


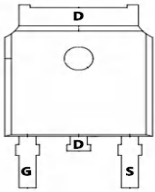
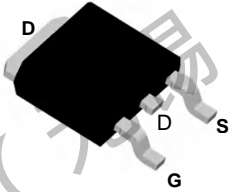
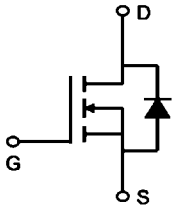


# TM60N06AD

# N-Channel Enhancement Mosfet

<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>• Low R<sub>DS(ON)</sub></li> <li>• RoHS and Halogen-Free Compliant</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>• Load switch</li> <li>• PWM</li> </ul>	<p><b>General Features</b></p> <p>V<sub>DS</sub> = 60V I<sub>D</sub> = 58A</p> <p>R<sub>DS(ON)</sub> = 10 mΩ (typ.) @ V<sub>GS</sub> = 10V</p> <p>100% UIS Tested 100% R<sub>g</sub> Tested</p> 
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**D:TO-252-3L**

Marking: 60N06A

**Absolute Maximum Ratings** (T<sub>C</sub> = 25°C Unless Otherwise Noted)

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	58	A
I <sub>D</sub> @T <sub>C</sub> =100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	31	A
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	168	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	81	mJ
I <sub>AS</sub>	Avalanche Current	10	A
P <sub>D</sub>	Total Power Dissipation <sup>3</sup>	75	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 175	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 175	°C

**Thermal Data**

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-ambient <sup>1</sup>	---	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	---	6.6	°C/W



**TM60N06AD**

**N-Channel Enhancement Mosfet**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\ \mu\text{A}$	60	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS}=0V, V_{DS}=60V$	---	---	1	$\mu\text{A}$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0A$	---	---	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	GATE-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$	1	2	3	V
$R_{DS(on)}$	Drain-Source On Resistance <sup>3</sup>	$V_{GS}=10V, I_D=30A$	---	10	12	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$	---	13	16	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$	---	1928	---	pF
$C_{oss}$	Output Capacitance		---	136	--	
$C_{rss}$	Reverse Transfer Capacitance		---	120	---	
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=30V, I_D=30A,$ $R_{ENG}=1.8\ \Omega, V_{GS}=10V$	---	10	---	ns
$t_r$	Rise Time		---	82	---	ns
$t_{d(off)}$	Turn-Off Delay Time		---	31	---	ns
$t_f$	Fall Time		---	101	---	ns
$Q_g$	Total Gate Charge		$V_{GS}=10V, V_{DS}=30V,$	---	47	---
$Q_{gs}$	Gate-Source Charge	$I_D=30A$	---	8.4	---	nc
$Q_{gd}$	Gate-Drain "Miller" Charge		---	11.55	---	nc
<b>Drain-Source Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_{SD}=30A$	---	---	1.2	V
$I_S$	Continuous Drain Current	$V_D=V_G=0V$	---	---	58	A
$I_{SM}$	Pulsed Drain Current		---	---	200	A
$T_{rr}$	Reverse Recovery Time	$I_F=30A, T_J=25^\circ\text{C}$	---	14	---	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt=100A/\mu\text{s}$	---	20	---	nc

**Notes:**

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition :  $T_J=25^\circ\text{C}, V_{DD}=30V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega, I_{AS}=18A$
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$ , Duty Cycle $\leq 0.5\%$



