



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

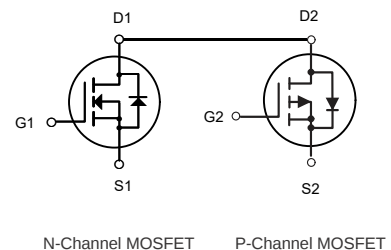
Wireless charging

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
I_{DM}	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	$^{\circ}C$
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	3.1		$^{\circ}C/W$



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 =250μA	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} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1	1.5	2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =10A	-	18	24	mΩ
		V _{GS} =4.5V, I _D =5A	-	26	37	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =10A		15	-	S
Dynamic Characteristics ^(Note4)						
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 =2Ω V _{GS} =10V, R _{GEN} =3Ω	-	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 =-250μA	-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} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.0	-1.5	-2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-7A	-	33	38	mΩ
		V _{GS} =-4.5V, I _D =-4A	-	37	49	mΩ
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 =2.3Ω V _{GS} =-10V, R _{GEN} =6Ω	-	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)

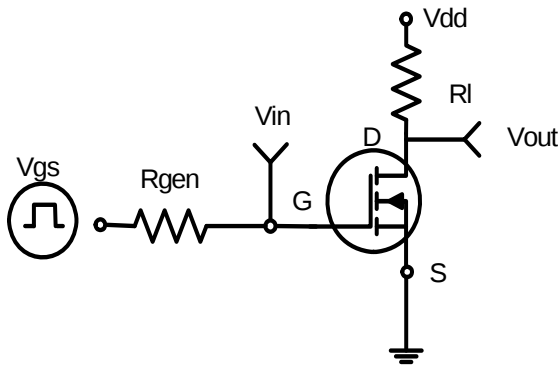


Figure 1: Switching Test Circuit

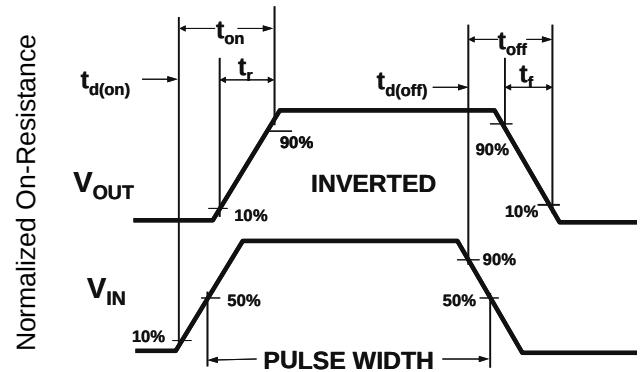


Figure 2: Switching Waveforms

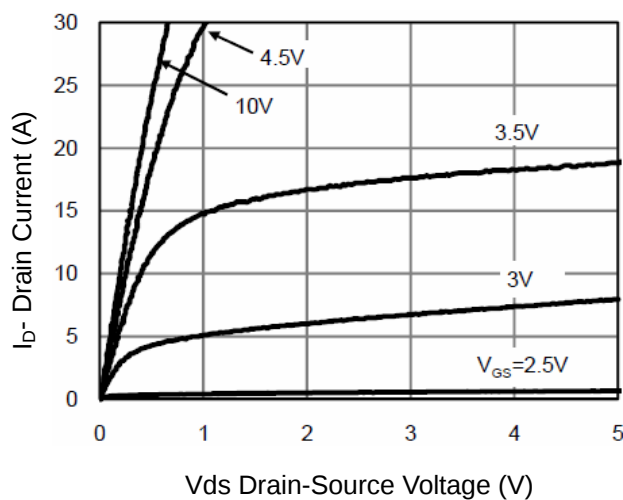


Figure 3 Output Characteristics

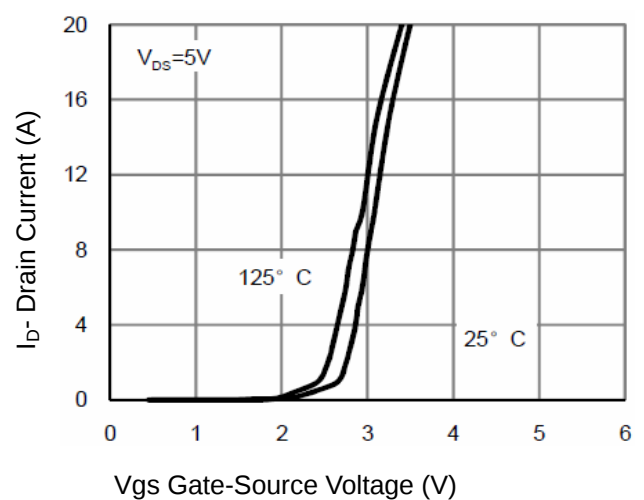


Figure 4 Transfer Characteristics

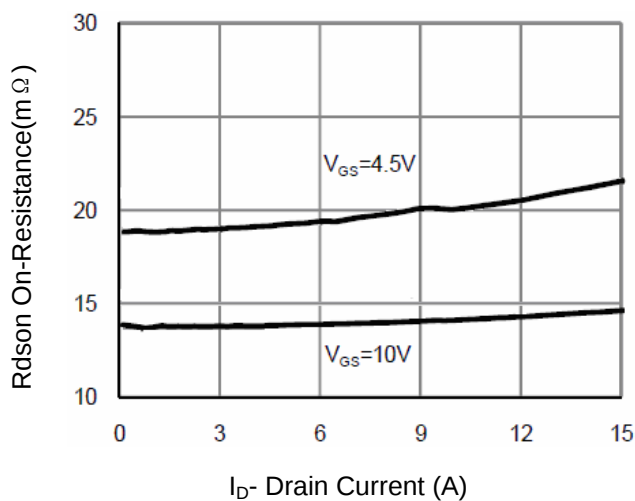


Figure 5 Drain-Source On-Resistance

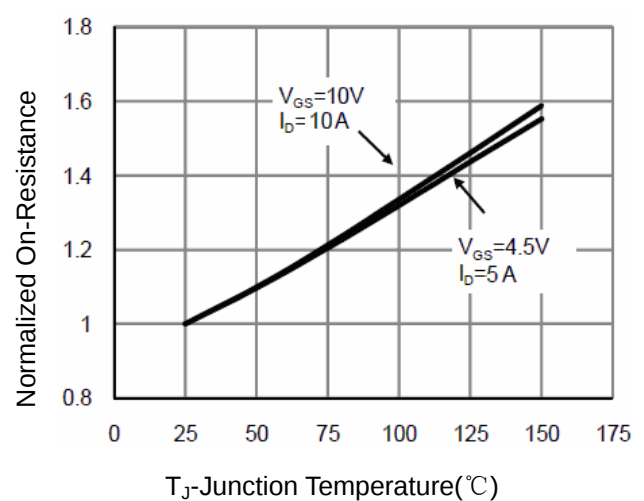
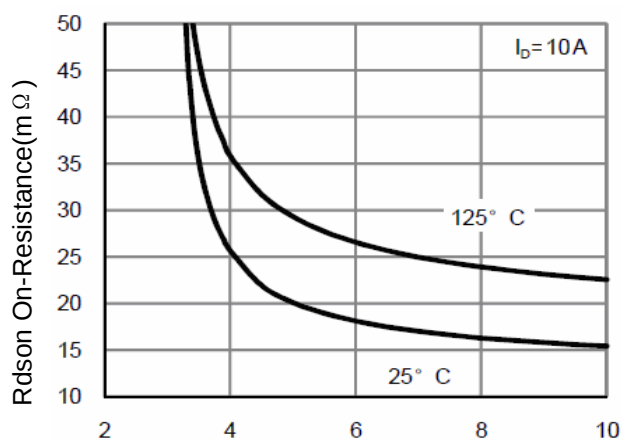
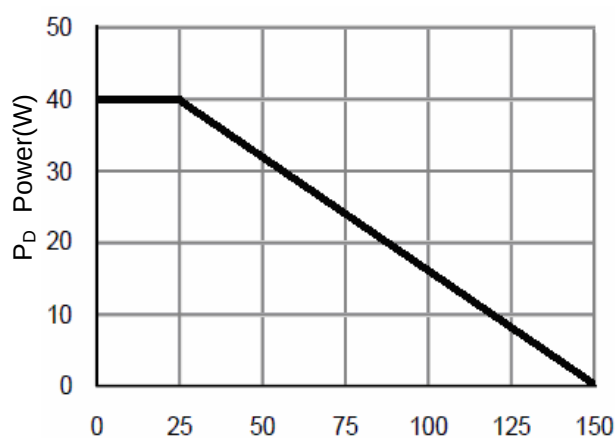


