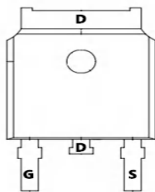
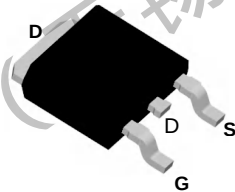
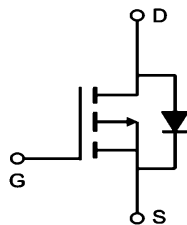


TM60P02D

P-Channel Enhancement Mosfet

General Description • Low $R_{DS(ON)}$ • RoHS and Halogen-Free Compliant Applications • Load switch • PWM General Features $V_{DS} = -20V$ $I_D = -60A$ $R_{DS(ON)} = 6.5m\Omega (typ.) @ V_{GS} = -4.5V$ 100% UIS Tested 100% R_g Tested 																																				
D:TO-252-3L    Marking: 60P02																																				
Absolute Maximum Ratings ($T_C = 25^{\circ}C$ Unless Otherwise Noted) <table><tr><th>Symbol</th><th>Parameter</th><th>Rating</th><th>Units</th></tr><tr><td>V_{DS}</td><td>Drain-Source Voltage</td><td>-20</td><td>V</td></tr><tr><td>V_{GS}</td><td>Gate-Source Voltage</td><td>± 12</td><td>V</td></tr><tr><td>$I_D @ T_C = 25^{\circ}C$</td><td>Continuous Drain Current, $V_{GS} @ -4.5V$</td><td>-60</td><td>A</td></tr><tr><td>$I_D @ T_C = 100^{\circ}C$</td><td>Continuous Drain Current, $V_{GS} @ -4.5V$</td><td>-36</td><td>A</td></tr><tr><td>I_{DM}</td><td>Pulsed Drain Current</td><td>-150</td><td>A</td></tr><tr><td>$P_D @ T_C = 25^{\circ}C$</td><td>Total Power Dissipation</td><td>70</td><td>W</td></tr><tr><td>T_{STG}</td><td>Storage Temperature Range</td><td>-55 to 175</td><td>$^{\circ}C$</td></tr><tr><td>T_J</td><td>Operating Junction Temperature Range</td><td>-55 to 175</td><td>$^{\circ}C$</td></tr></table>	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, $V_{GS} @ -4.5V$	-60	A	$I_D @ T_C = 100^{\circ}C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-36	A	I_{DM}	Pulsed Drain Current	-150	A	$P_D @ T_C = 25^{\circ}C$	Total Power Dissipation	70	W	T_{STG}	Storage Temperature Range	-55 to 175	$^{\circ}C$	T_J	Operating Junction Temperature Range	-55 to 175	$^{\circ}C$
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Thermal Data <table><tr><th>Symbol</th><th>Parameter</th><th>Typ.</th><th>Max.</th><th>Unit</th></tr><tr><td>$R_{\theta JA}$</td><td>Thermal Resistance Junction-ambient</td><td>---</td><td>62</td><td>$^{\circ}C/W$</td></tr><tr><td>$R_{\theta JC}$</td><td>Thermal Resistance Junction-Case</td><td>---</td><td>6.6</td><td>$^{\circ}C/W$</td></tr></table>	Symbol	Parameter	Typ.	Max.	Unit	$R_{\theta JA}$	Thermal Resistance Junction-ambient	---	62	$^{\circ}C/W$	$R_{\theta JC}$	Thermal Resistance Junction-Case	---	6.6	$^{\circ}C/W$																					
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TM60P02D
P-Channel Enhancement Mosfet
Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D = -250μA	-20	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -20V, V _{GS} = 0V,	-	-	-1	μA
I _{GSS}	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} = ±12V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250μA	-0.4	-0.65	-1.0	V
R _{DS(on)}	Static Drain-Source on-Resistance note3	V _{GS} =-4.5V, I _D =-15A	-	6.5	7.5	mΩ
		V _{GS} =-2.5V, I _D =-12A	-	8.8	11	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =-10V, V _{GS} =0V, f = 1.0MHz		3520	-	pF
C _{oss}	Output Capacitance		-	505	-	pF
C _{rss}	Reverse Transfer Capacitance		-	440	-	pF
Q _g	Total Gate Charge	V _{DS} =-10V, I _D =-15A, V _{GS} =-4.5V	-	46	-	nC
Q _{gs}	Gate-Source Charge		-	7.3	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	10	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =-10V, I _D =-14A, R _{GEN} =2.7Ω, V _{GS} =-10V	-	8	-	ns
t _r	Turn-on Rise Time		-	59	-	ns
t _{d(off)}	Turn-off Delay Time		-	111	-	ns
t _f	Turn-off Fall Time		-	43	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-60	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-240	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _S =-20A	-	-	-1.2	V
t _{rr}	Reverse Recovery Time	T _J =25℃, I _{SD} =-15A,	-	18	-	ns
Q _{rr}	Reverse Recovery Charge	V _{GS} =0V di/dt=-100A/μs	-	7.7	-	nC

