

TM70P02D

P -Channel Enhancement Mosfet

General Description

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

Applications

- Load switch
- PWM

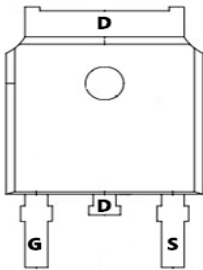
General Features

$V_{DS} = -20V$ $I_D = -70A$

$R_{DS(ON)} = 6.5m\Omega$ (typ.)@ $V_{GS} = -4.5V$

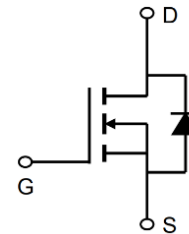
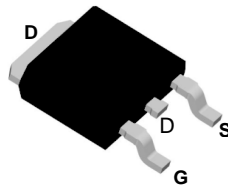
100% UIS Tested

100% R_g Tested



Marking: 70P02

D:TO-252-3L



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

Symbol	Parameter	Max.	Units
V_{DSS}	Drain-Source Voltage	-20	V
V_{GSS}	Gate-Source Voltage	± 12	V
I_D	Continuous Drain Current	$T_C = 25^\circ C$	-70
		$T_C = 100^\circ C$	-39
I_{DM}	Pulsed Drain Current ^{note1}	-240	A
P_D	Power Dissipation	70	W
$R_{\theta JC}$	Thermal Resistance, Junction to Ambient	2.1	$^\circ C/W$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ C$

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	$V_{GS}=0V, I_D = -250\mu A$	-20	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -20V, V_{GS} = 0V,$	-	-	-1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 12V$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu A$	-0.5	-0.7	-1.0	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS} = -4.5V, I_D = -15A$	-	6.5	8.5	m Ω
		$V_{GS} = -2.5V, I_D = -12A$	-	8	12	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = -10V, V_{GS} = 0V,$ $f = 1.0MHz$	-	4590	-	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	$V_{DD} = -10V, I_D = -14A,$ $R_{GEN} = 2.7\Omega,$ $V_{GS} = -10V$	-	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		-	-	-70	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	$T_J = 25^\circ\text{C}, I_{SD} = -15A,$	-	18	-	ns
Q_{rr}	Reverse Recovery Charge	$V_{GS} = 0V$ $di/dt = -100A/\mu s$	-	7.7	-	nC

- Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
 2. EAS condition: $T_J = 25^\circ\text{C}, V_{DD} = -10V, V_G = -10V, R_G = 5.9\Omega, L = 0.5\text{mh}, I_{AS} = -13.2A$
 3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$



