

Description

The TX3020GD 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.

General Features

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

$R_{DS(ON)} < 20m\Omega$ @ $V_{GS}=10V$

$V_{DS} = -30V$ $I_D = -23A$

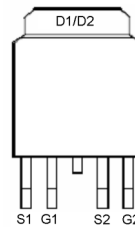
$R_{DS(ON)} < 30m\Omega$ @ $V_{GS}=-10V$

Application

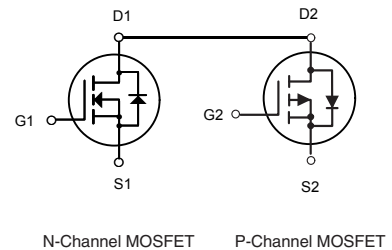
Wireless charging

Boost driver

Brushless motor



TO252-4L



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

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_{D@T_C=25^\circ C}$	Continuous Drain Current, V_{GS} @ 10V ¹	20	-23	A
$I_{D@T_C=70^\circ C}$	Continuous Drain Current, V_{GS} @ 10V ¹	15	-14	A
I_{DM}	Pulsed Drain Current ²	60	-60	A
E_{AS}	Single Pulse Avalanche Energy ³	26.6	38	mJ
$P_{D@T_A=25^\circ C}$	Total Power Dissipation ⁴	20.8	20.8	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	62		$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	6		$^\circ C/W$

N-Channel 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
$\Delta BV_{DSS}/\Delta T$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	0.023	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=10A$	---	15	20	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=6A$	---	20	25	
$V_{GS(th)}$	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		---	-4.2	---	$\text{mV}/^\circ\text{C}$
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	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V, I_D=10A$	---	14	---	S
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	2.3	---	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=20V, V_{GS}=4.5V, I_D=10A$	---	5	---	nC
Q_{gs}	Gate-Source Charge		---	1.11	---	
Q_{gd}	Gate-Drain Charge		---	2.61	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=12V, V_{GS}=10V, R_G=3.3\Omega$ $I_D=6A$	---	7.7	---	ns
T_r	Rise Time		---	46	---	
$T_{d(off)}$	Turn-Off Delay Time		---	11	---	
T_f	Fall Time		---	3.6	---	
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$	---	416	---	pF
C_{oss}	Output Capacitance		---	62	---	
C_{rss}	Reverse Transfer Capacitance		---	51	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	20	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	40	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1.2	V

Note :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z 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 $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=12.7A$
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.

P-Channel 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
$\Delta BV_{DSS}/\Delta T$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.021	---	$V/^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V$, $I_D=-8A$	---	25	30	$\text{m}\Omega$
		$V_{GS}=-4.5V$, $I_D=-6A$	---	30	35	
$V_{GS(th)}$	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		---	-4.2	---	$\text{mV}/^{\circ}\text{C}$
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	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5V$, $I_D=-8A$	---	12.6	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1\text{MHz}$		15	---	Ω
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-20V$, $V_{GS}=-4.5V$, $I_D=-6A$	---	9.8	---	nC
Q_{gs}	Gate-Source Charge		---	2.2	---	
Q_{gd}	Gate-Drain Charge		---	3.4	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-24V$, $V_{GS}=-10V$, $R_G=3.3\Omega$, $I_D=-1A$	---	16.4	---	ns
T_r	Rise Time		---	20.2	---	
$T_{d(off)}$	Turn-Off Delay Time		---	55	---	
T_f	Fall Time		---	10	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	930	---	pF
C_{oss}	Output Capacitance		---	148	---	
C_{rss}	Reverse Transfer Capacitance		---	115	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	-23	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	-35	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=-1A$, $T_J=25^{\circ}\text{C}$	---	---	-1.2	V

Note :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z 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 $V_{DD}=-25V$, $V_{GS}=-10V$, $L=0.1\text{mH}$, $I_{AS}=-30A$
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.