Typical Performance Characteristics

Figure1: Output Characteristics

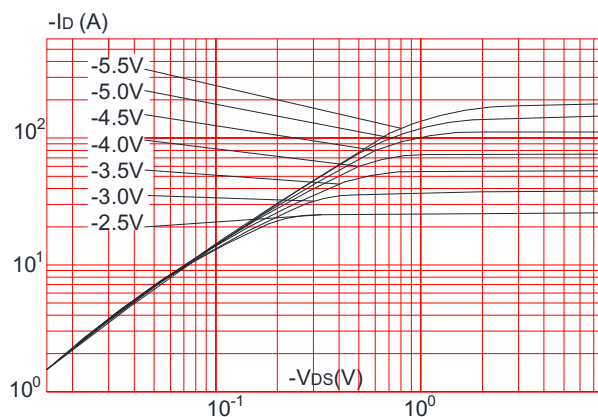


Figure 2: Typical Transfer Characteristics

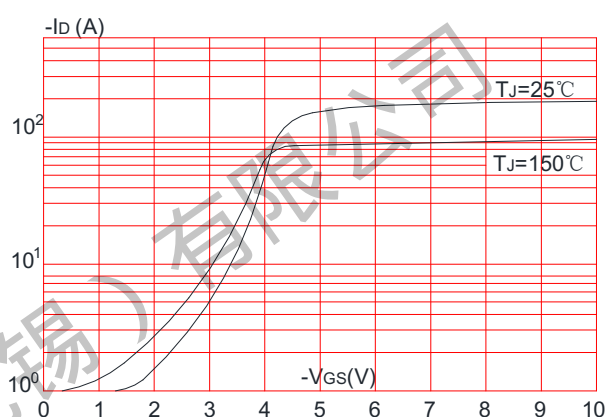


Figure 3: On-resistance vs. Drain Current

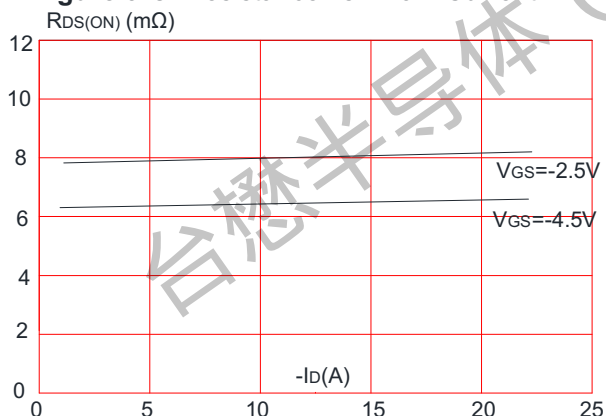


Figure 4: Body Diode Characteristics

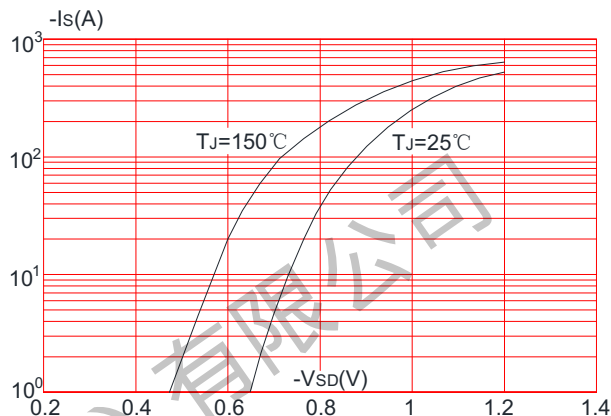


Figure 5: Gate Charge Characteristics

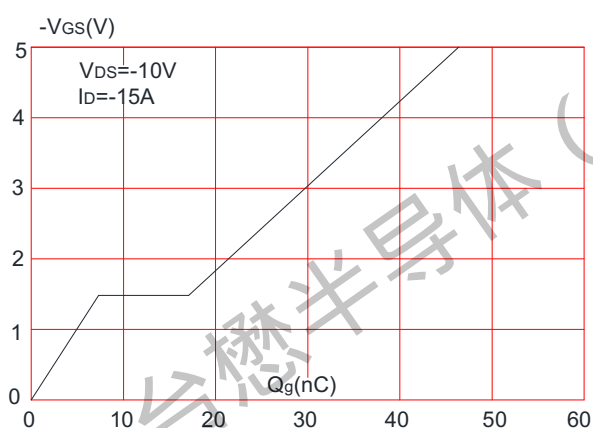
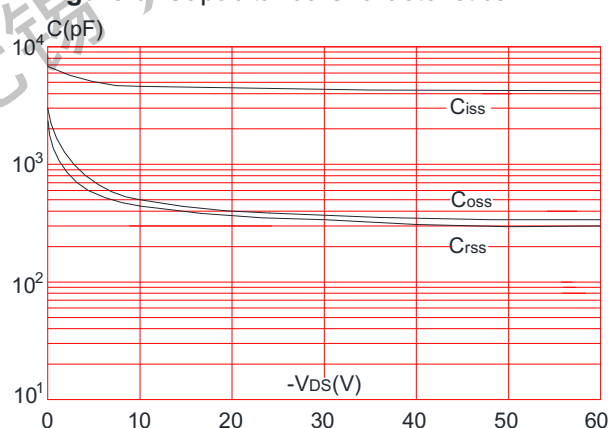


