



Description

The HXY4012GD 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

$V_{DS} = 40V$ $I_D = 20A$

$R_{DS(ON)} < 24m\Omega$ @ $V_{GS}=10V$

$V_{DS} = -40V$ $I_D = -20A$

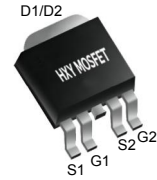
$R_{DS(ON)} < 38m\Omega$ @ $V_{GS}=-10V$

Application

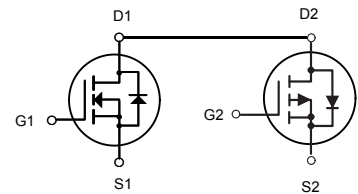
Wireless charging

Boost driver

Brushless motor



TO252-4L



N-Channel MOSFET

P-Channel MOSFET

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
HXY4012GD	TO252-4L	4012 XXXX	2500

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

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
V _{DS}	Drain-Source Voltage	40	-40	V
V _{GS}	Gate-Source Voltage	±20	±20	V
$I_D@T_A=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	20	-20	A
$I_D@T_A=70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	16.5	-16.5	A
IDM	Pulsed Drain Current ²	40	-40	A
$P_D@T_A=25^\circ C$	Total Power Dissipation ⁴	40	40	W
TSTG	Storage Temperature Range	-55 to 150	-55 to 150	°C
T _J	Operating Junction Temperature Range	-55 to 150	-55 to 150	°C
R _{θJA}	Thermal Resistance Junction-Ambient ¹	62		°C/W
R _{θJC}	Thermal Resistance Junction-Case ¹	3.1		°C/W



N-CH Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	2.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$	-	18	24	m Ω
		$V_{GS}=4.5V, I_D=5A$	-	26	37	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=10A$		15	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$V_{DS}=20V, V_{GS}=0V,$ $F=1.0MHz$	-	1500	-	PF
Output Capacitance	C_{oss}		-	215	-	PF
Reverse Transfer Capacitance	C_{rss}		-	135	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V, R_L=2\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	4	-	nS
Turn-on Rise Time	t_r		-	11.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	18	-	nS
Turn-Off Fall Time	t_f		-	5.6	-	nS
Total Gate Charge	Q_g	$V_{DS}=20V, I_D=10A,$ $V_{GS}=10V$	-	24	-	nC
Gate-Source Charge	Q_{gs}		-	4	-	nC
Gate-Drain Charge	Q_{gd}		-	3.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=10A$	-	0.8	1.2	V



P-CH Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.5	-2.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-7A$	-	33	38	m Ω
		$V_{GS}=-4.5V, I_D=-4A$	-	37	49	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-7A$	-	15	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=-20V, V_{GS}=0V,$ $F=1.0MHz$	-	1225	-	PF
Output Capacitance	C_{oss}		-	190	-	PF
Reverse Transfer Capacitance	C_{rss}		-	120	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, R_L=2.3\Omega$ $V_{GS}=-10V, R_{GEN}=6\Omega$	-	10	-	nS
Turn-on Rise Time	t_r		-	15	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	18	-	nS
Total Gate Charge	Q_g	$V_{DS}=-20V, I_D=-7A$ $V_{GS}=-10V$	-	21	-	nC
Gate-Source Charge	Q_{gs}		-	3.5	-	nC
Gate-Drain Charge	Q_{gd}		-	3.0	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-14A$	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production



N- Channel Typical Electrical and Thermal Characteristics (Curves)