N-Channel Typical Characteristics

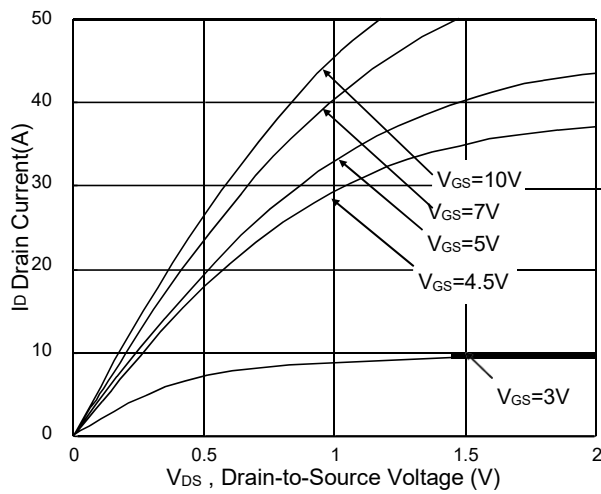


Fig.1 Typical Output Characteristics

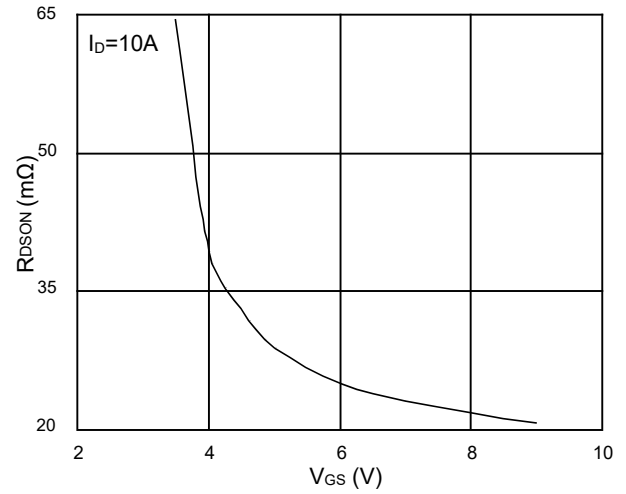


Fig.2 On-Resistance vs. Gate-Source

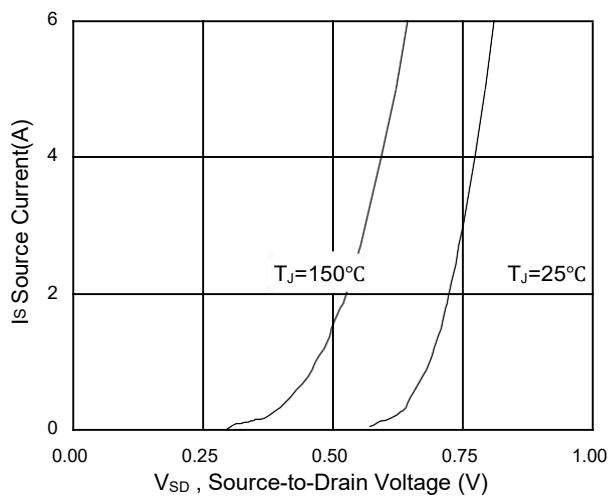


Fig.3 Forward Characteristics Of Reverse

