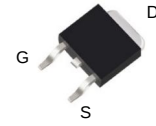


Description

The TX60P03D uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



TO252-2L

General Features

$V_{DS} = -30V$ $I_D = -60 A$

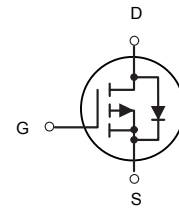
$R_{DS(ON)} < 10m\Omega$ @ $V_{GS}=10V$

Application

Battery protection

Load switch

Uninterruptible power supply



P-Channel MOSFET

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

Symbol	Parameter	Rating		Units
V_{DS}	Drain-Source Voltage	-30		V
V_{GS}	Gate-Source Voltage	± 25		V
$I_{D@T_C=25^\circ C}$	Continuous Drain Current, V_{GS} @ -10V ¹	-60		A
$I_{D@T_C=100^\circ C}$	Continuous Drain Current, V_{GS} @ -10V ¹	-30		A
$I_{D@T_A=25^\circ C}$	Continuous Drain Current, V_{GS} @ -10V ¹	-15	-9.6	A
$I_{D@T_A=70^\circ C}$	Continuous Drain Current, V_{GS} @ -10V ¹	-12	-7.7	A
I_{DM}	Pulsed Drain Current ²	-150		A
EAS	Single Pulse Avalanche Energy ³	125		mJ
I_{AS}	Avalanche Current	-50		A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	45		W
$P_D@T_A=25^\circ C$	Total Power Dissipation ⁴	5	2.0	W
T_{STG}	Storage Temperature Range	-55 to 150		$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150		$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	62		$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹ (t ≤ 10s)	25		$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	2.8		$^\circ C/W$

Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=-250\mu A$	-30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=-1mA$	---	-0.0232	---	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V$, $I_D=-30A$	---	7	10	m Ω
		$V_{GS}=-4.5V$, $I_D=-15A$	---	13	18	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=-250\mu A$	-1.0	---	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.6	---	mV/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-24V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	-1	μA
		$V_{DS}=-24V$, $V_{GS}=0V$, $T_J=55^\circ\text{C}$	---	---	-5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 25V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5V$, $I_D=-30A$	---	30	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	9	---	Ω
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-15V$, $V_{GS}=-4.5V$, $I_D=-15A$	---	22	---	nC
Q_{gs}	Gate-Source Charge		---	8.7	---	
Q_{gd}	Gate-Drain Charge		---	7.2	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V$, $V_{GS}=-10V$, $R_G=3.3$, $I_D=-15A$	---	8	---	ns
T_r	Rise Time		---	73.7	---	
$T_{d(off)}$	Turn-Off Delay Time		---	61.8	---	
T_f	Fall Time		---	24.4	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1MHz$	---	2215	---	pF
C_{oss}	Output Capacitance		---	310	---	
C_{rss}	Reverse Transfer Capacitance		---	237	---	
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	-45	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	-150	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=-1A$, $T_J=25^\circ\text{C}$	---	---	-1	V
t_{rr}	Reverse Recovery Time	$I_F=-15A$, $dI/dt=100A/\mu s$, $T_J=25^\circ\text{C}$	---	19	---	nS
Q_{rr}	Reverse Recovery Charge		---	9	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch²FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is $V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-50A$
- 4.The power dissipation is limited by 150°C junction temperature 5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Characteristics