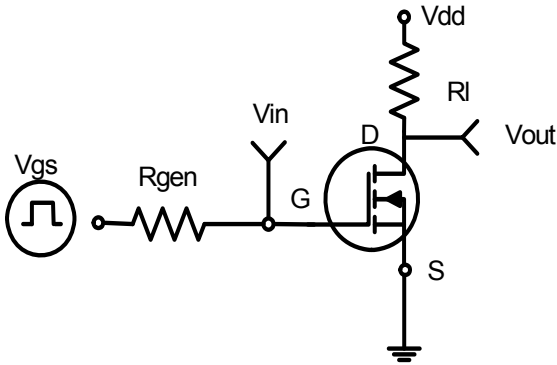


Figure 1: Switching Test Circuit

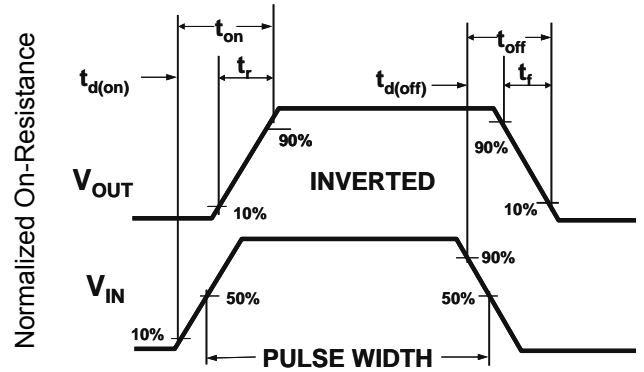


Figure 2: Switching Waveforms

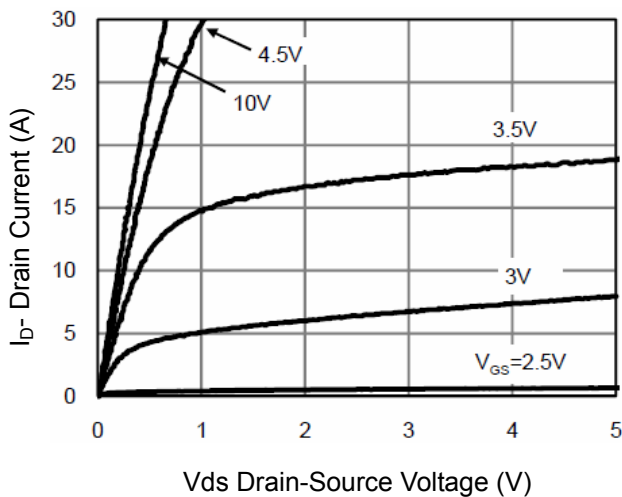


Figure 3 Output Characteristics

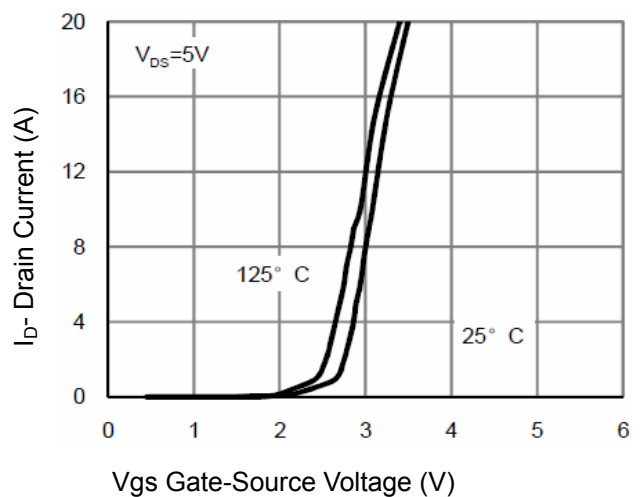


Figure 4 Transfer Characteristics