Figure 6 Drain-Source On-Resistance



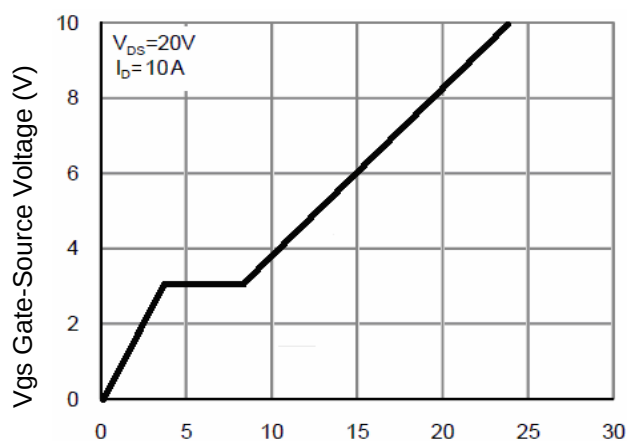
Vgs Gate-Source Voltage (V)

Figure 7 Rdson vs Vgs



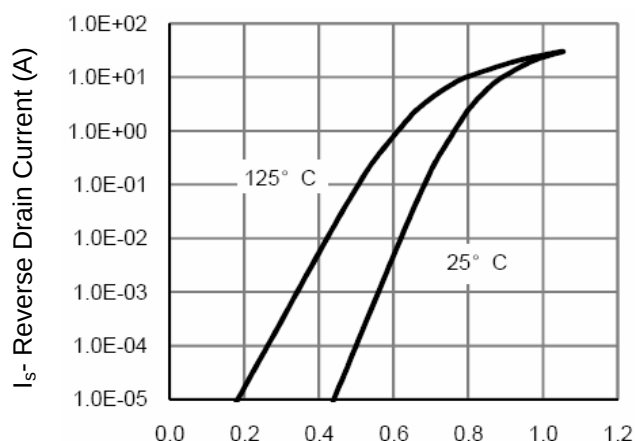
Tj-Junction Temperature(°C)

Figure 8 Power Dissipation



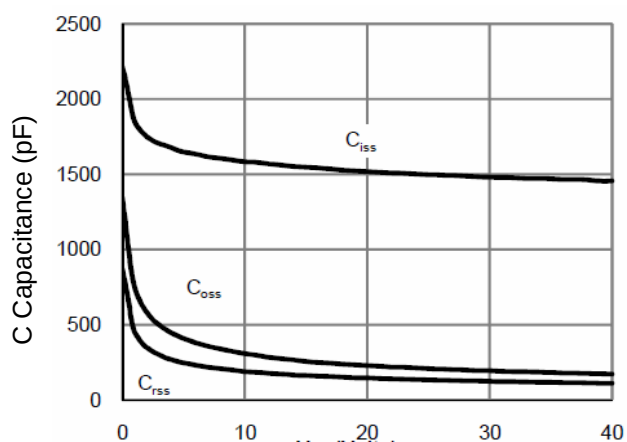
Qg Gate Charge (nC)

Figure 9 Gate Charge



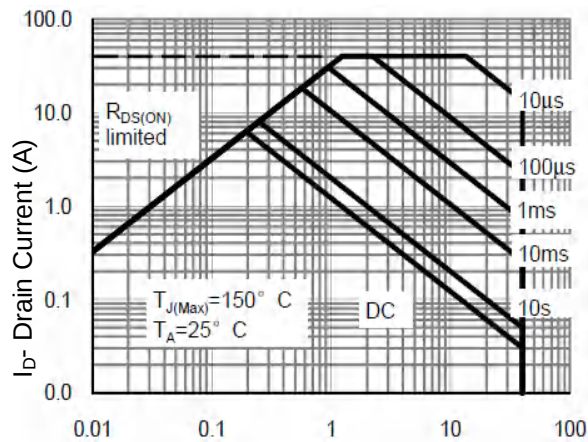
Vds Drain-Source Voltage (V)