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

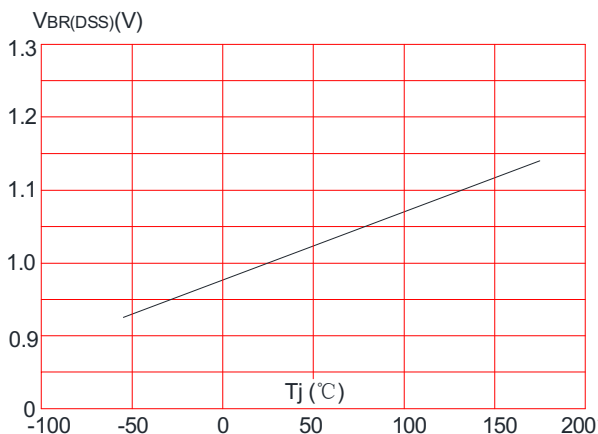


Figure 8: Normalized on Resistance vs. Junction Temperature

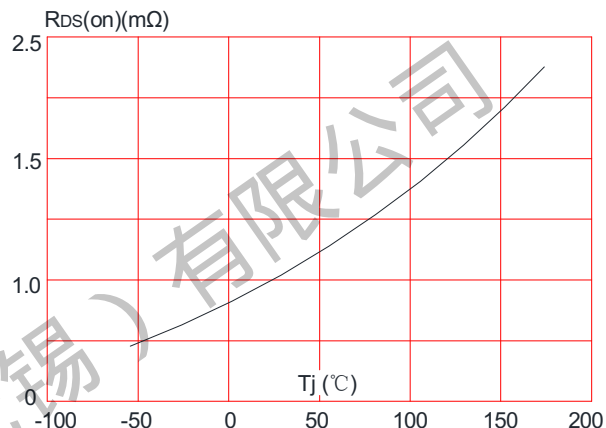


Figure 9: Maximum Safe Operating Area