Typical Performance Characteristics

Figure 1: Output Characteristics

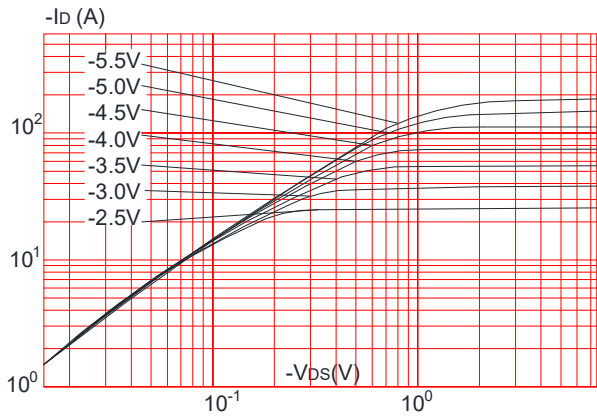


Figure 2: Typical Transfer Characteristics

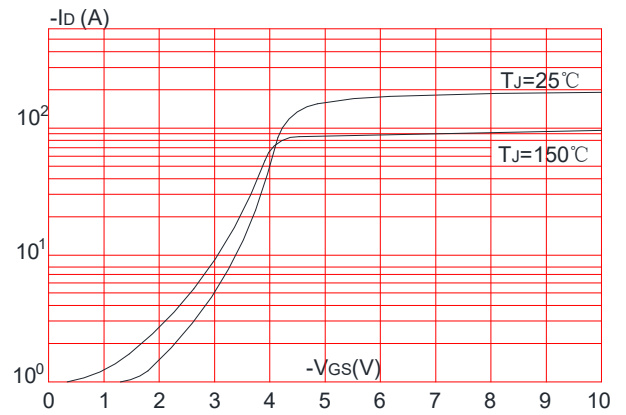


Figure 3: On-resistance vs. Drain Current

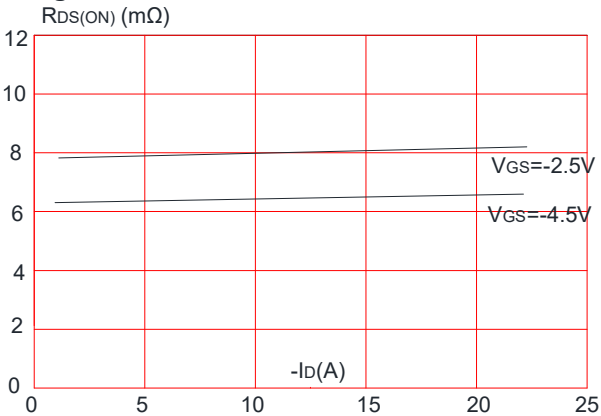


Figure 4: Body Diode Characteristics

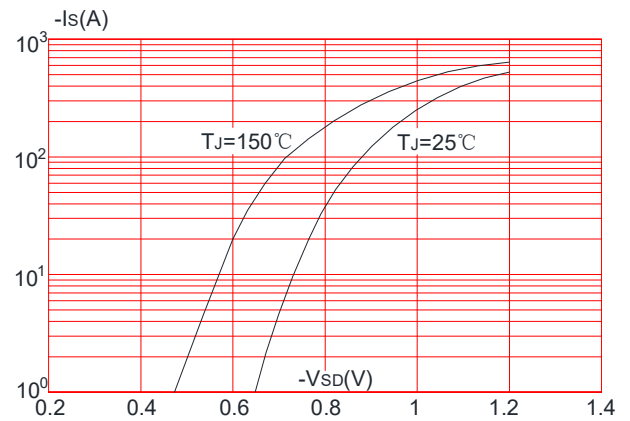


Figure 5: Gate Charge Characteristics

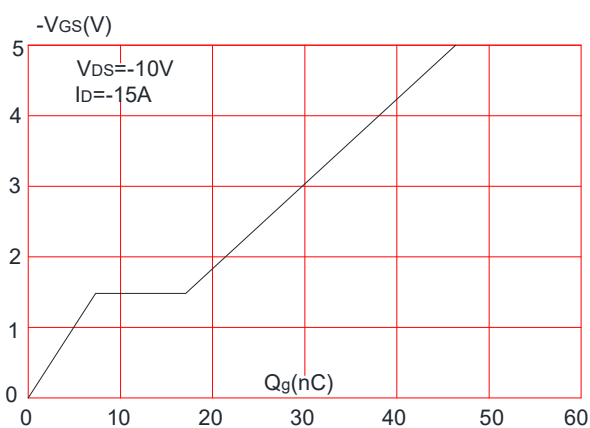
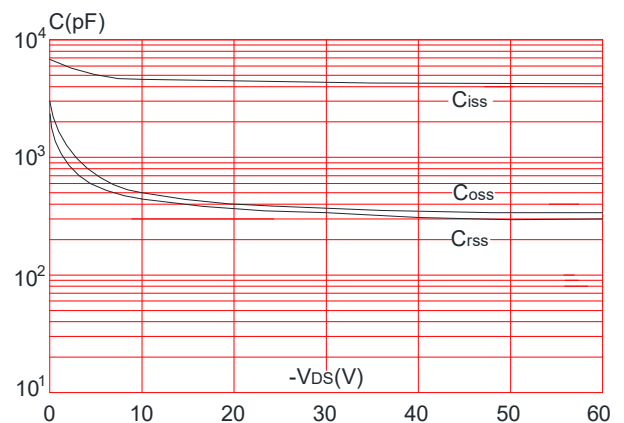