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

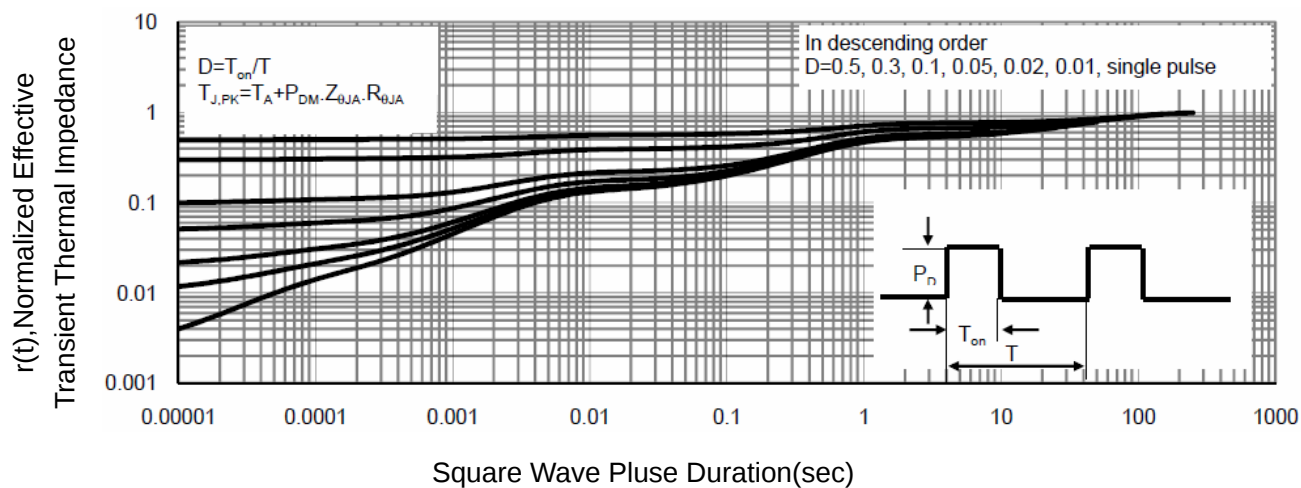


Figure 13 Normalized Maximum Transient Thermal Impedance



P- Channel Typical Electrical and Thermal Characteristics (Curves)