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Typical Characteristics

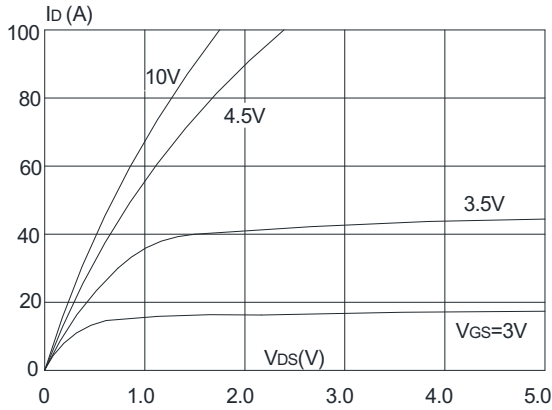


Figure 1: Output Characteristics

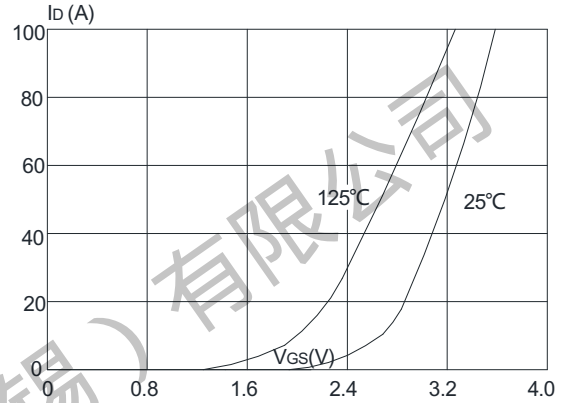


Figure 2: Typical Transfer Characteristics

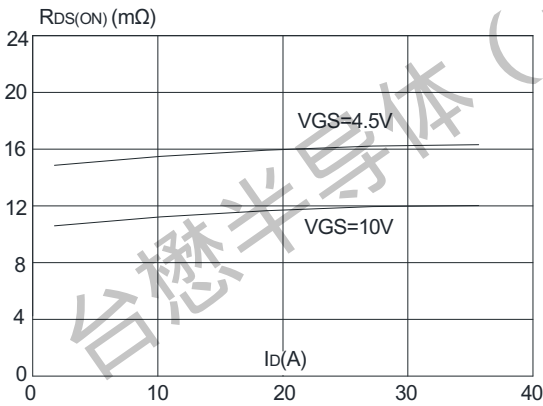


Figure 3: On-resistance vs. Drain Current

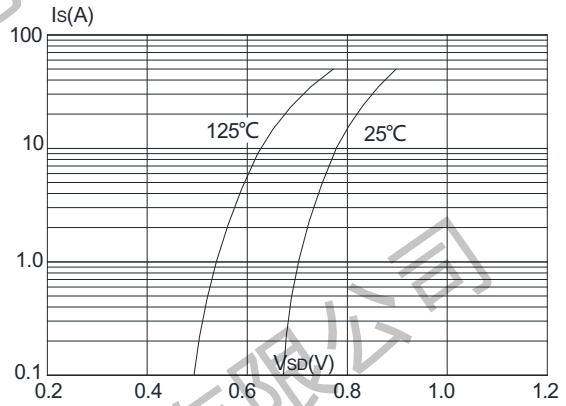


Figure 4: Body Diode Characteristics

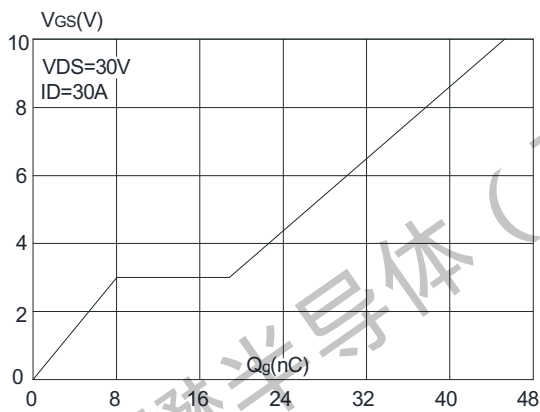


Figure 5: Gate Charge Characteristics

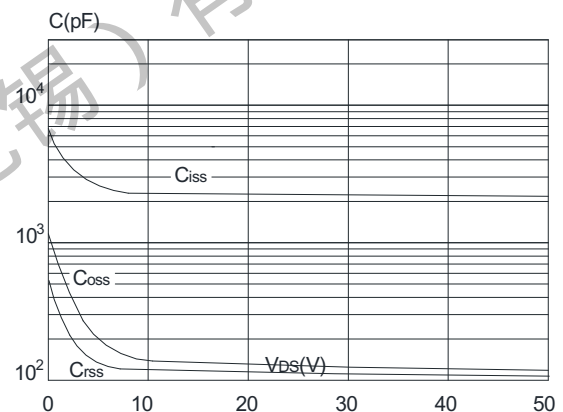


Figure 6: Capacitance Characteristics



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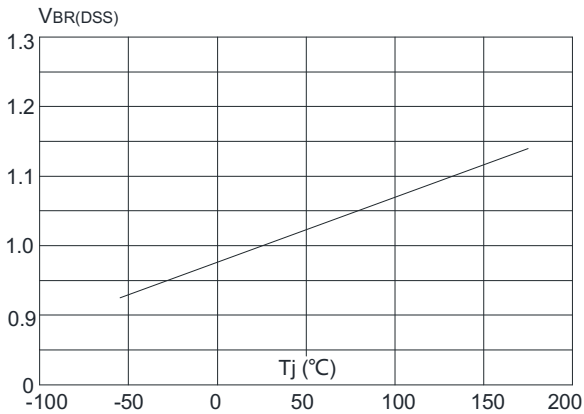