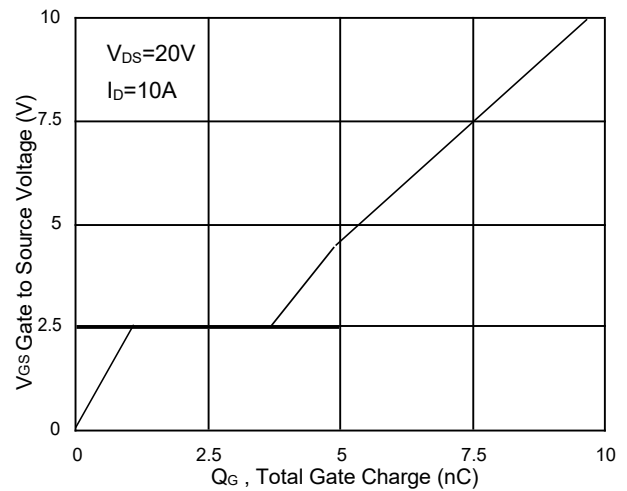


Fig.4 Gate-Charge Characteristics

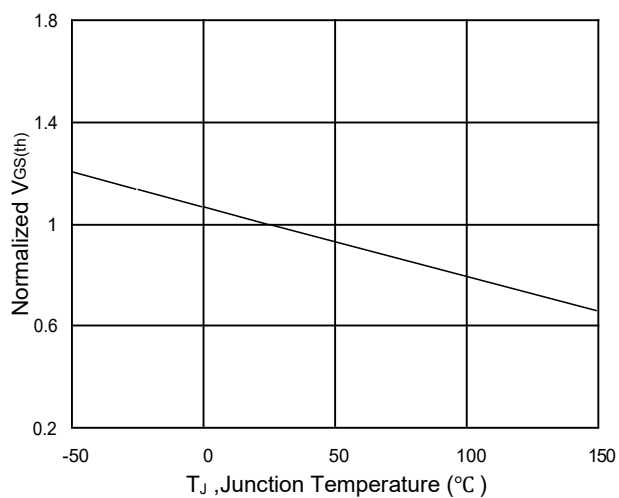


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

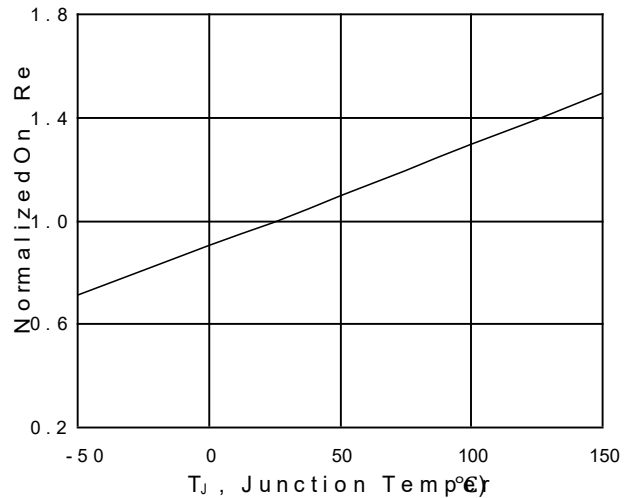


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

