

TMN3020D

N-Channel Enhancement Mosfet

General Description

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

Applications

- Load switch
- PWM

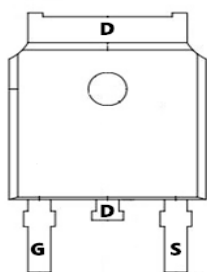
General Features

$V_{DS} = 30V$ $I_D = 20A$

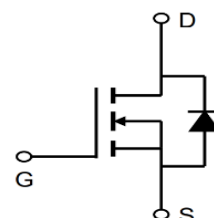
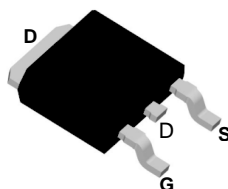
$R_{DS(ON)} = 15\text{ m}\Omega$ (Typ.) @ $V_{GS} = 10V$

100% UIS Tested

100% R_g Tested



D:TO-252-3L



Marking: 20N03

Absolute Maximum Ratings ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating		Units
		10s	Steady State	
V_{DS}	Drain-Source Voltage	30		V
V_{GS}	Gate-Source Voltage	± 20		V
$I_D @ T_c = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	20		A
$I_D @ T_c = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	8		A
I_{DM}	Pulsed Drain Current ²	38		A
EAS	Single Pulse Avalanche Energy ³	28		mJ
I_{AS}	Avalanche Current	13.8		A
$P_D @ T_c = 25^\circ\text{C}$	Total Power Dissipation ⁴	5.5		W
T_{STG}	Storage Temperature Range	-55 to 175		$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 175		$^\circ\text{C}$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	36	$^\circ\text{C/W}$



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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	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=30V, V_{GS}=0V,$	-	-	1.0	μA
I_{GSS}	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS}=10V, I_D=5A$	-	15	20	m Ω
		$V_{GS}=4.5V, I_D=3A$	-	21	29	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V,$ $f=1.0\text{MHz}$	-	490	-	pF
C_{oss}	Output Capacitance		-	79	-	pF
C_{rss}	Reverse Transfer Capacitance		-	61	-	pF
Q_g	Total Gate Charge	$V_{DS}=15V, I_D=5.8A,$ $V_{GS}=10V$	-	10	-	nC
Q_{gs}	Gate-Source Charge		-	1.7	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	2.5	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=15V, I_D=3A,$ $V_{GS}=10V, R_{REN}=3\Omega$	-	6	-	ns
t_r	Turn-on Rise Time		-	15	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	17	-	ns
t_f	Turn-off Fall Time		-	17	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	9	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	36	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=9A$	-	-	1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F=5A, di/dt=100A/\mu s$	-	7	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	2	-	nC