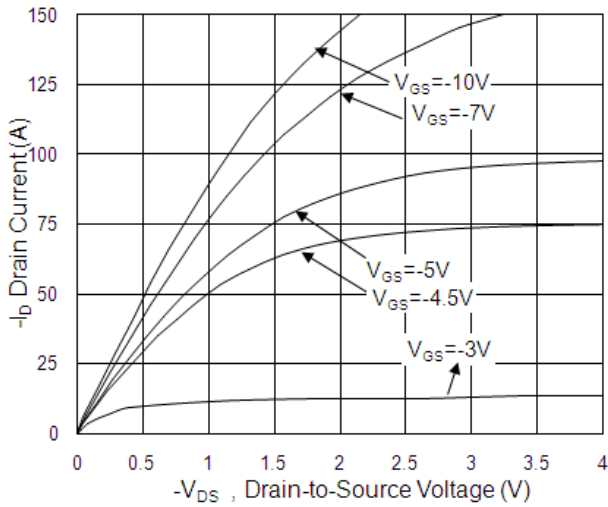


Fig.1 Typical Output Characteristics

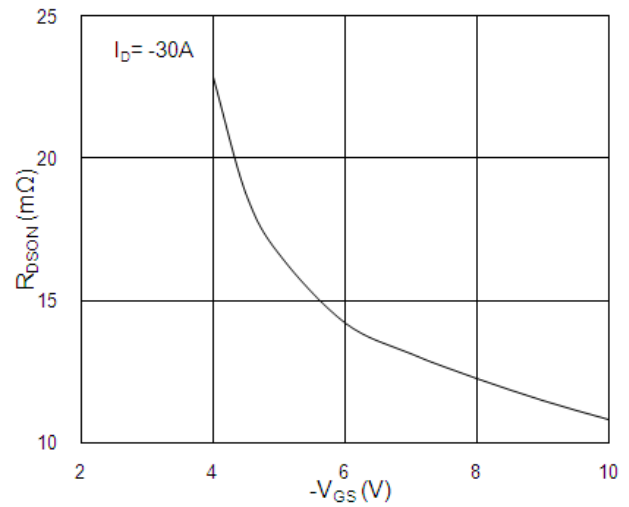


Fig.2 On-Resistance vs. G-S Voltage

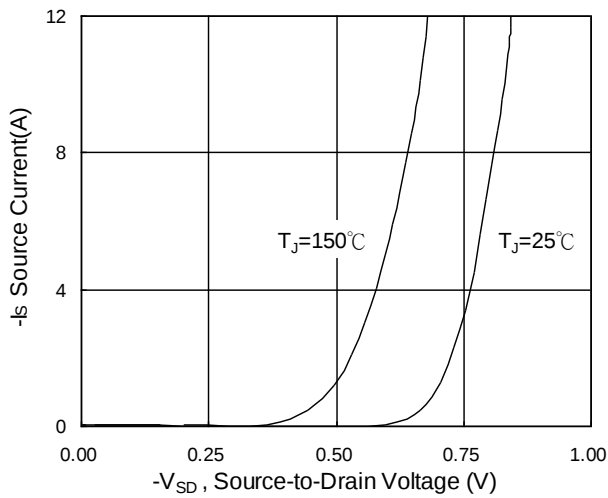


Fig.3 Forward Characteristics of Reverse

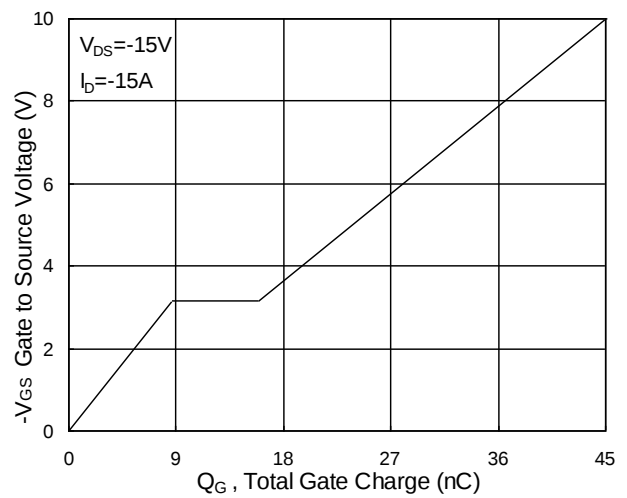


Fig.4 Gate-charge Characteristics

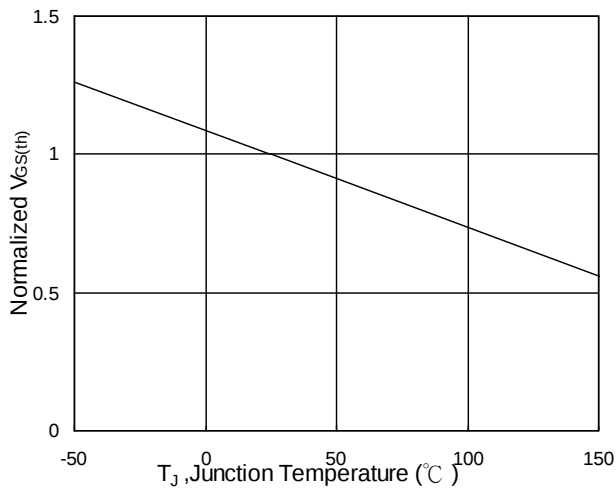