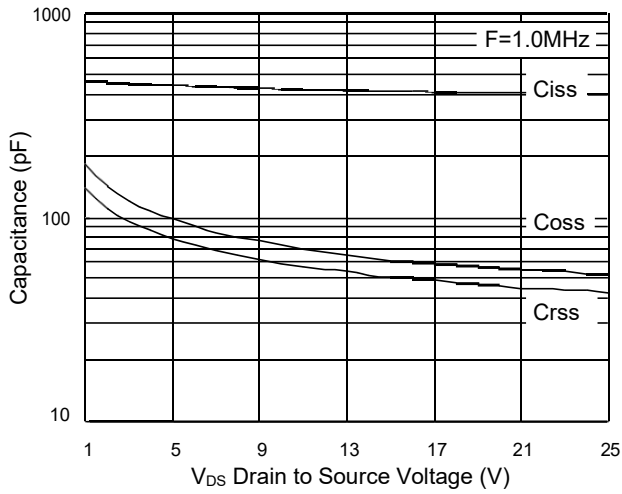


Fig.7 Capacitance

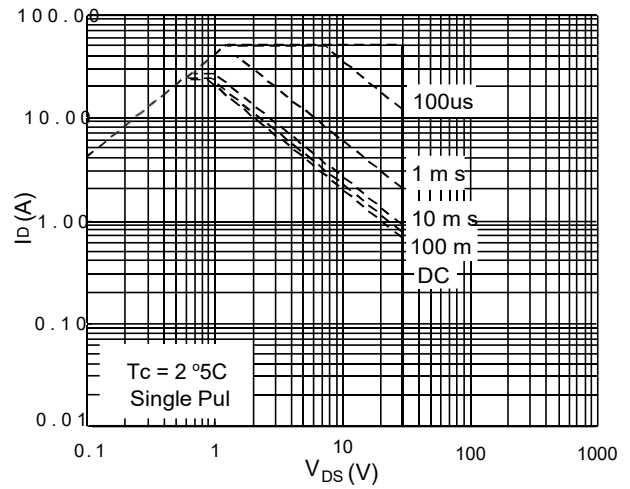


Fig.8 Safe Operating Area

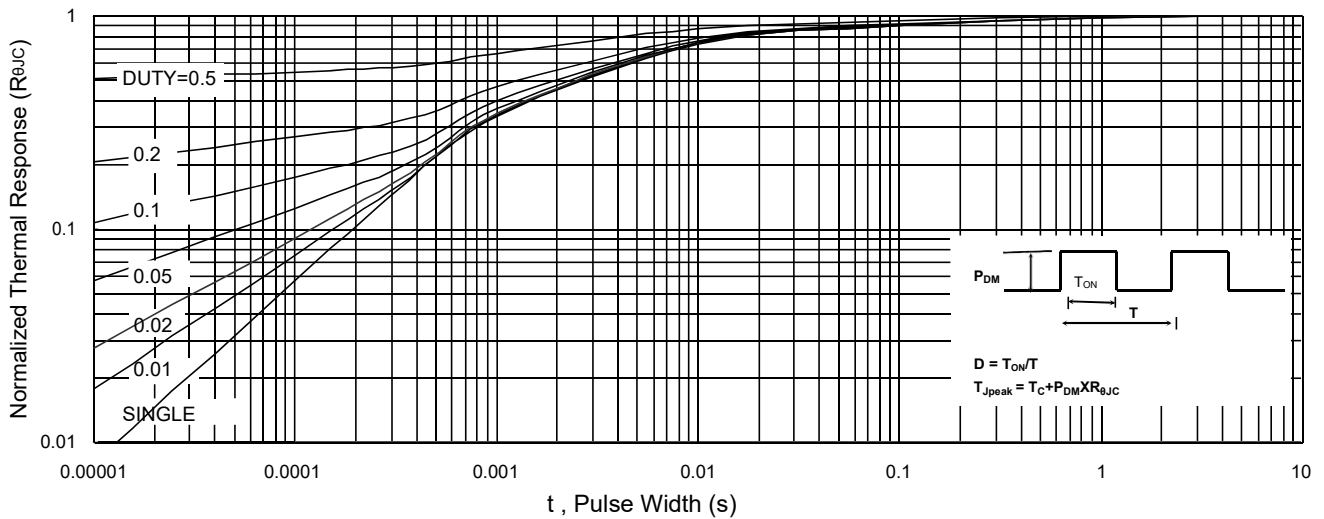
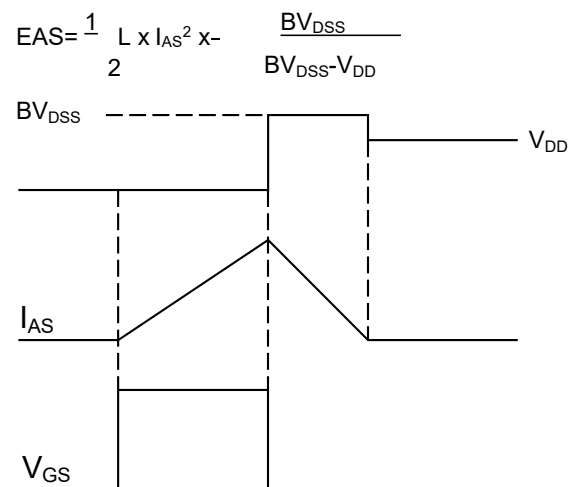
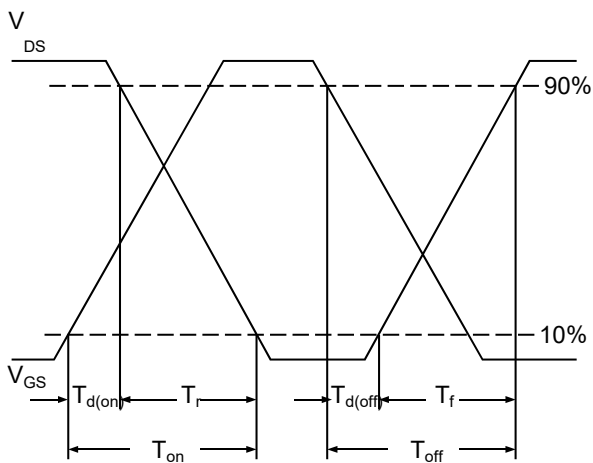