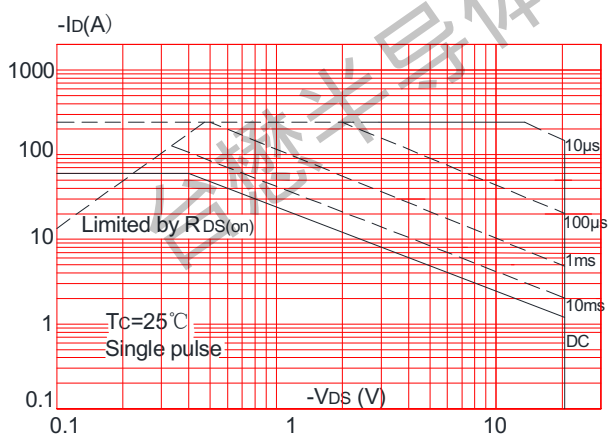


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

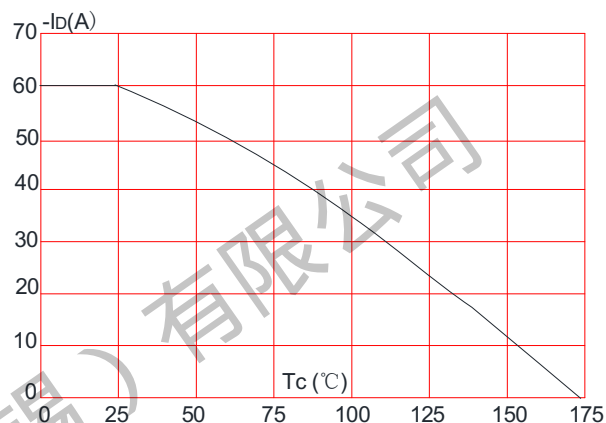
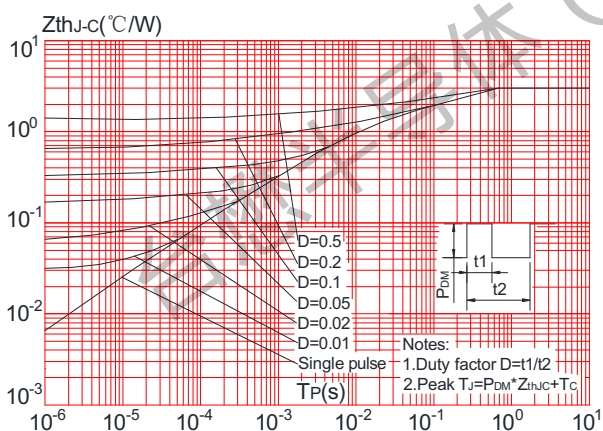


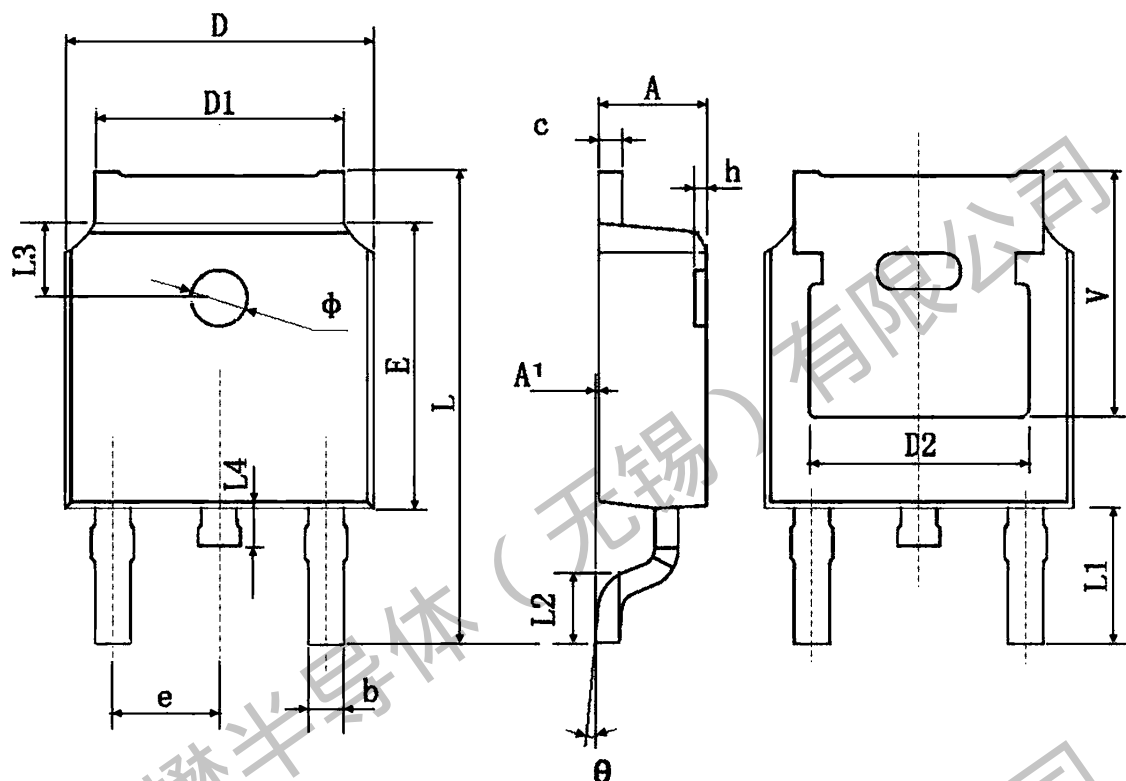
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