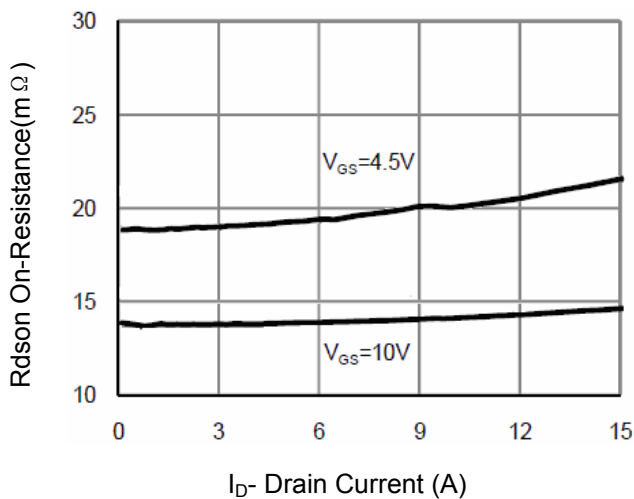


Figure 5 Drain-Source On-Resistance

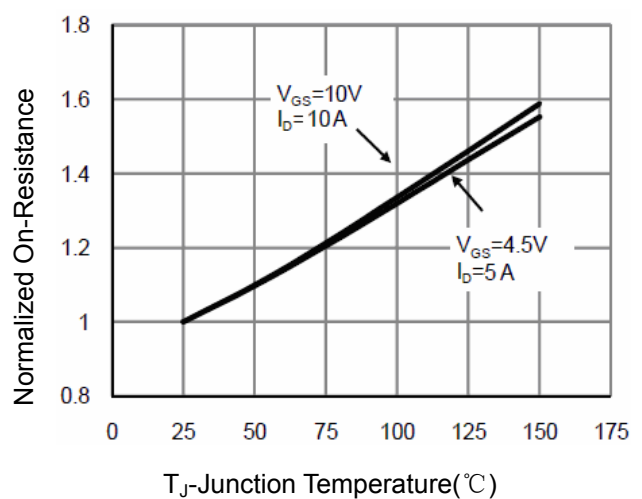
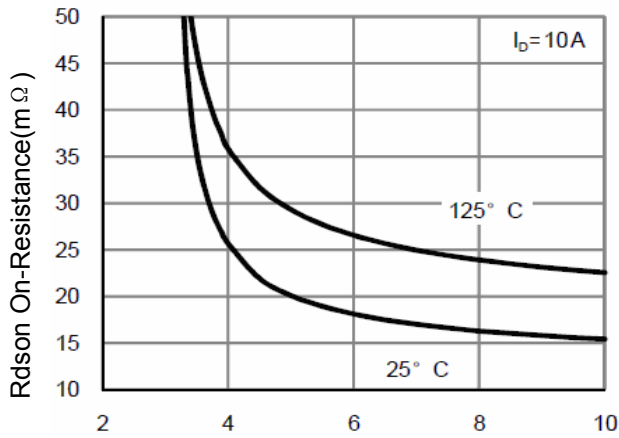
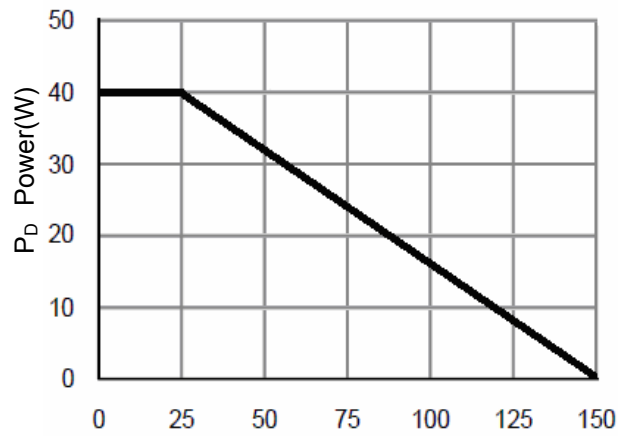


Figure 6 Drain-Source On-Resistance



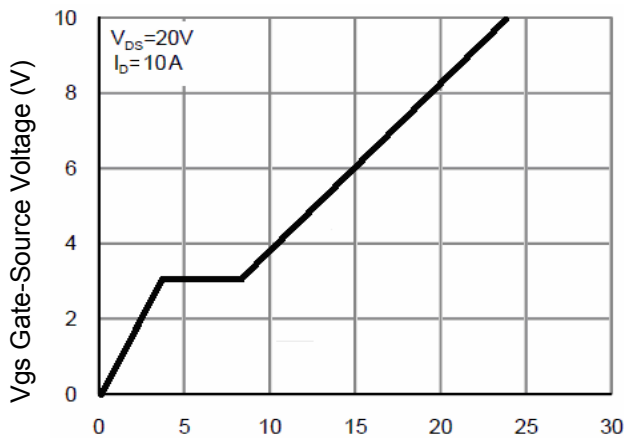
Vgs Gate-Source Voltage (V)

