

**TM70N03D**

**N-Channel Enhancement Mosfet**

**General Description**

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

**Applications**

- Load switch
- PWM

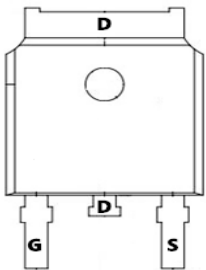
**General Features**

$V_{DS} = 30V$   $I_D = 70A$

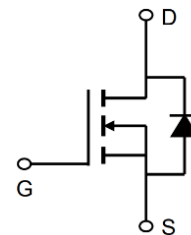
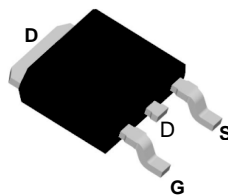
$R_{DS(ON)} = 6.2m\Omega$  (typ.) @  $V_{GS} = 10V$

100% UIS Tested

100%  $R_g$  Tested



D:TO-252-3L



Marking: 70N03

**Absolute Maximum Ratings** ( $T_A = 25^\circ C$  Unless Otherwise Noted)

Symbol	Parameter	Rating		Units
		10s	Steady State	
$V_{DS}$	Drain-Source Voltage	30		V
$V_{GS}$	Gate-Source Voltage	$\pm 20$		V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	70		A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	33		A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	198		A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	36		mJ
$I_{AS}$	Avalanche Current	53.8		A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation <sup>4</sup>	32.5		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
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	3.56	$^\circ C/W$



# TM70N03D

# N-Channel Enhancement Mosfet

## Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	30	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V,	-	-	1.0	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.5	2.5	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance note3	V <sub>GS</sub> =10V, I <sub>D</sub> =25A	-	6.2	9.2	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	-	9.3	11	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1.0MHz	-	1140	-	pF
C <sub>oss</sub>	Output Capacitance		-	175	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	151	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =15V, I <sub>D</sub> =25A, V <sub>GS</sub> =10V	-	13.3	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	3.1	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	5	-	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DS</sub> =15V, I <sub>D</sub> =25A, R <sub>GEN</sub> =3Ω, V <sub>GS</sub> =10V	-	15	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	19	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	35	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	21	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	70	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	200	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =30A	-	-	1.2	V
trr	Body Diode Reverse Recovery Time	I <sub>F</sub> =30A, dI/dt=100A/μs	-	25	-	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge		-	26	-	nC

- Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature  
 2. EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=15V, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH, I<sub>AS</sub>=12A  
 3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