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Package Mechanical Data: TO-252-3L



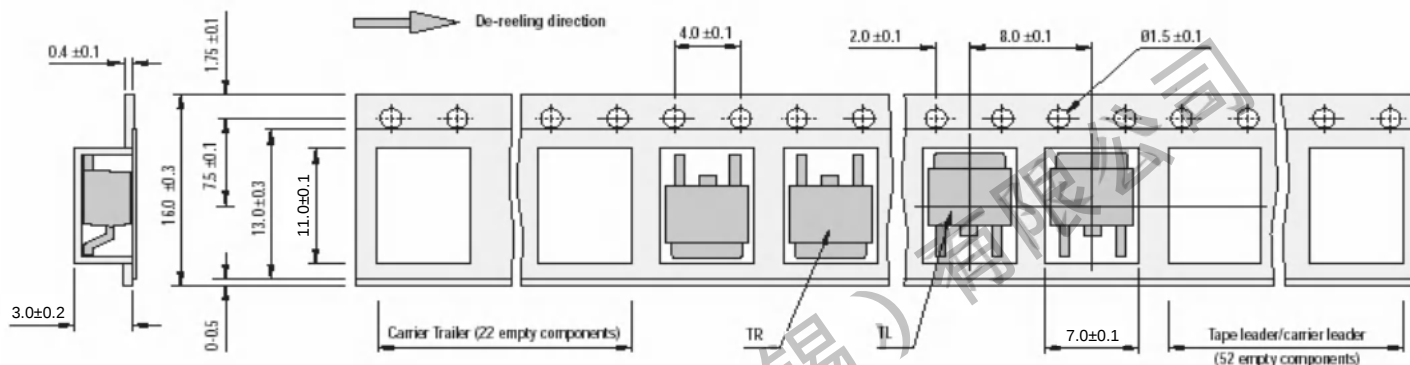
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	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
phi	1.100	1.300	0.043	0.051
theta	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	



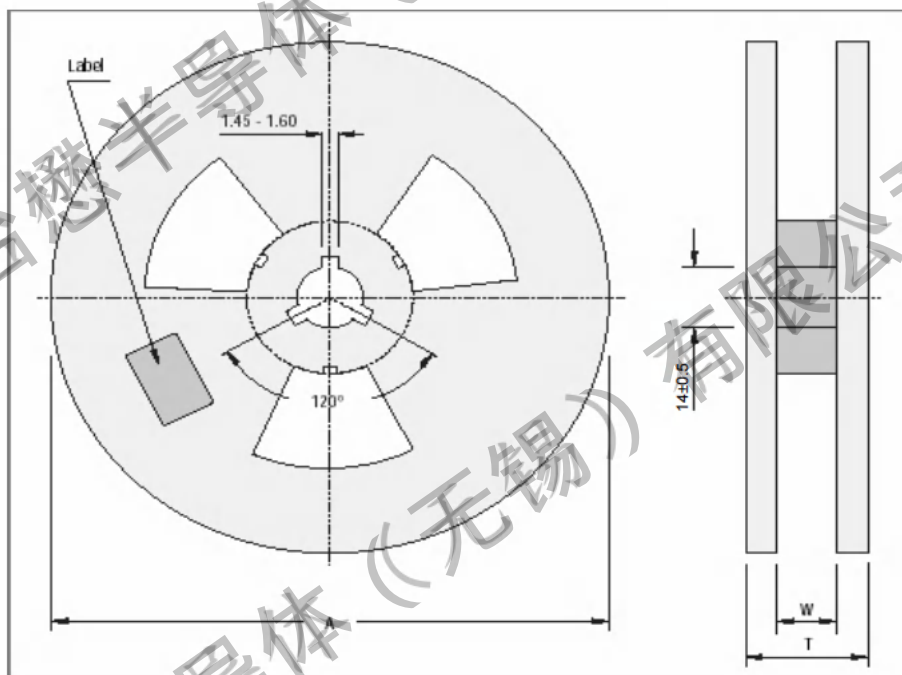
TM60P02D

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
2023.05.09	23.05	Original	