Figure 7 Rdson vs Vgs



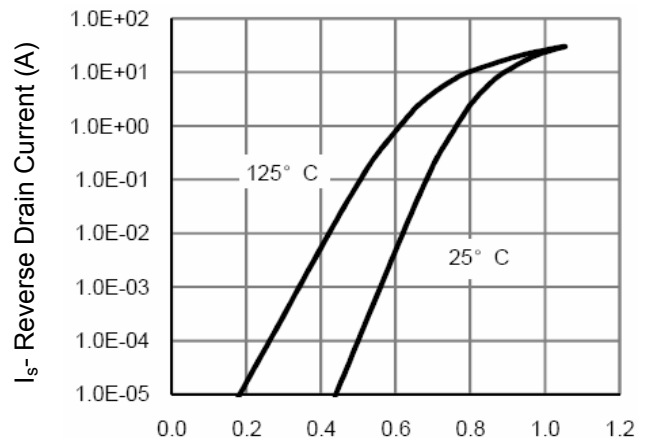
Tj Junction Temperature (°C)

Figure 8 Power Dissipation



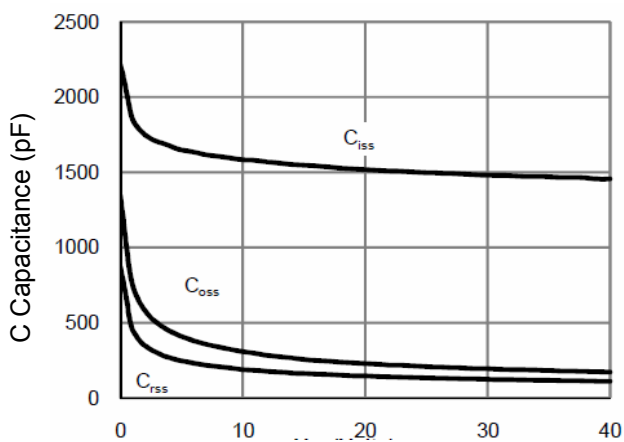
Qg Gate Charge (nC)

Figure 9 Gate Charge



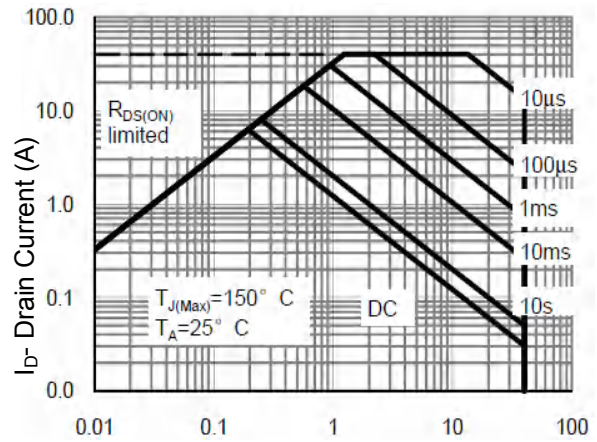
Vds Drain-Source Voltage (V)

Figure 10 Source- Drain Diode Forward



Vds Drain-Source Voltage (V)

Figure 11 Capacitance vs Vds



Vds Drain-Source Voltage (V)