## Typical Performance Characteristics

Figure 1: Output Characteristics

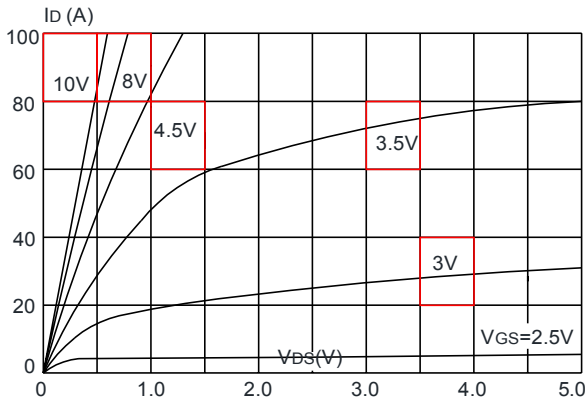


Figure 2: Typical Transfer Characteristics

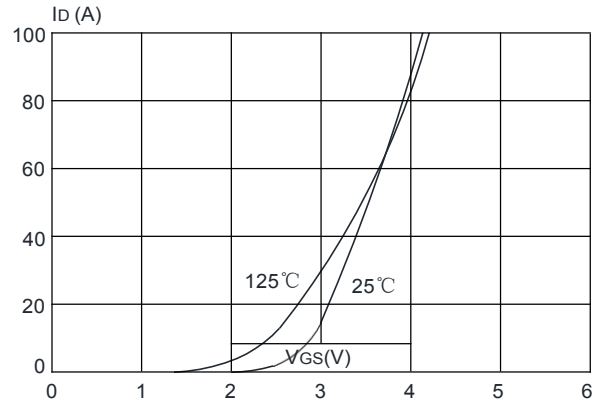


Figure 3: On-resistance vs. Drain Current

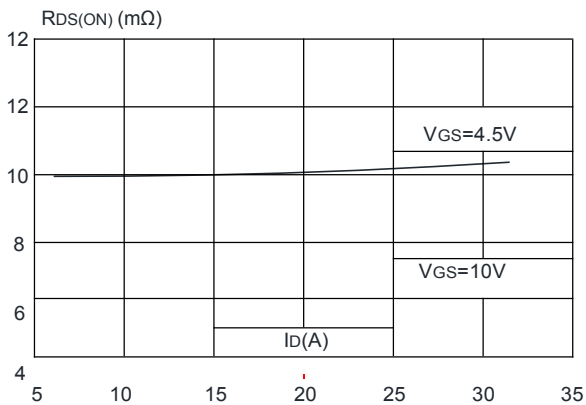


Figure 4: Body Diode Characteristics

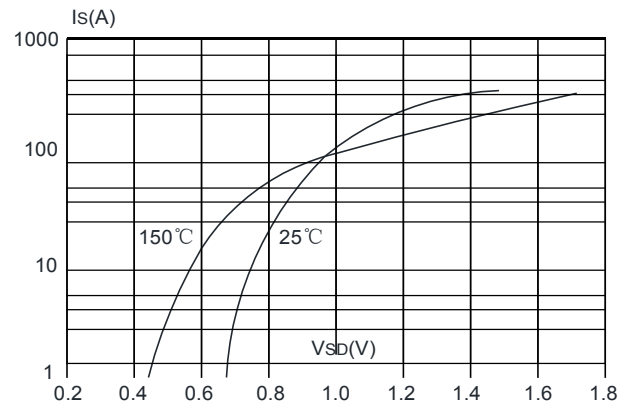


Figure 5: Gate Charge Characteristics

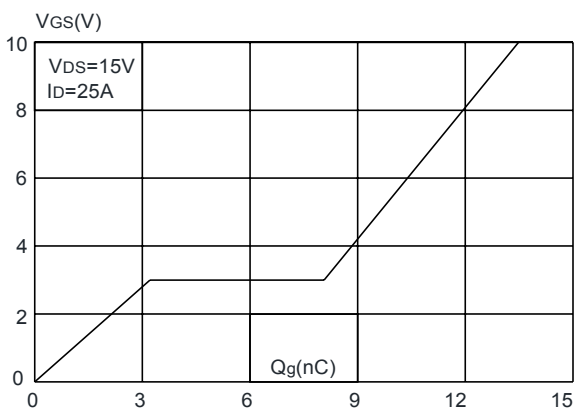
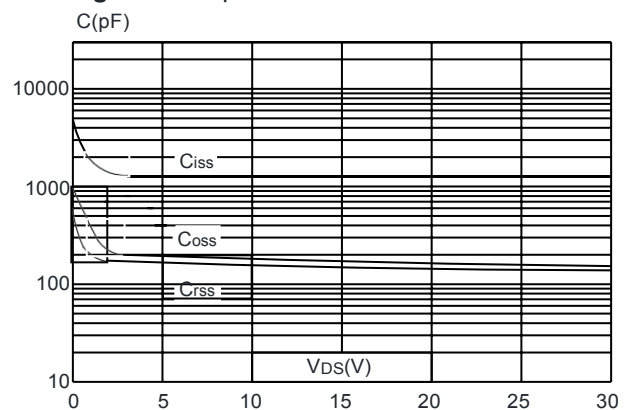


