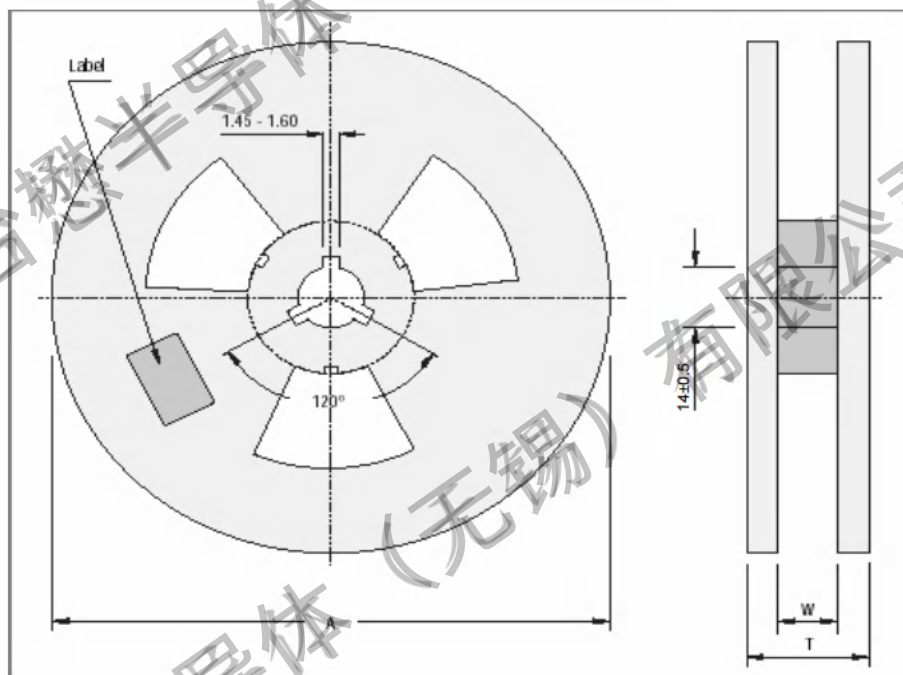
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TO-252-3L Embossed Carrier Tape



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
2023.05.09	23.05	Original	