Figure 12 Safe Operation Area

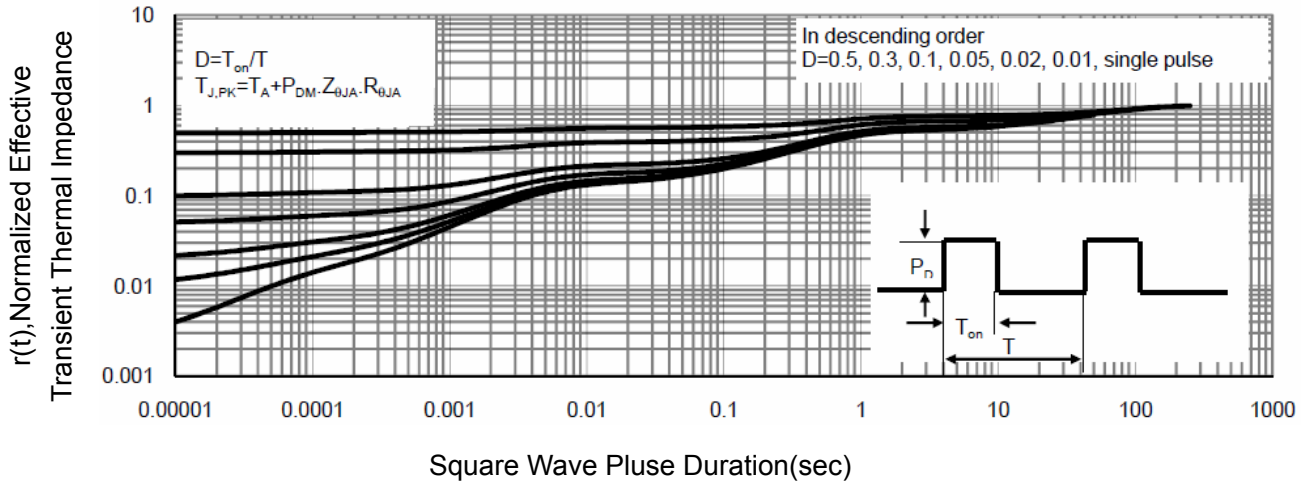


Figure 13 Normalized Maximum Transient Thermal Impedance



P- Channel Typical Electrical and Thermal Characteristics (Curves)