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

2. EAS condition : $T_J=25^\circ\text{C}, V_{DD}=15V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega, I_{AS}=6A$

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

Typical Performance Characteristics

Figure 1: Output Characteristics

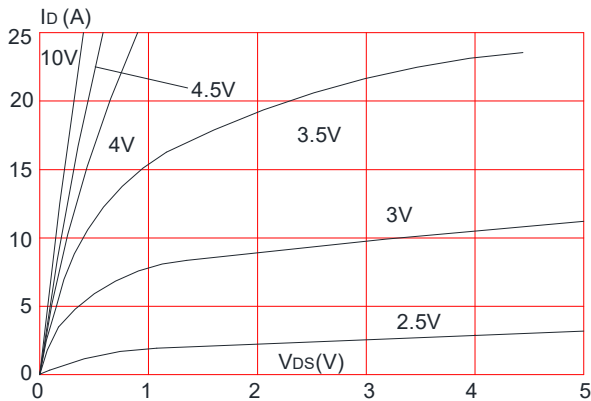


Figure 2: Typical Transfer Characteristics

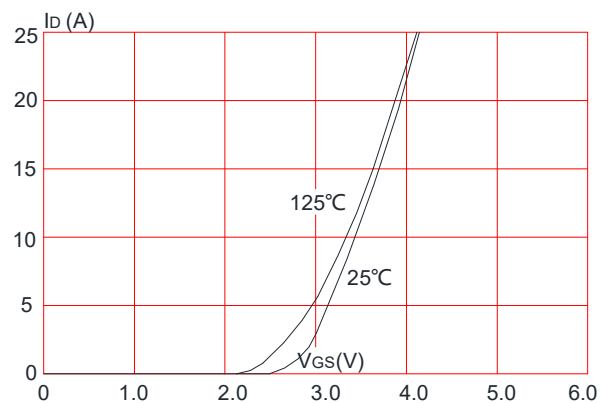


Figure 3: On-resistance vs. Drain Current

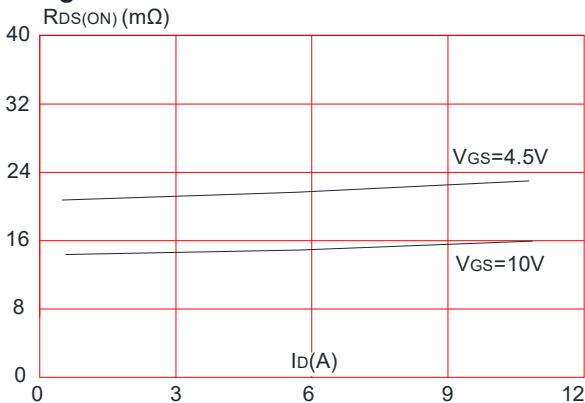


Figure 4: Body Diode Characteristics

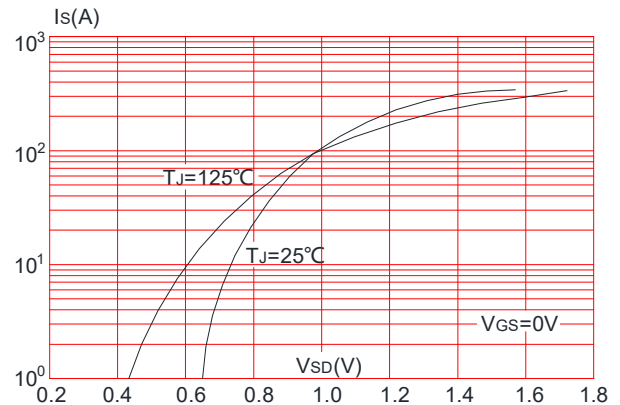


Figure 5: Gate Charge Characteristics

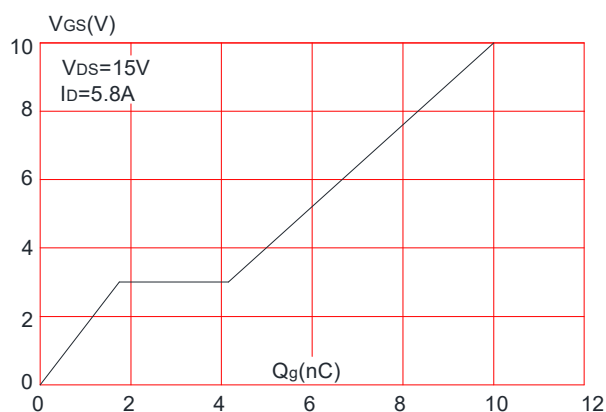
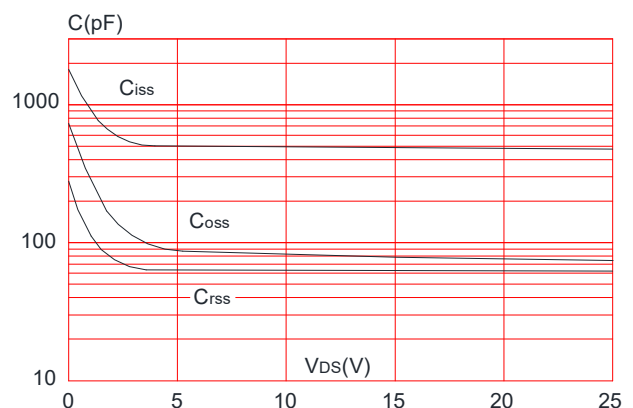