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

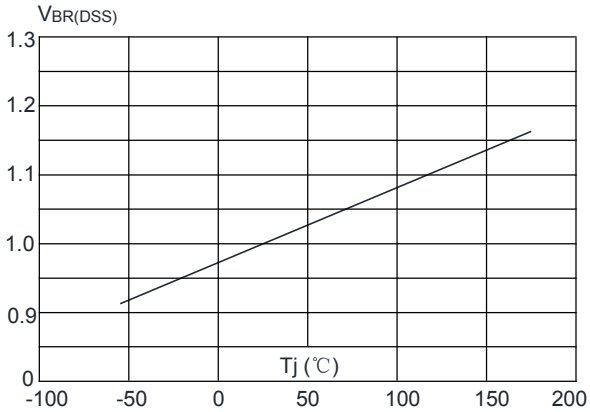


Figure 8: Normalized on Resistance vs. Junction Temperature

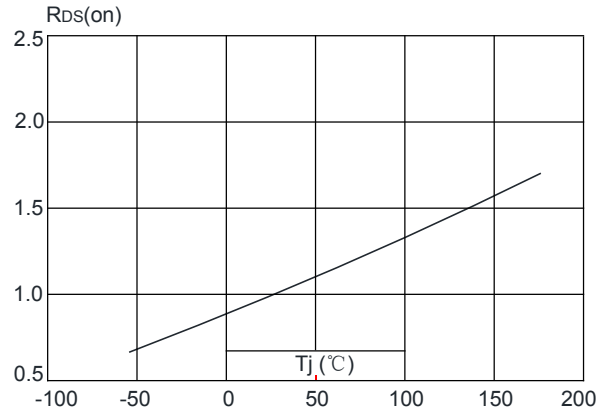
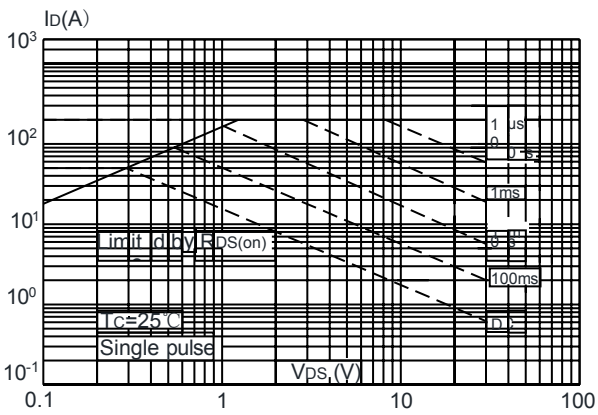


Figure 9: Maximum Safe Operating Area



Maximum Effective Transient Thermal Impedance, Junction-to-Case

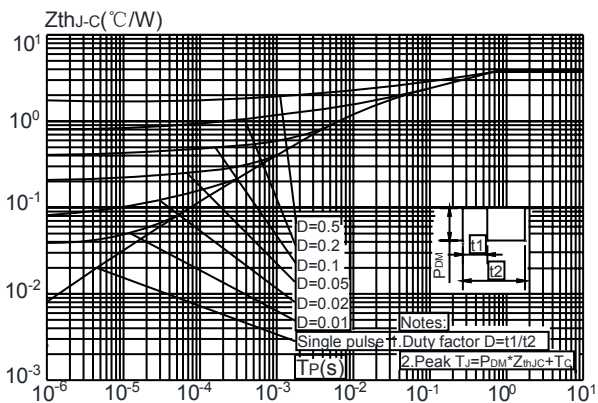
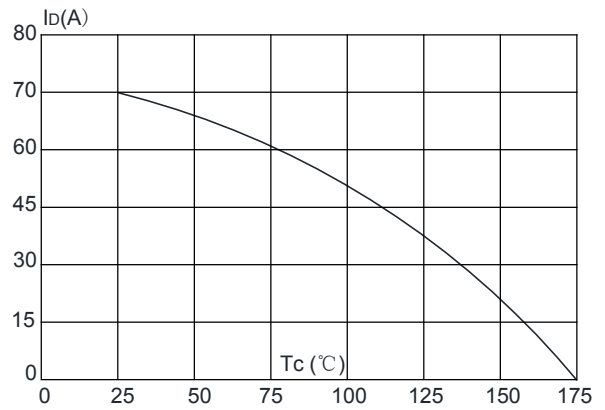