Fig.9 Normalized Maximum Transient Thermal Impedance



P-Channel Typical Characteristics

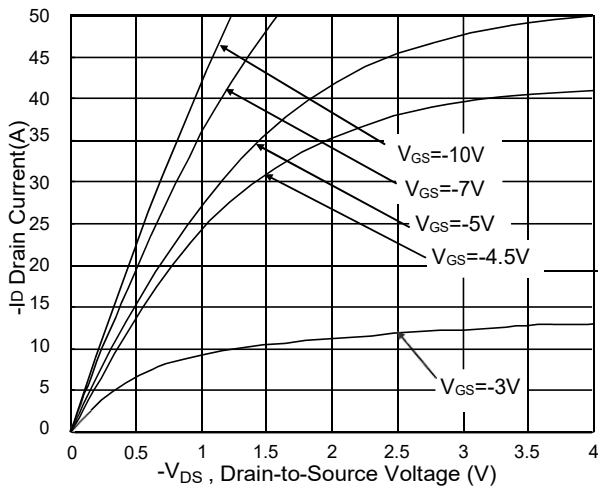


Fig.1 Typical Output Characteristics

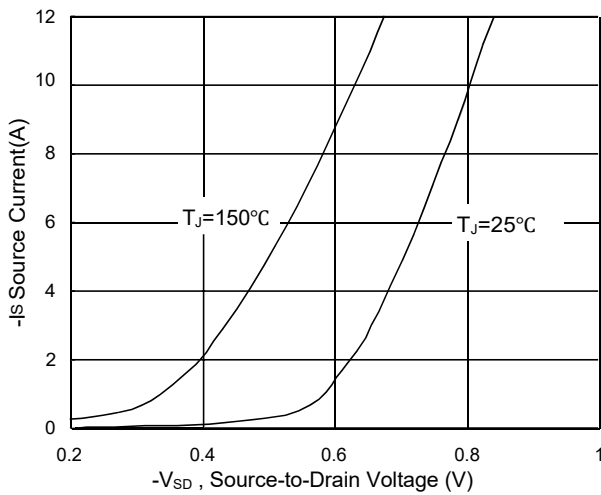


Fig.3 Forward Characteristics Of Reverse

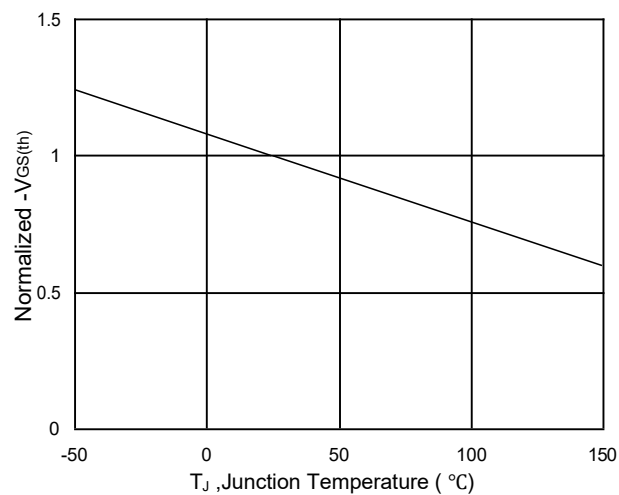


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