Figure 6: Capacitance Characteristics



TM70P02D

P -Channel Enhancement Mosfet

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

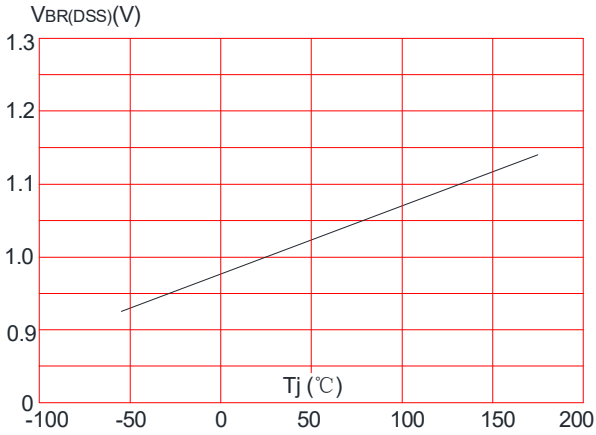


Figure 8: Normalized on Resistance vs. Junction Temperature

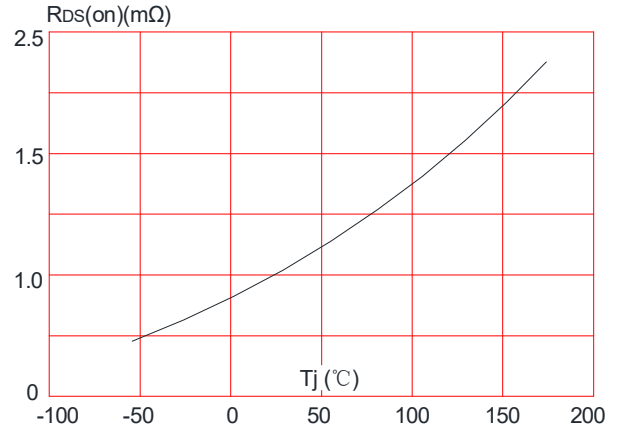


Figure 9: Maximum Safe Operating Area

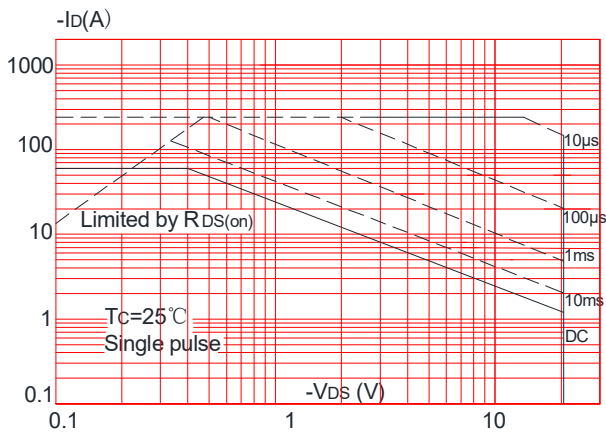


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

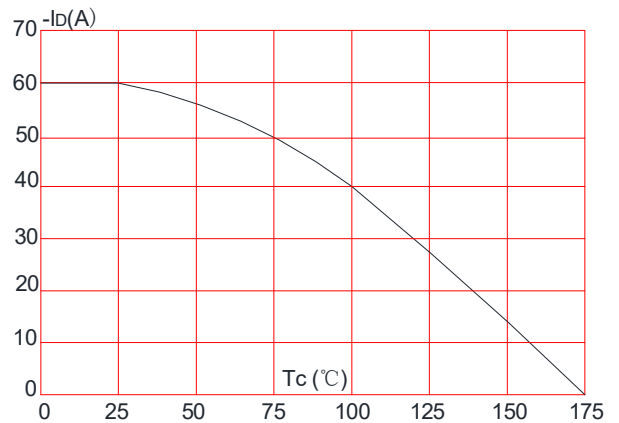
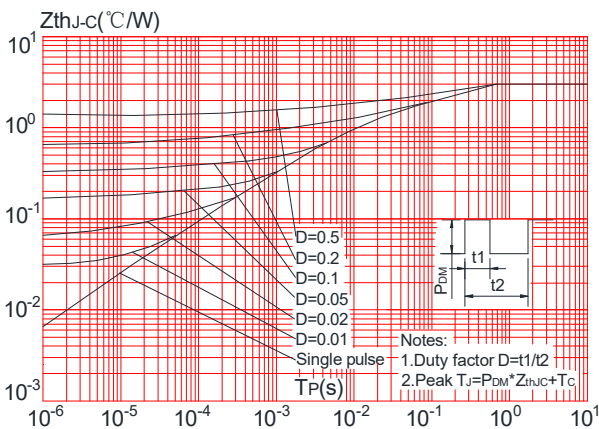
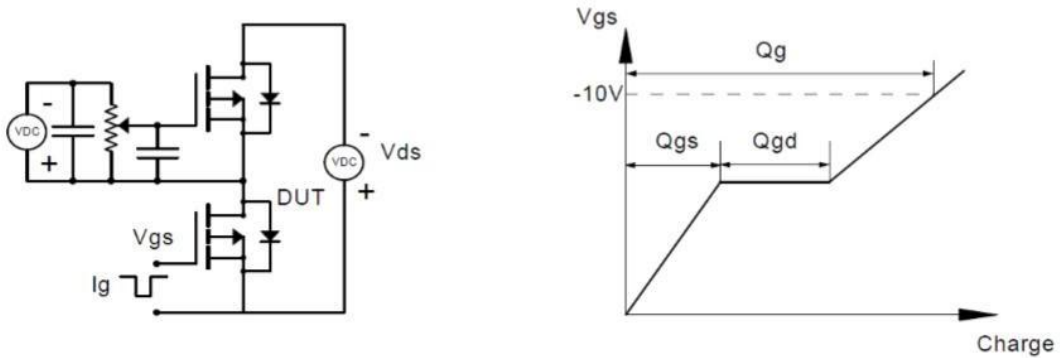