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

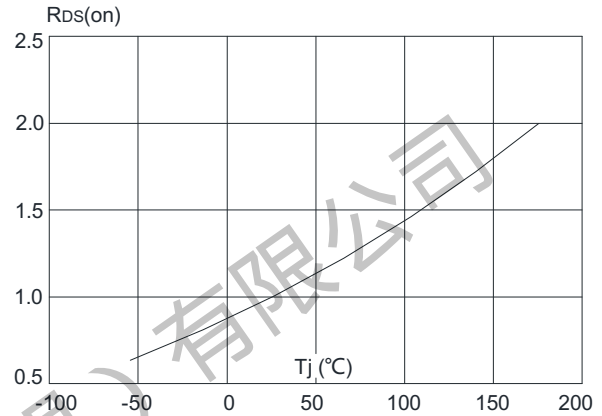


Figure 8: Normalized on Resistance vs. Junction Temperature

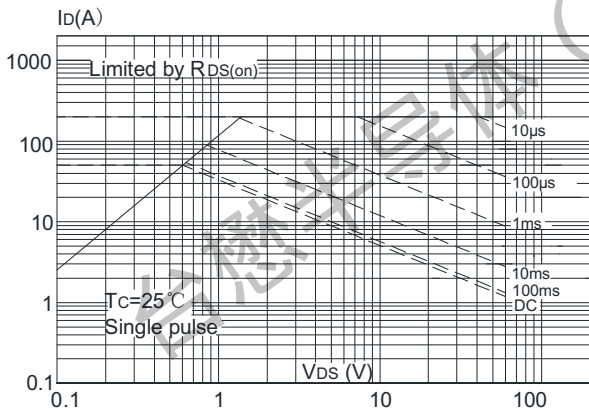


Figure 9: Maximum Safe Operating Area

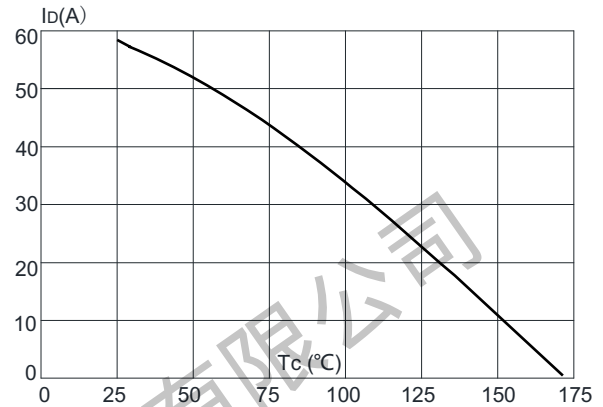