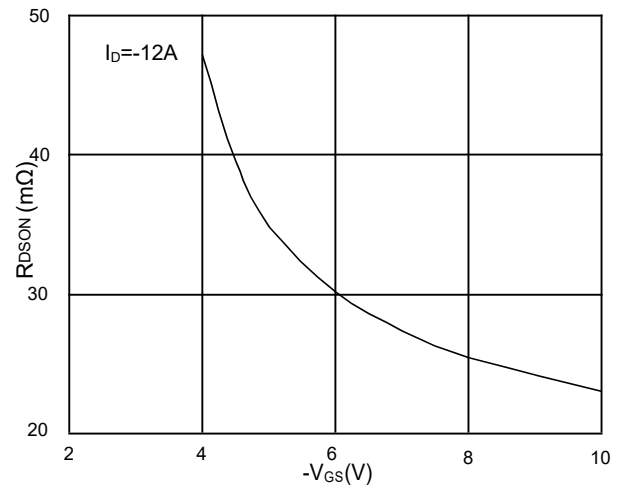


Fig.2 On-Resistance v.s Gate-Source

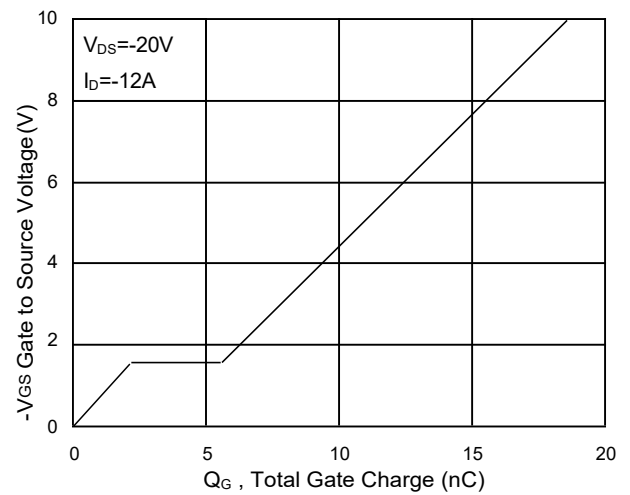


Fig.4 Gate-Charge Characteristics

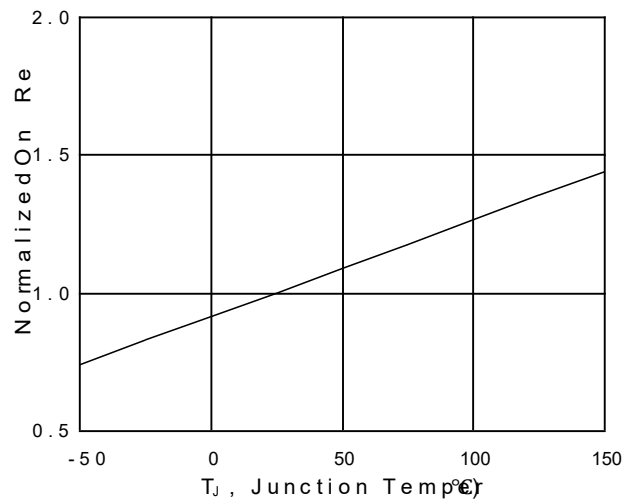


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

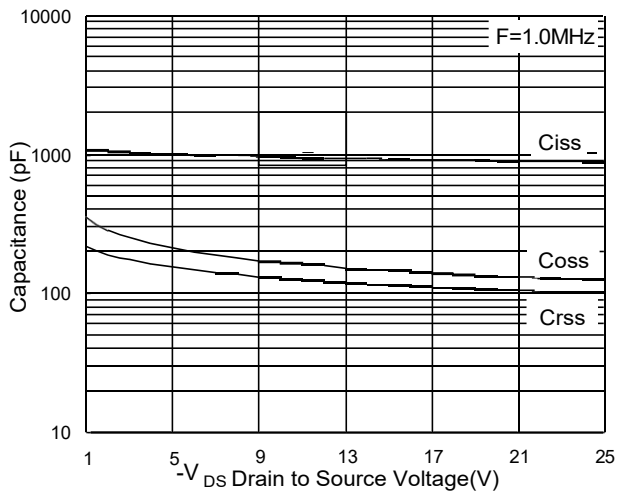


Fig.7 Capacitance

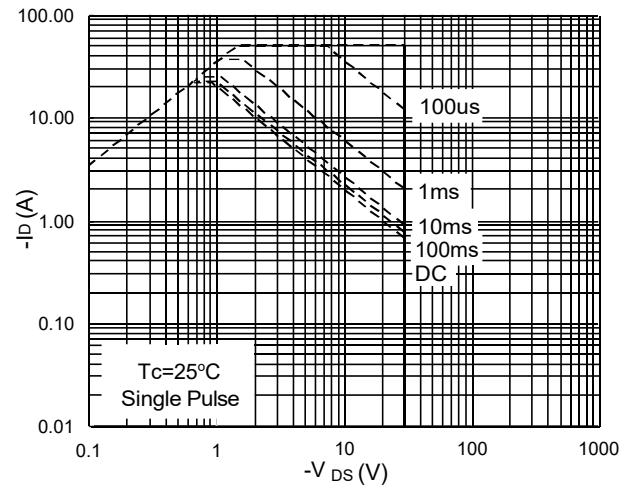