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

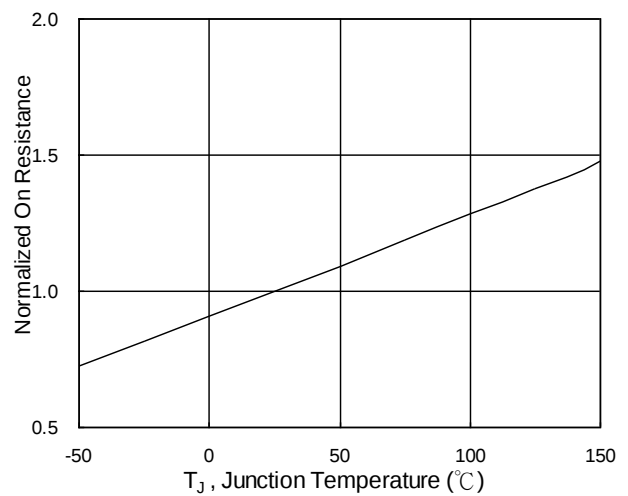


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

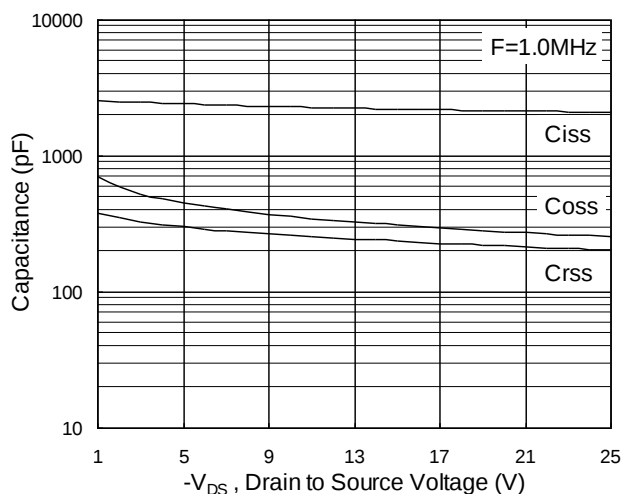


Fig.7 Capacitance

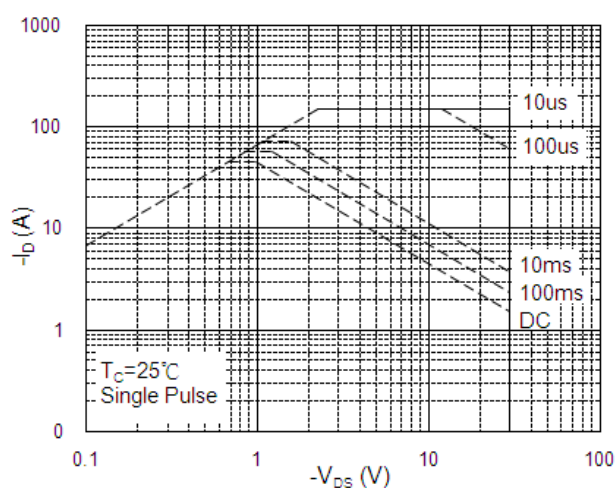


Fig.8 Safe Operating Area

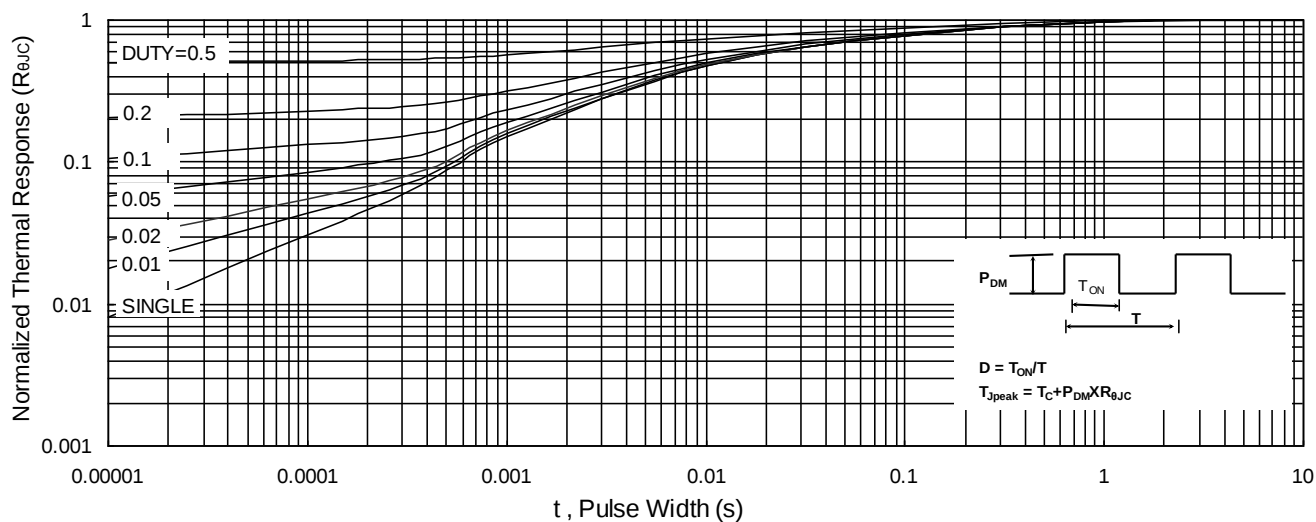


Fig.9 Normalized Maximum Transient Thermal Impedance

