

TMN2090D

N-Channel Enhancement Mosfet

General Description

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

Applications

- Load switch
- PWM

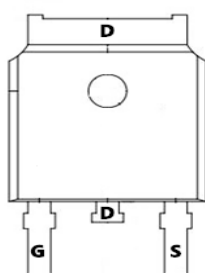
General Features

$V_{DS} = 20V$ $I_D = 90A$

$R_{DS(ON)} = 3.4m\Omega (typ.) @ V_{GS} = 4.5V$

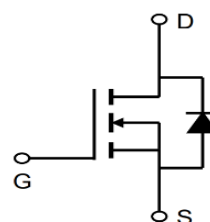
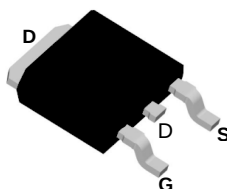
100% UIS Tested

100% R_g Tested



Marking: 90N02

D:TO-252-3L



Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	90	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	35	A
I_{DM}	Pulsed Drain Current ²	200	A
EAS	Single Pulse Avalanche Energy ³	58	mJ
I_{AS}	Avalanche Current	41	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ⁴	58	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R	Thermal Resistance Junction Case ¹		2.6	$^\circ C/W$

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N-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,	-	-	1.0	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	0.7	1.1	V
R _{DS(on)}	Static Drain-Source on-Resistance note3	V _{GS} =4.5V, I _D =30A		3.4	5	mΩ
		V _{GS} =2.5V, I _D =20A	-	4.75	6.5	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f = 1.0MHz	-	2500	-	pF
C _{oss}	Output Capacitance		-	407	-	pF
C _{rss}	Reverse Transfer Capacitance		-	386	-	pF
Q _g	Total Gate Charge	V _{DS} =10V, I _D =30A, V _{GS} =4.5V	-	32	-	nC
Q _{gs}	Gate-Source Charge		-	3	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	11	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DS} =10V, I _D =30A, R _{GEN} =3Ω, V _{GS} =4.5V	-	17	-	ns
t _r	Turn-on Rise Time		-	49	-	ns
t _{d(off)}	Turn-off Delay Time		-	74	-	ns
t _f	Turn-off Fall Time		-	26	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	90	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	300	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _S =30A	-	-	1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=10V$, $V_G=4.5V$, $L=0.5mH$, $R_G=25\Omega$, $I_{AS}=15A$