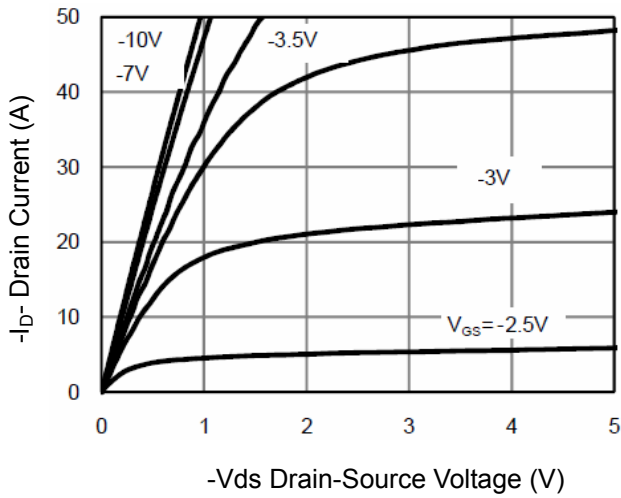


Figure 1 Output Characteristics

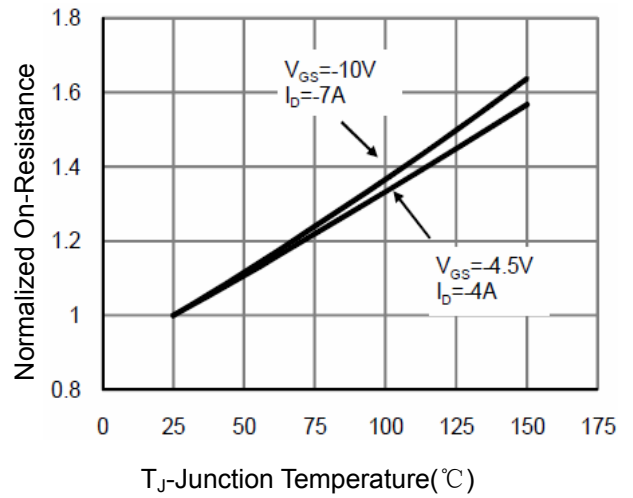


Figure 4 Rdson-Junction Temperature

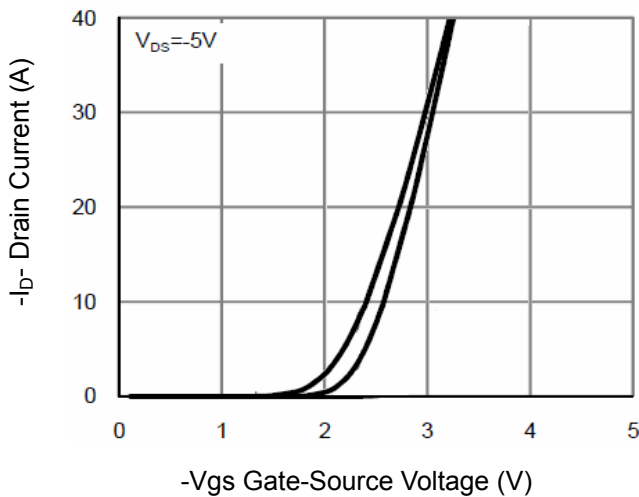


Figure 2 Transfer Characteristics

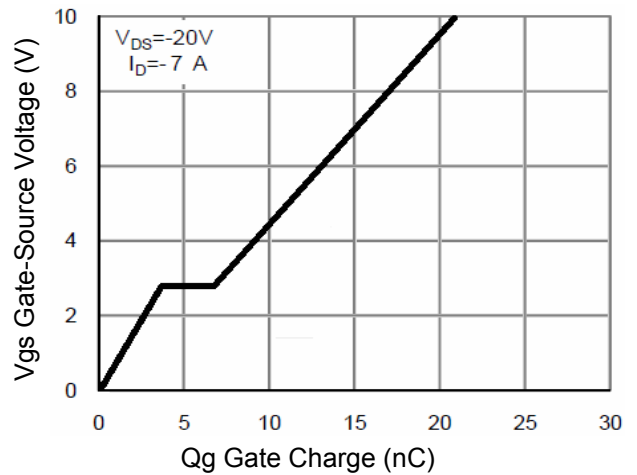


Figure 5 Gate Charge

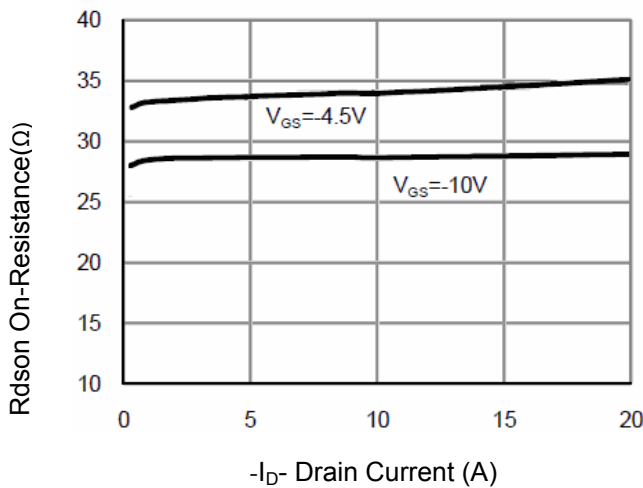