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

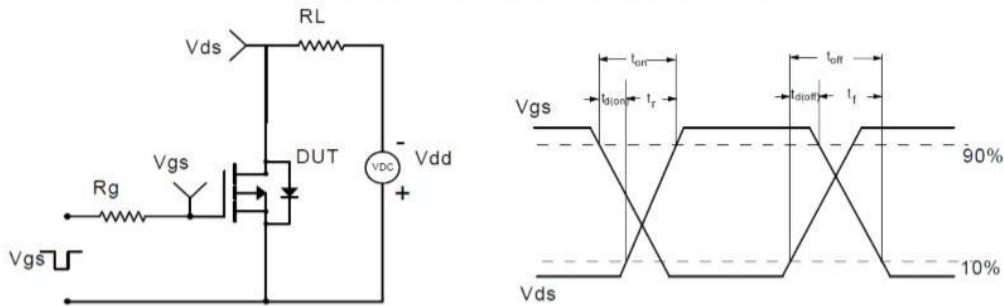


Test Circuit

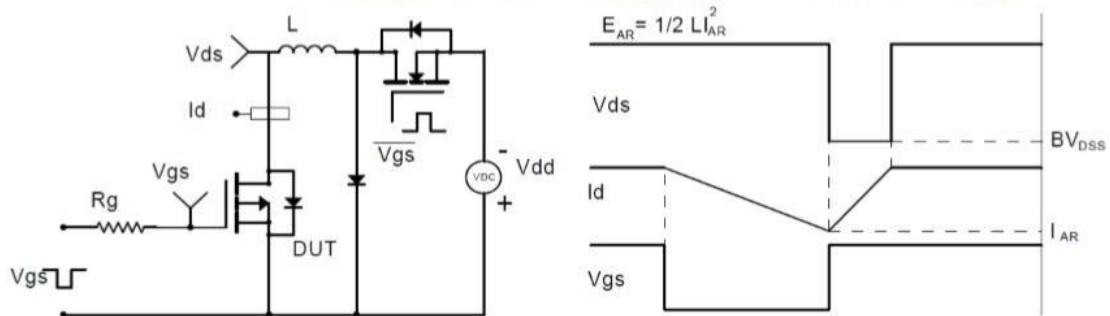
Gate Charge Test Circuit & Waveform



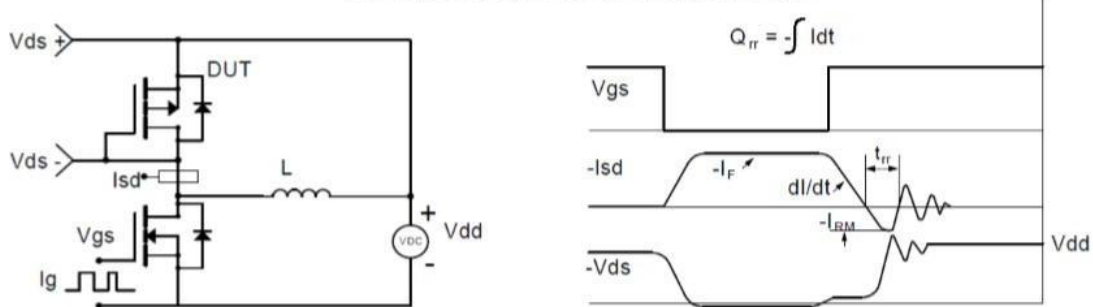