3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$

Typical Performance Characteristics

Figure 1: Output Characteristics

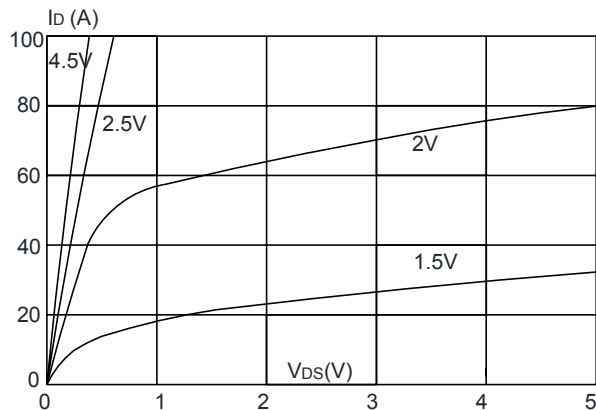


Figure 2: Typical Transfer Characteristics

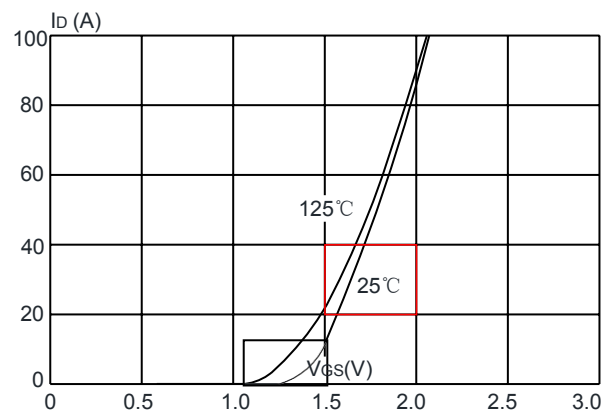


Figure 3: On-resistance vs. Drain Current

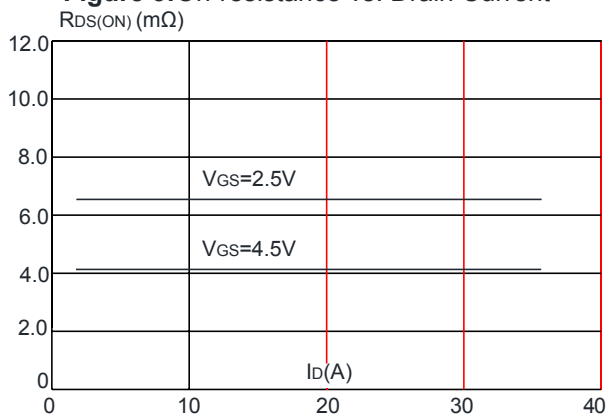


Figure 4: Body Diode Characteristics

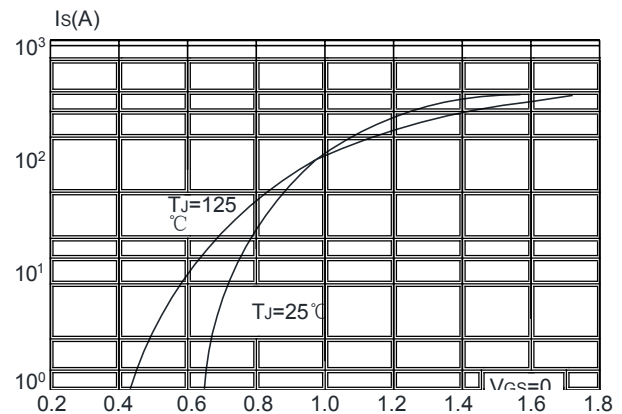


Figure 5: Gate Charge Characteristics

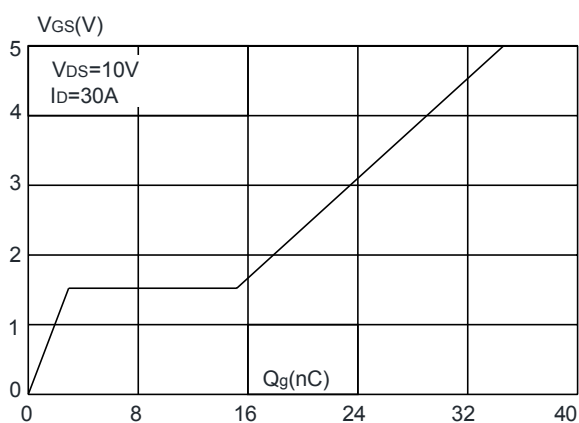
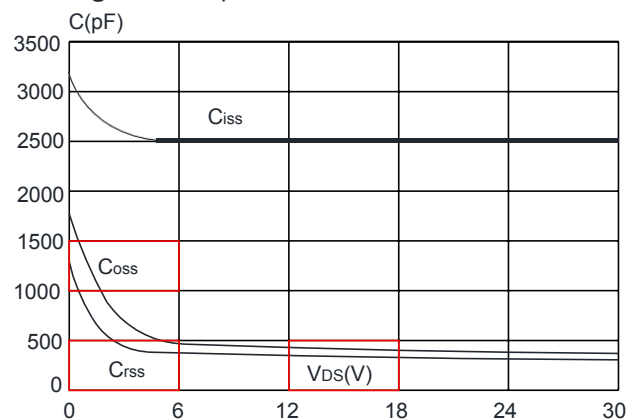
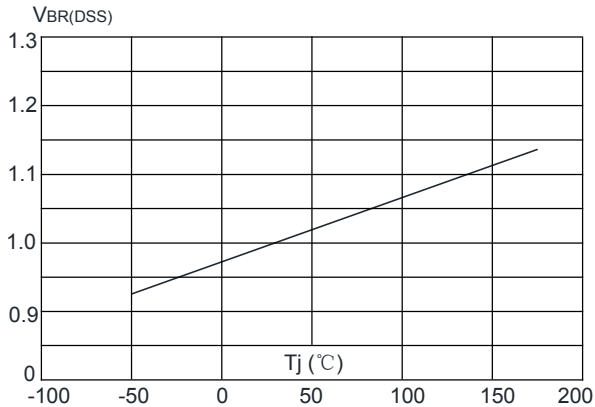