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

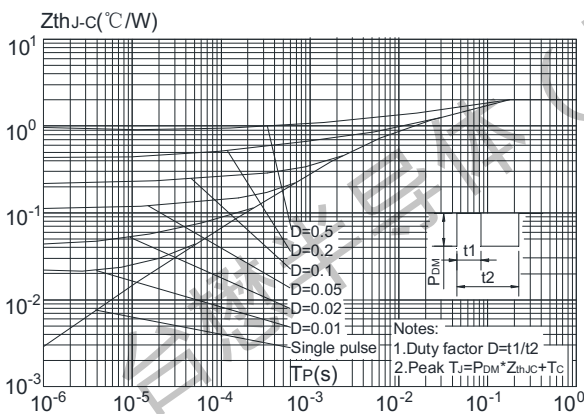


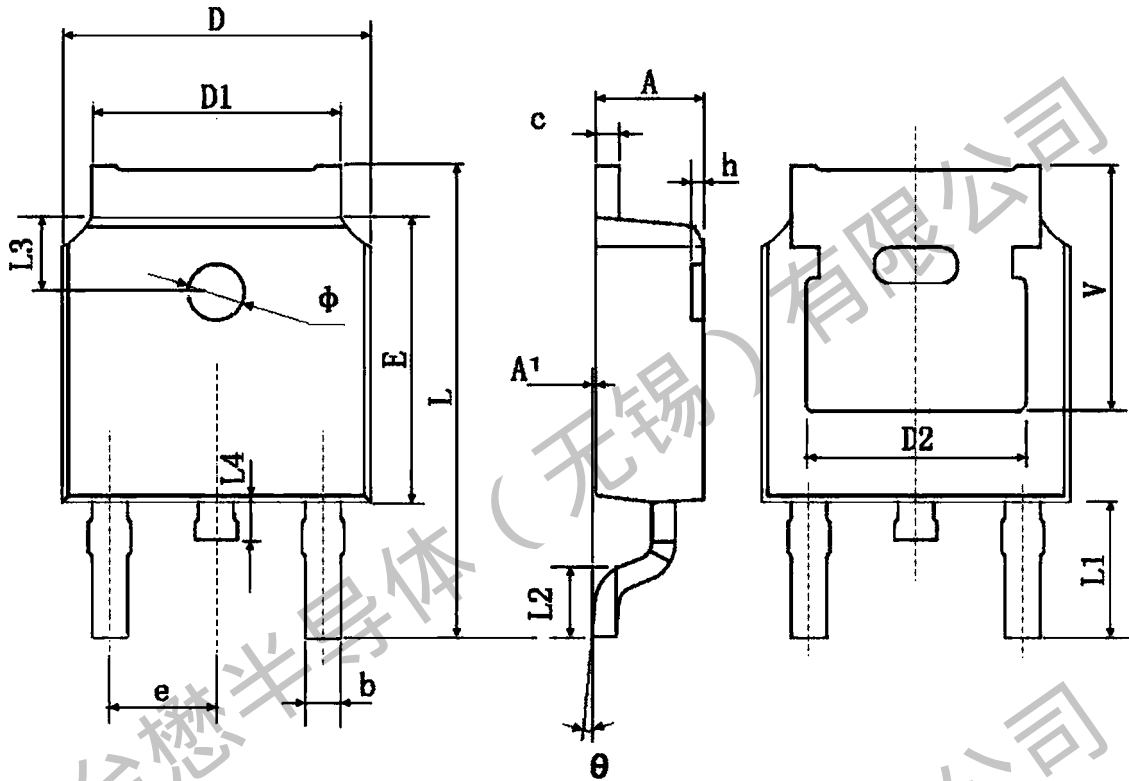
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



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Package Mechanical Data: TO-252-3L