Figure 3 Rdson- Drain Current

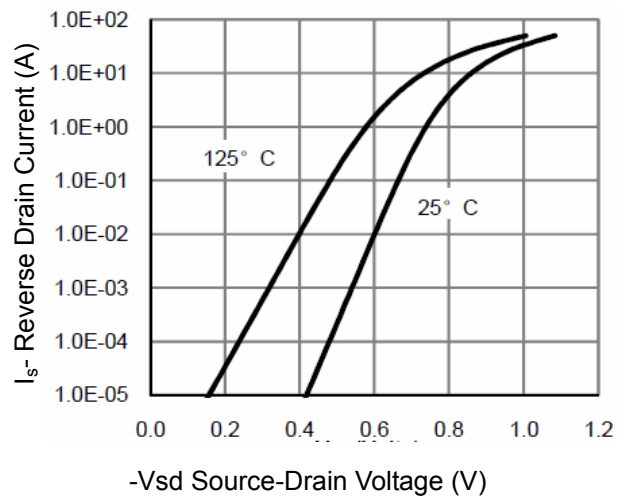


Figure 6 Source- Drain Diode Forward

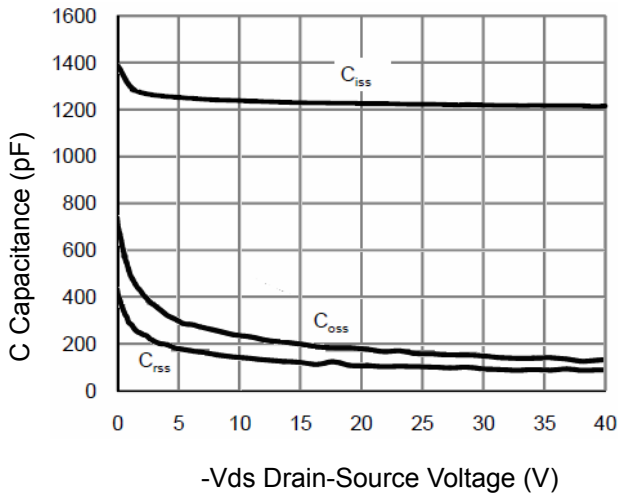


Figure 7 Capacitance vs Vds

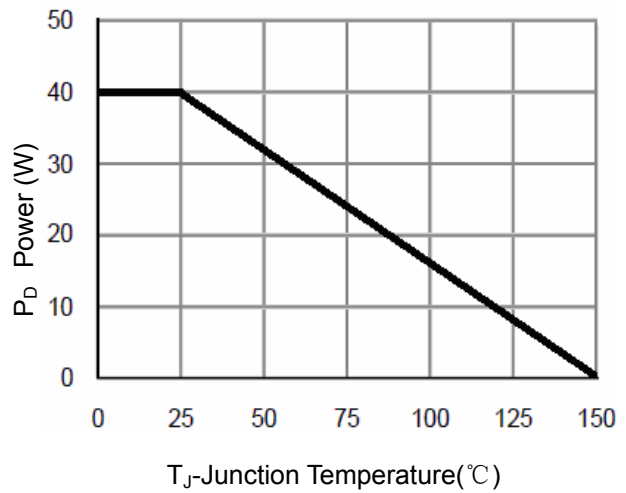


Figure 9 Power Dissipation

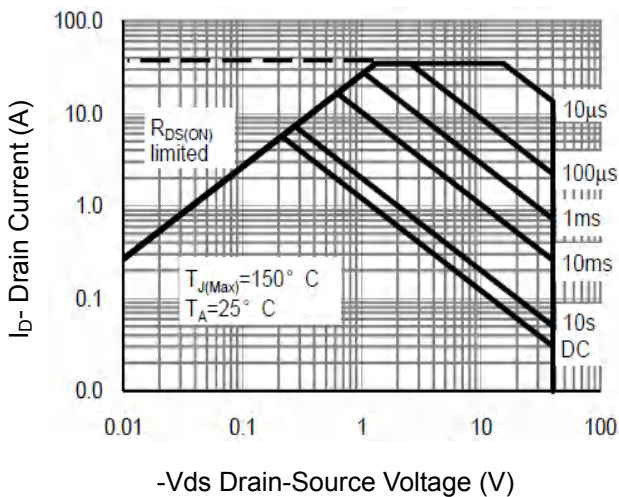


Figure 8 Safe Operation Area