Resistive Switching Test Circuit & Waveforms



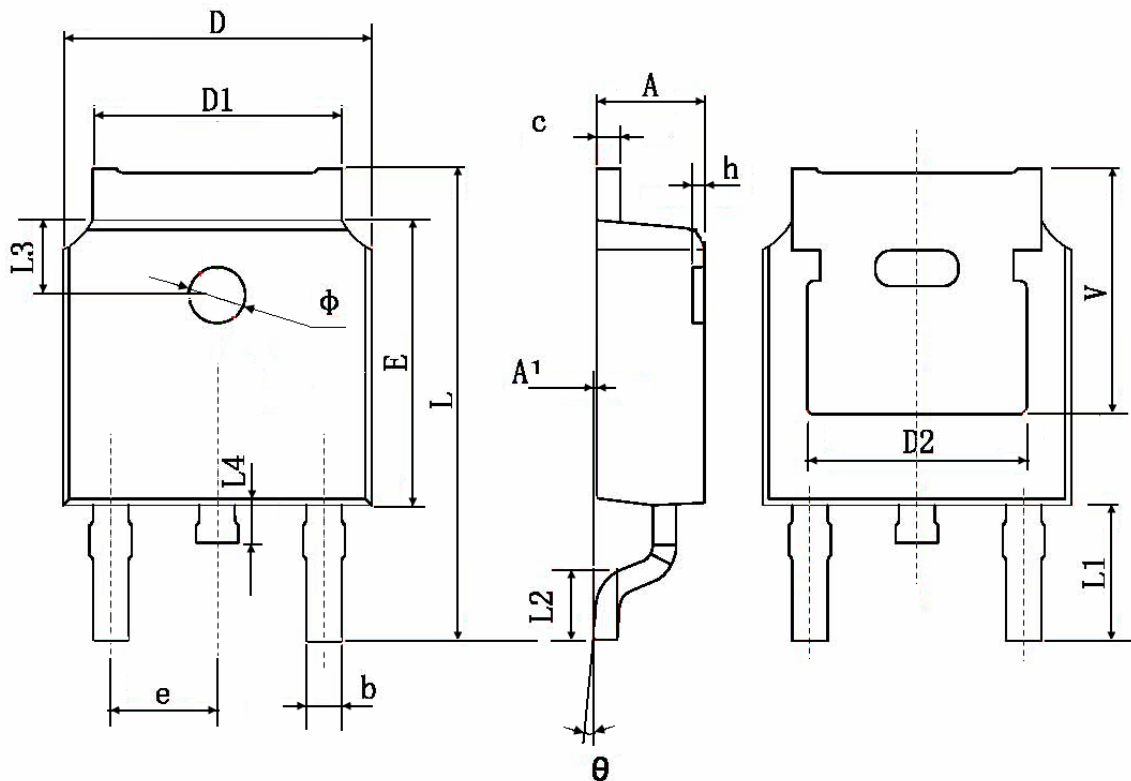
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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.	