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

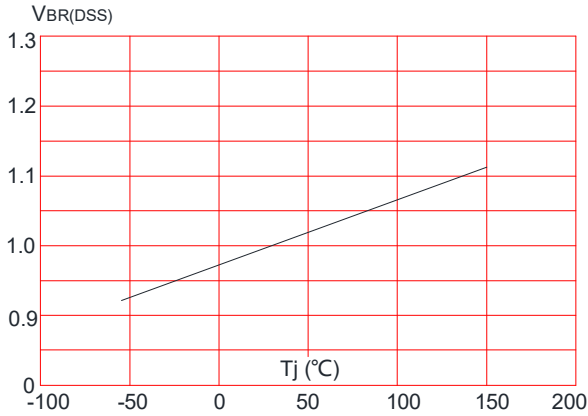


Figure 8: Normalized on Resistance vs. Junction Temperature

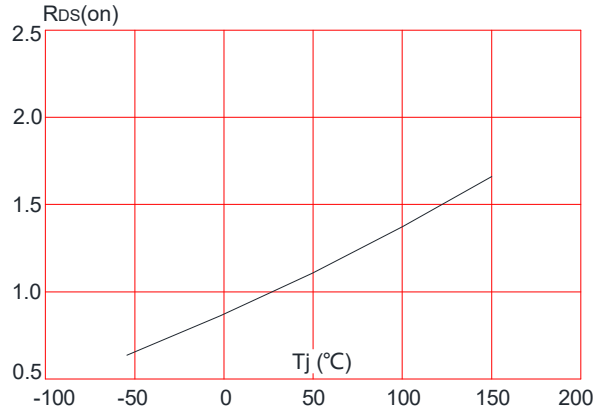


Figure 9: Maximum Safe Operating Area

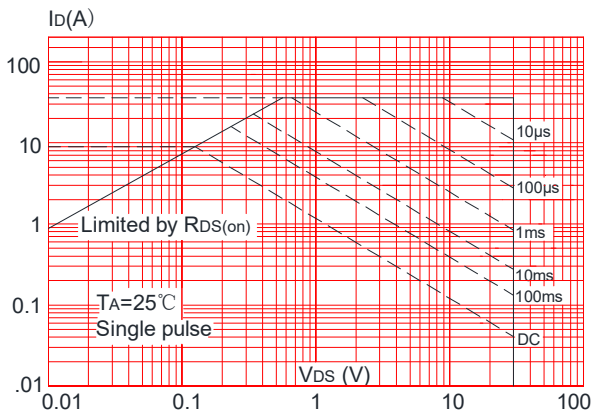


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

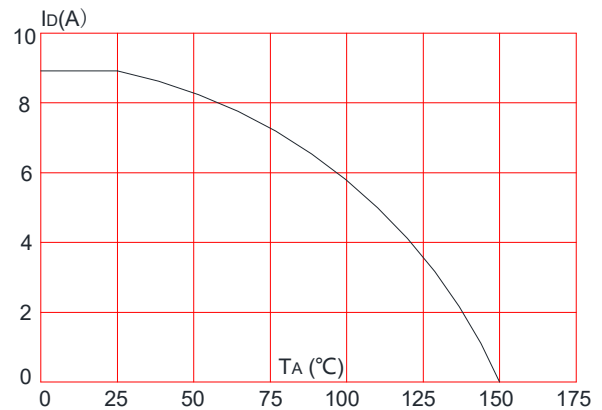
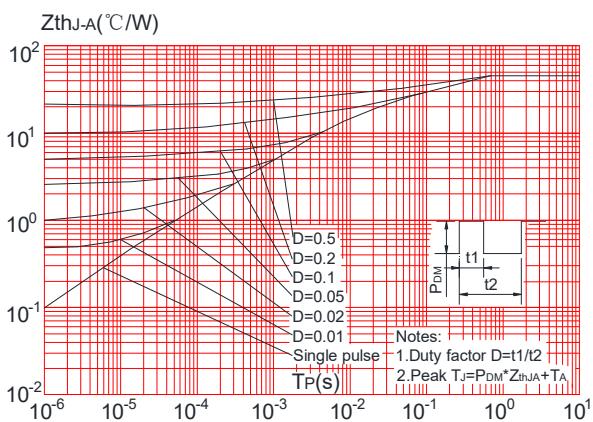