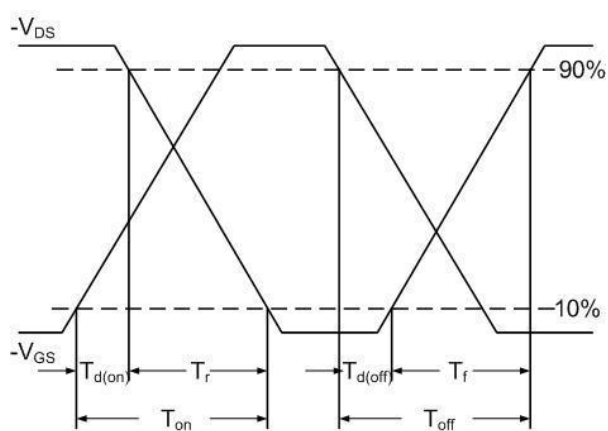


Fig.10 Switching Time Waveform

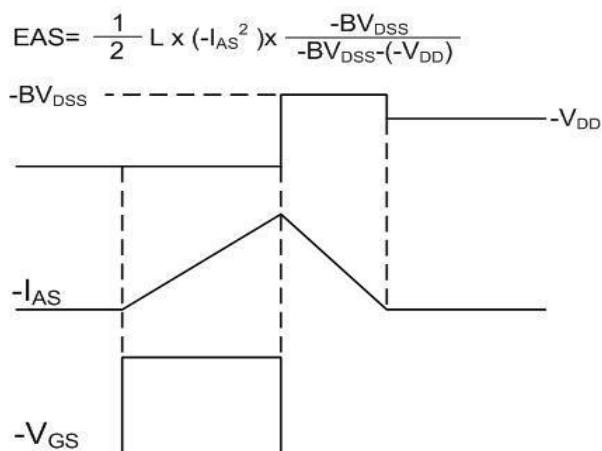
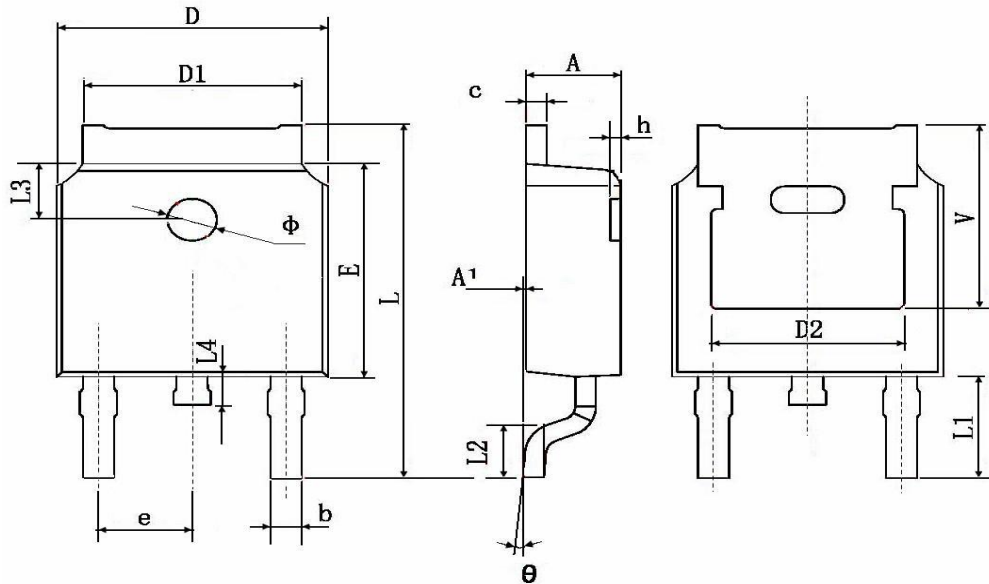


Fig.11 Unclamped Inductive Switching Waveform

TO252-2L Package Information



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.	

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