Fig.8 Safe Operating Area

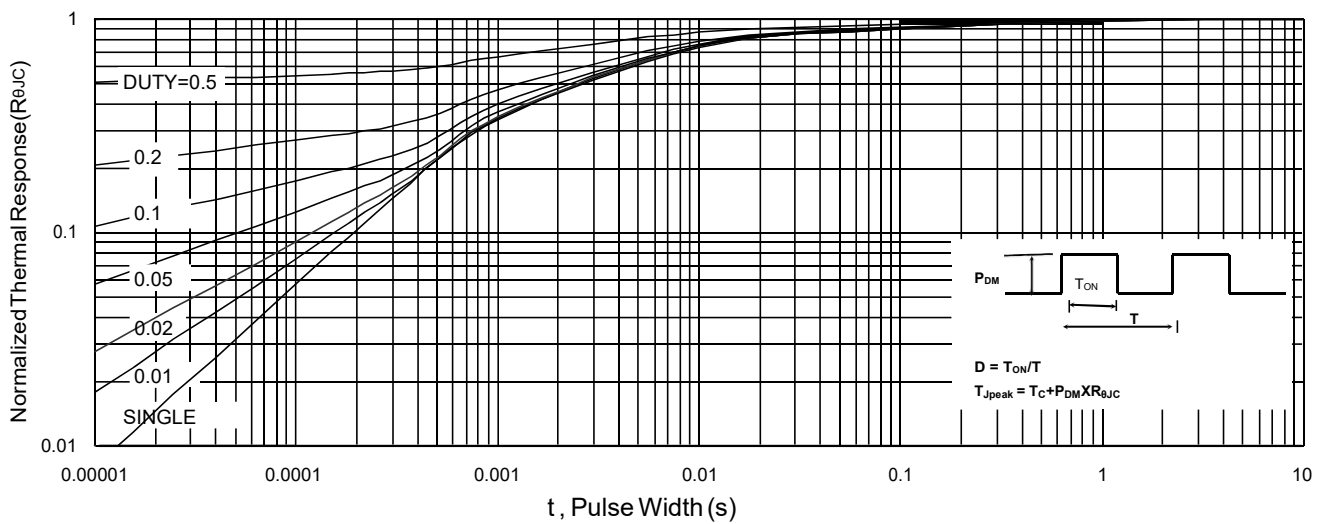


Fig.9 Normalized Maximum Transient Thermal Impedance

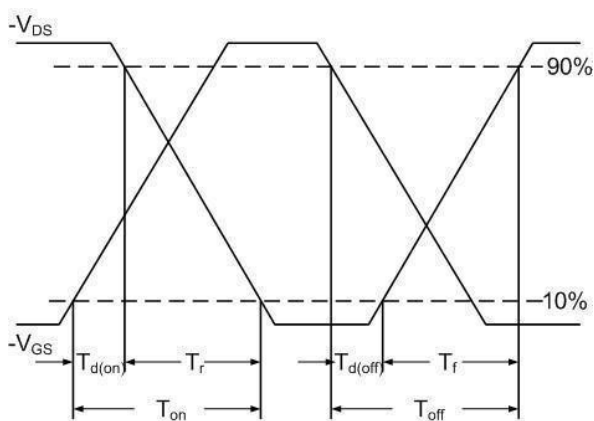


Fig.10 Switching Time Waveform

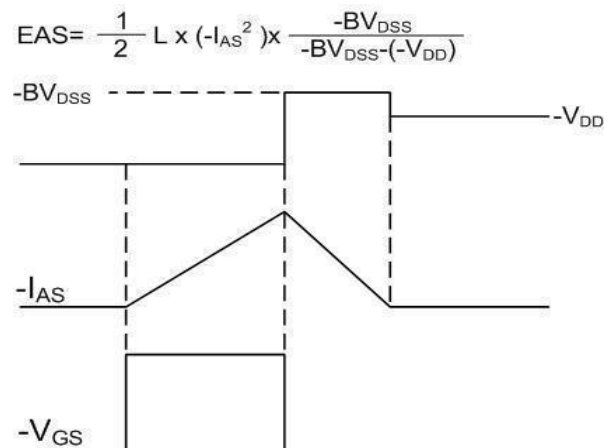
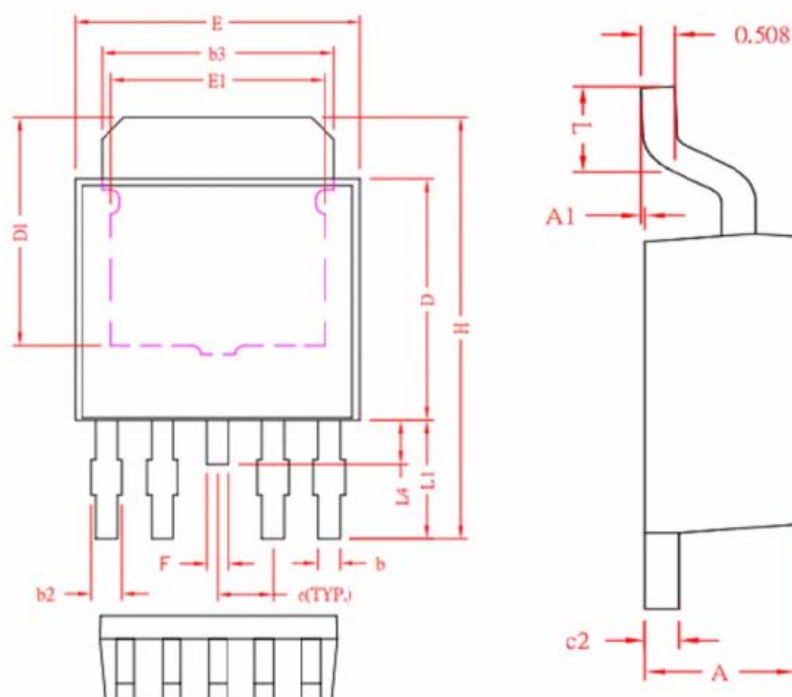


Fig.11 Unclamped Inductive Switching Waveform

TO252-4L Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0	0.08	0.15
b	0.45	0.53	0.60
b2	0.50	0.65	0.80
b3	5.20	5.35	5.50
c2	0.45	0.50	0.55
D	5.40	5.60	5.80
D1	4.57	-	-
E	6.40	6.60	6.80
E1	3.81	-	-
e	1.27 REF.		
F	0.40	0.50	0.60
H	9.40	9.80	10.20
L	1.40	1.59	1.77
L1	2.40	2.70	3.00
L4	0.80	1.00	1.20

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