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



Test Circuit

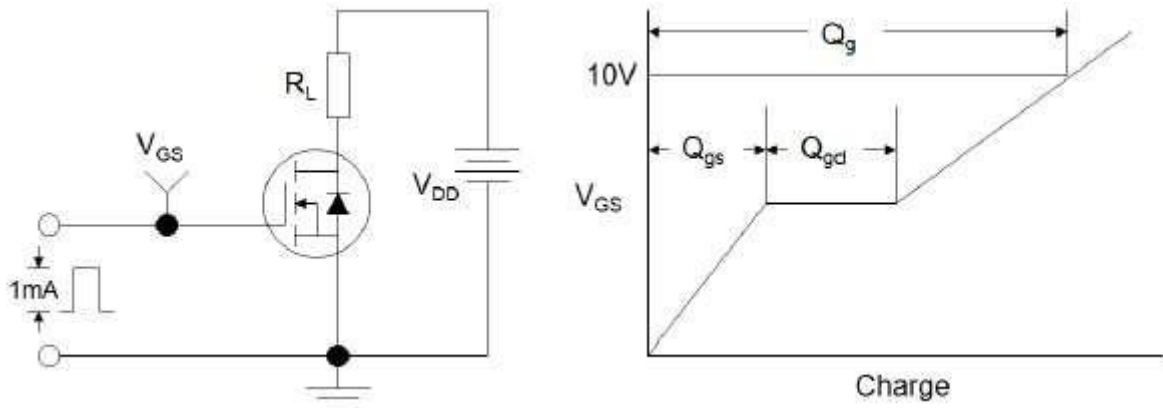


Figure1:Gate Charge Test Circuit & Waveform

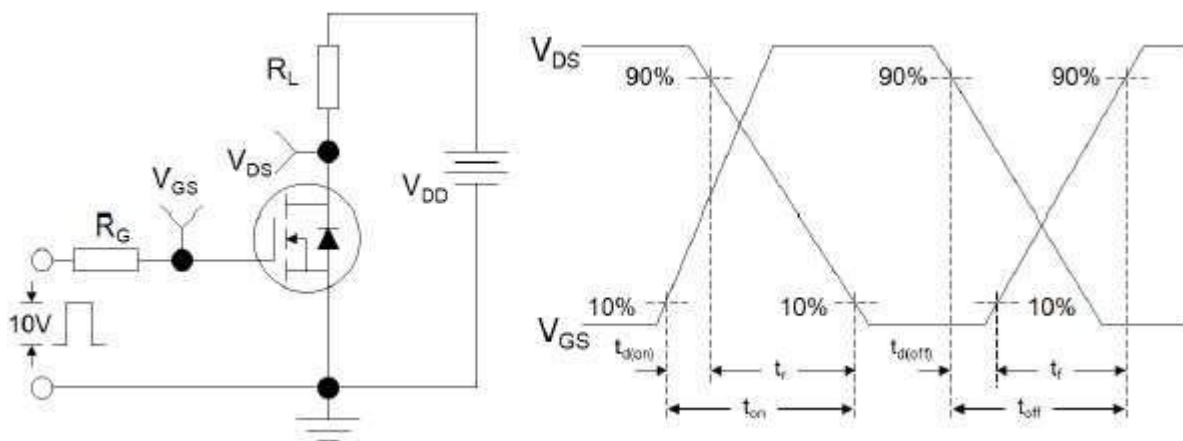


Figure 2: Resistive Switching Test Circuit & Waveforms