Figure 10: Maximum Continuous Drain Current vs. Case Temperature



Test Circuit

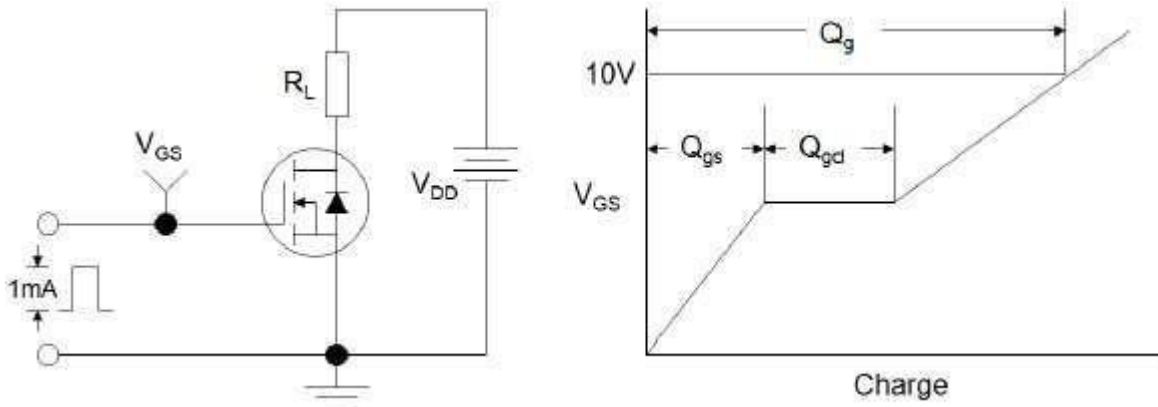


Figure1:Gate Charge Test Circuit & Waveform

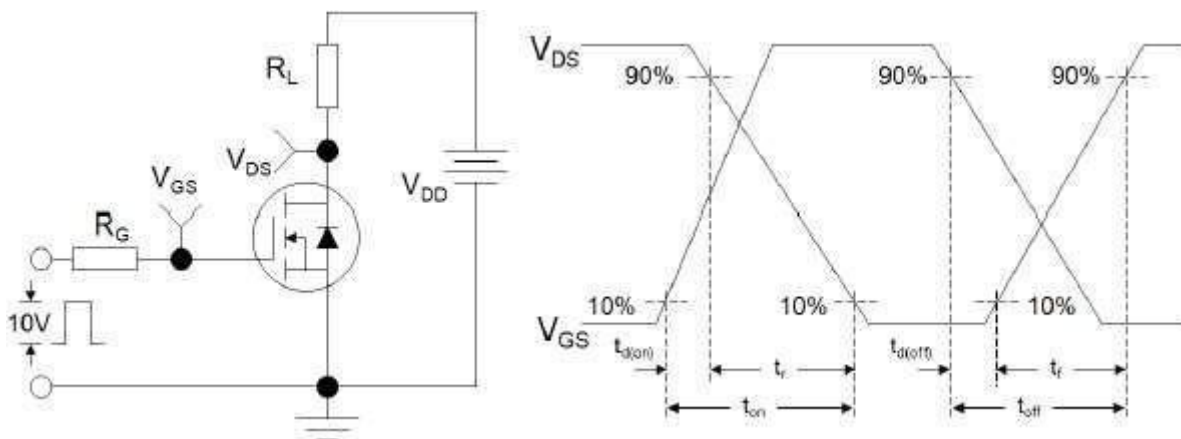


Figure 2: Resistive Switching Test Circuit & Waveforms