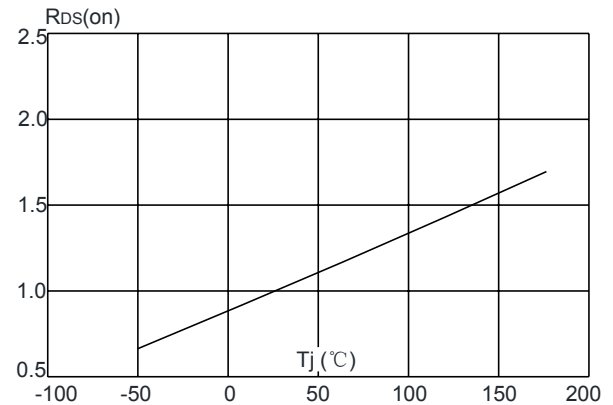
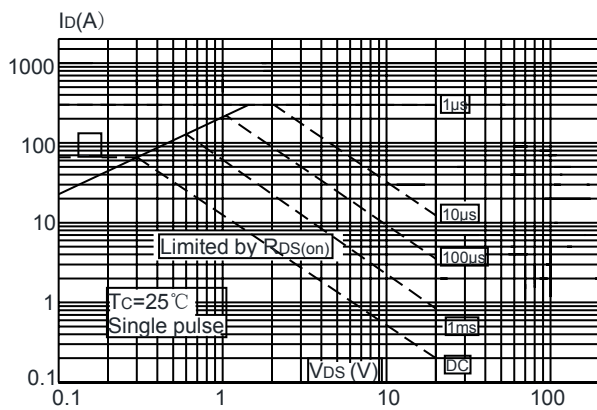
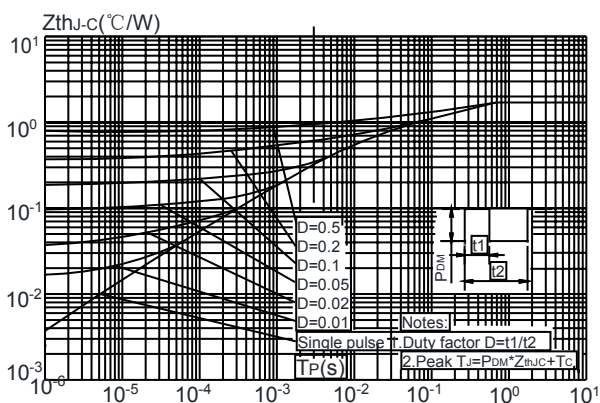
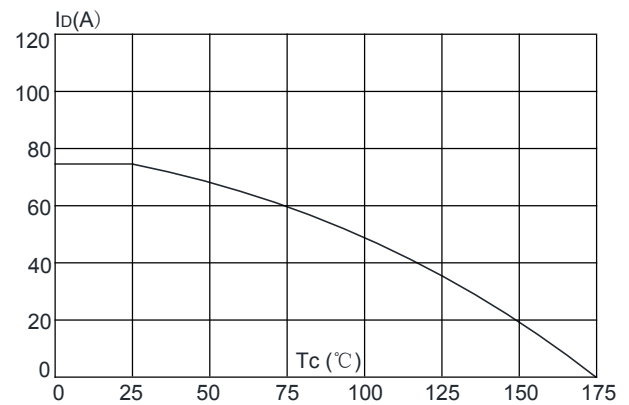
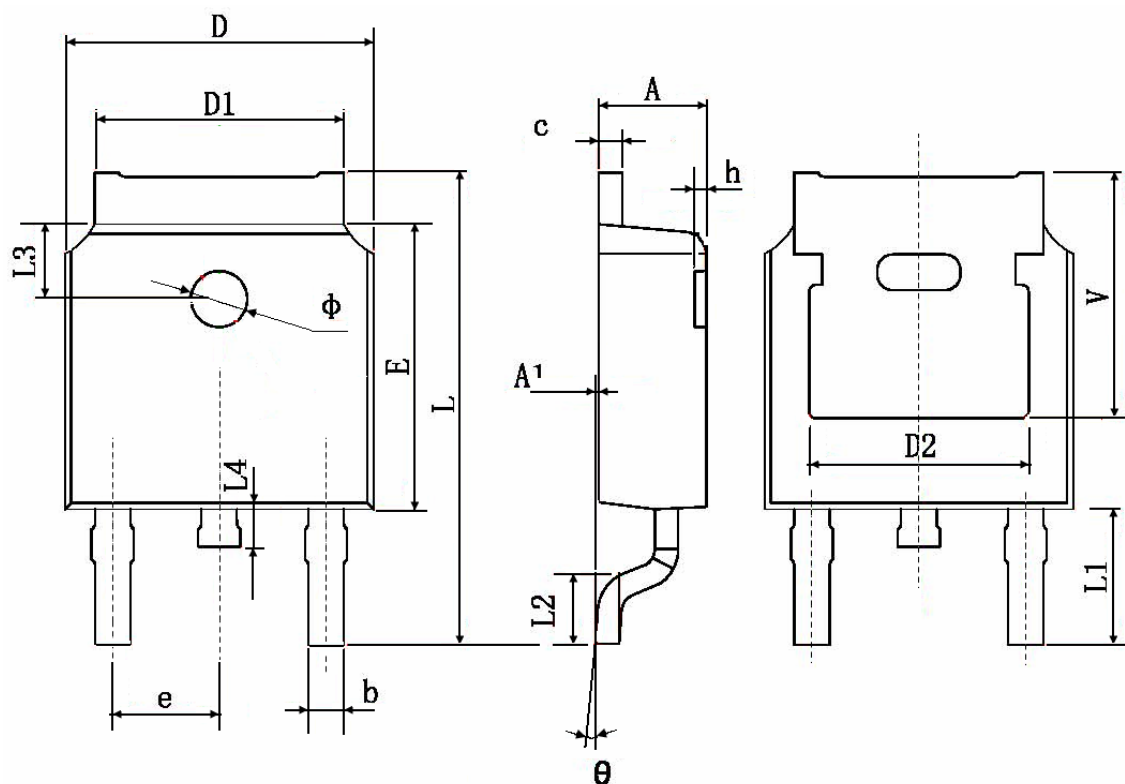


Figure 6: Capacitance Characteristics



**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature**Figure 8:** Normalized on Resistance vs. Junction Temperature**Figure 9:** Maximum Safe Operating Area**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature

Package Information: 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.	