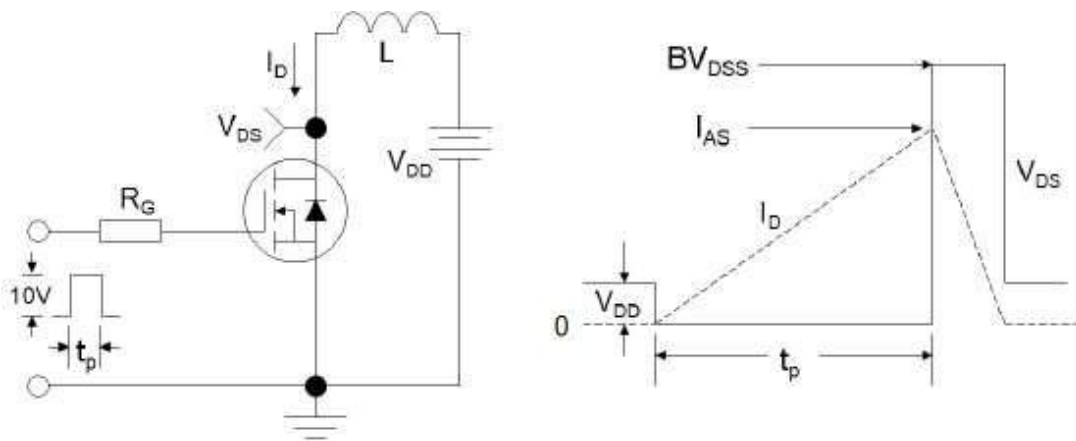
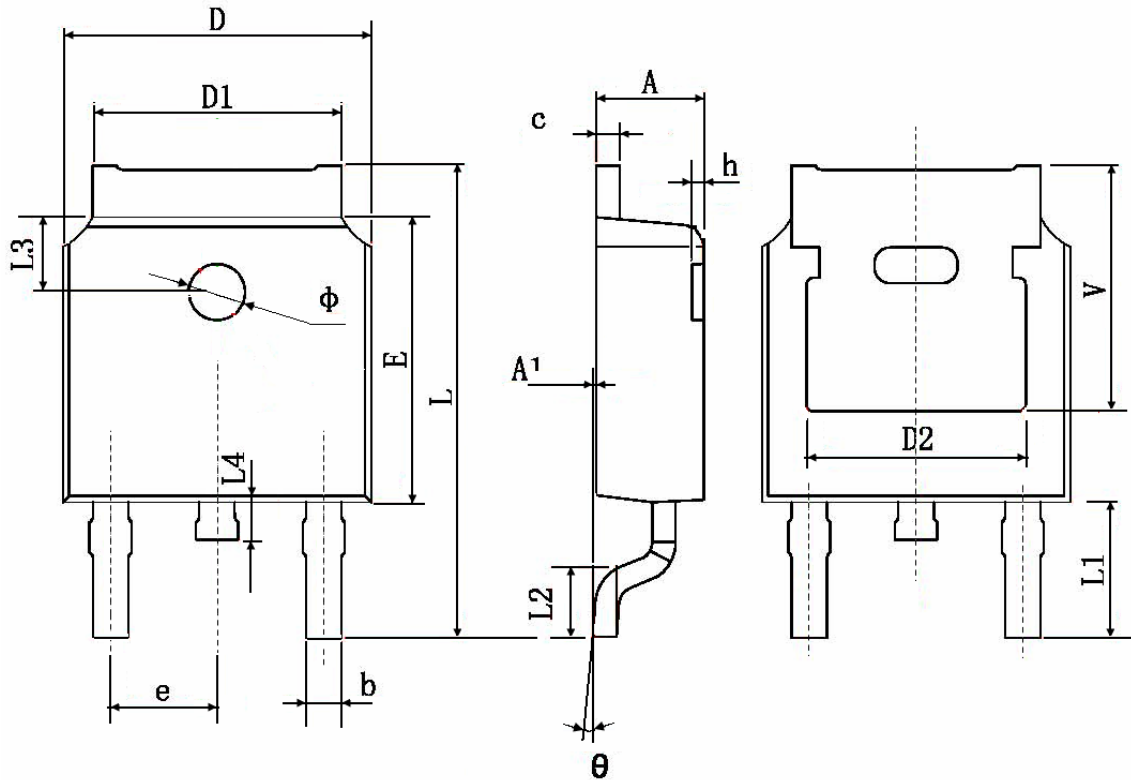


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

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
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.	