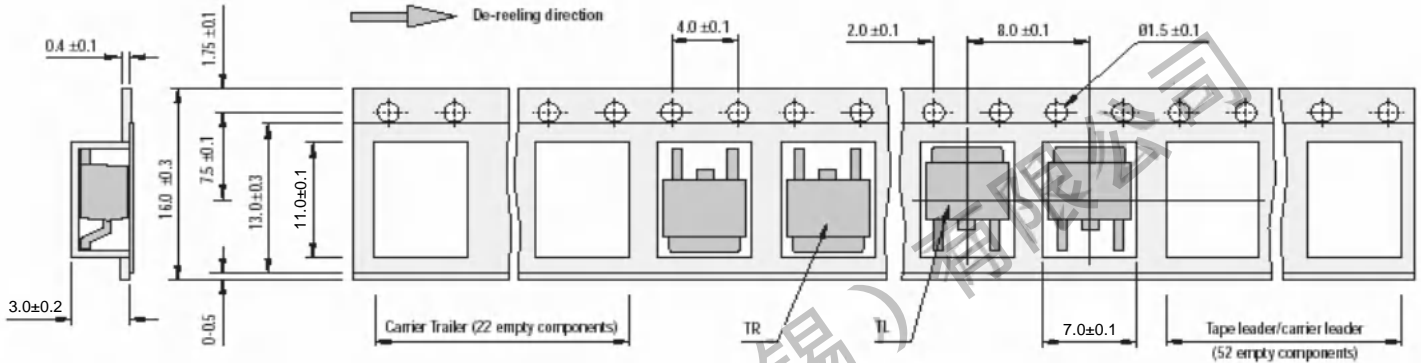
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	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.	



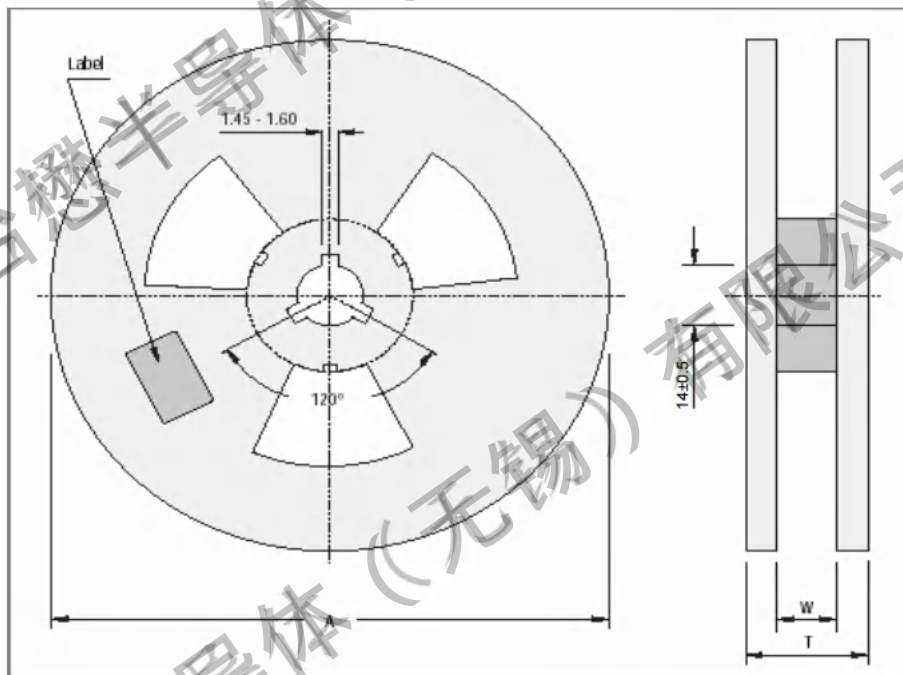
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N-Channel Enhancement Mosfet

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
2023.07.10	23.07	Original	