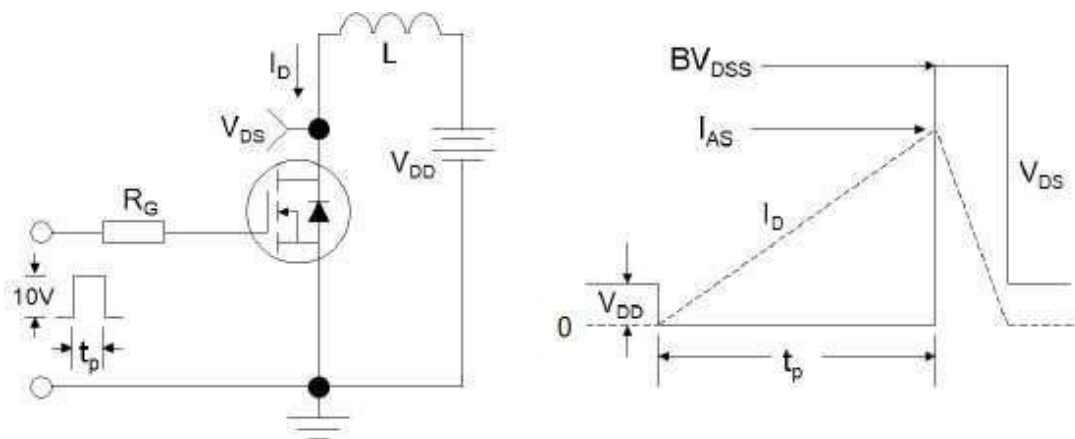
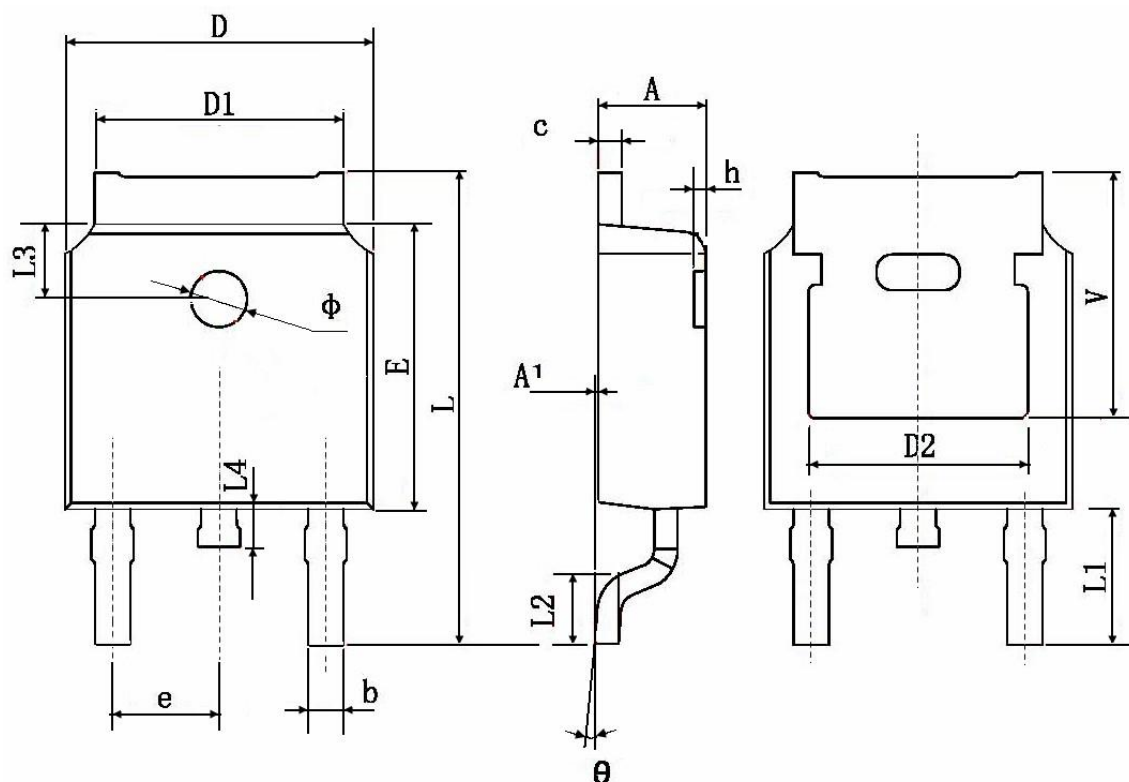


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

### 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.	

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