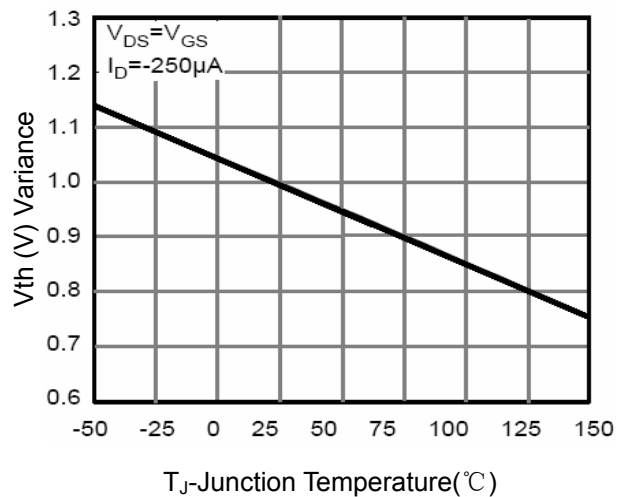


Figure 10 $V_{GS(th)}$ vs Junction Temperature

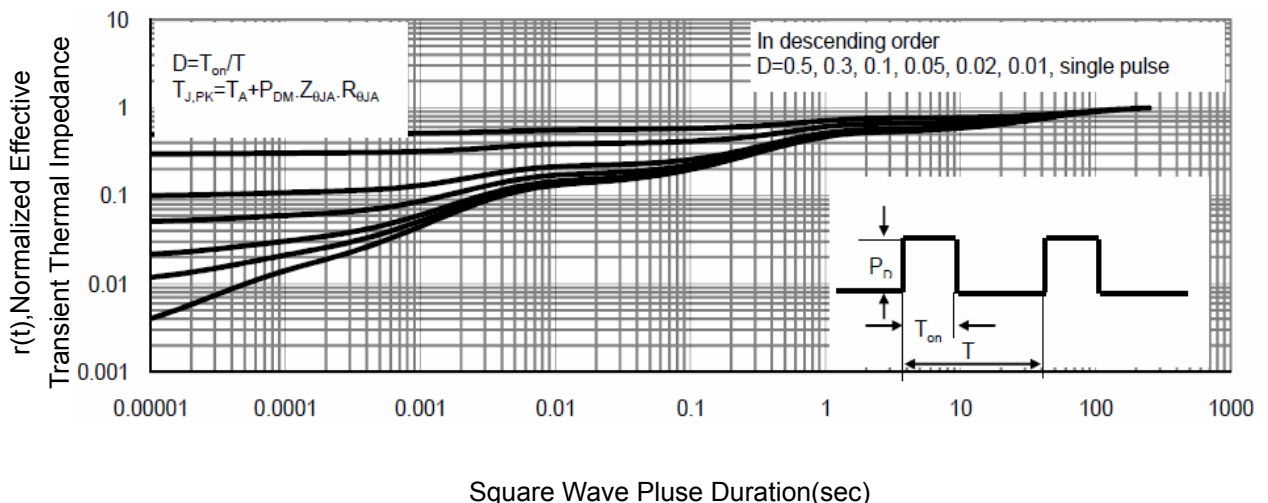
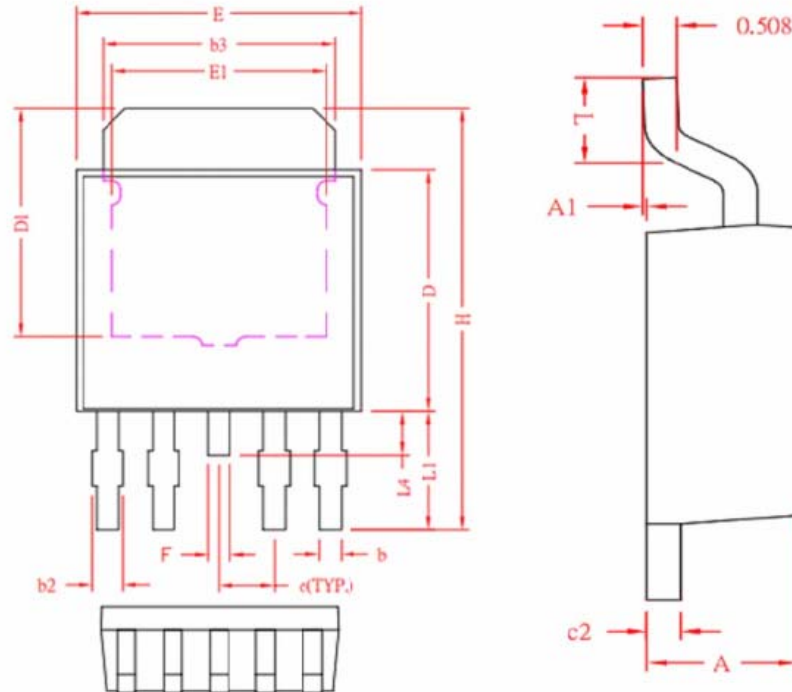


Figure 11 Normalized Maximum Transient Thermal Impedance



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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