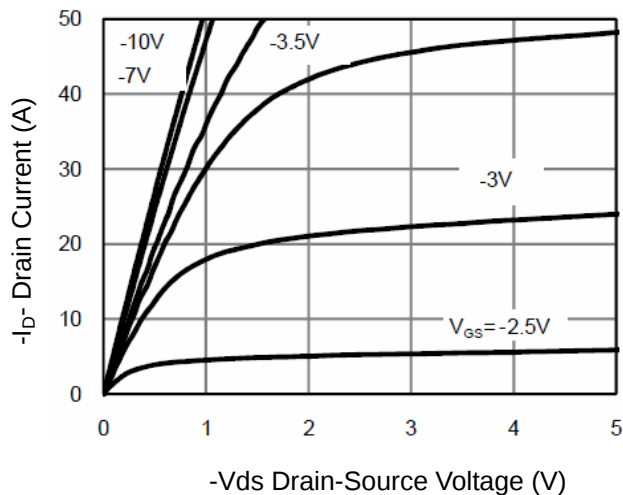


Figure 1 Output Characteristics

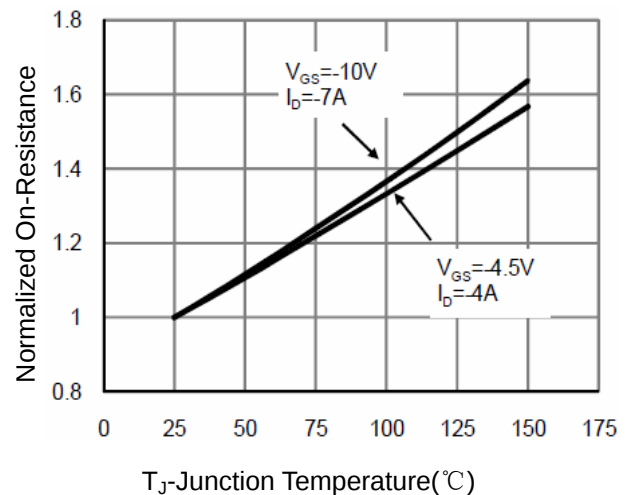


Figure 4 Rdson-Junction Temperature

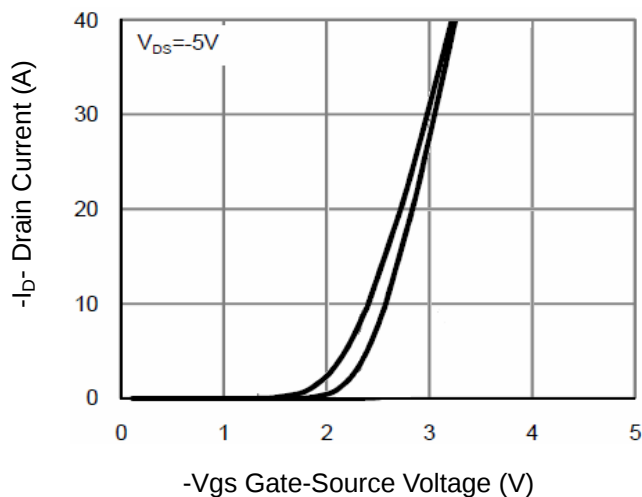


Figure 2 Transfer Characteristics

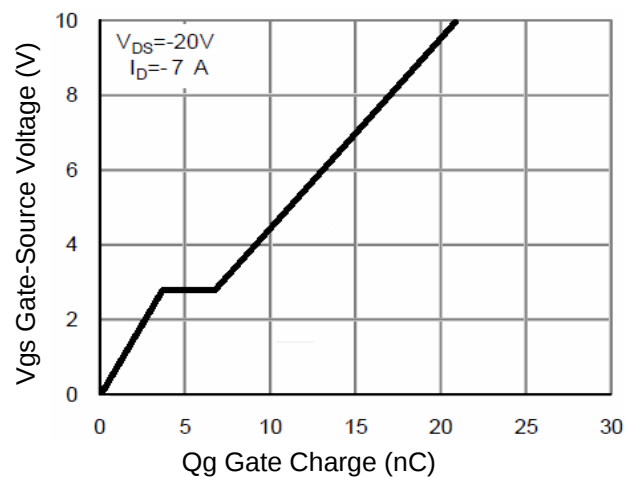


Figure 5 Gate Charge

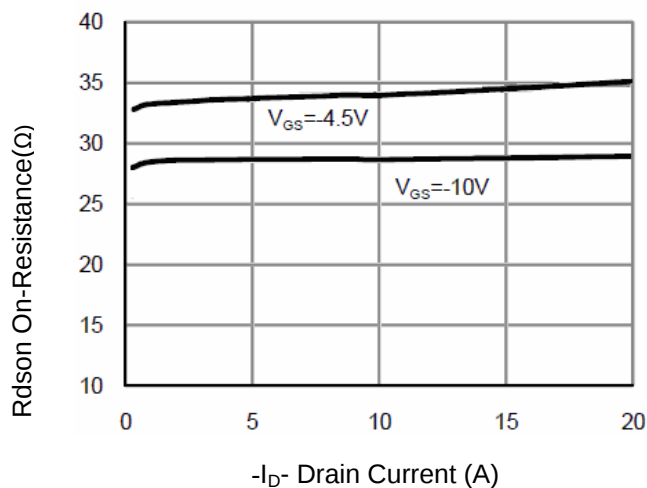


Figure 3 Rdson- Drain Current

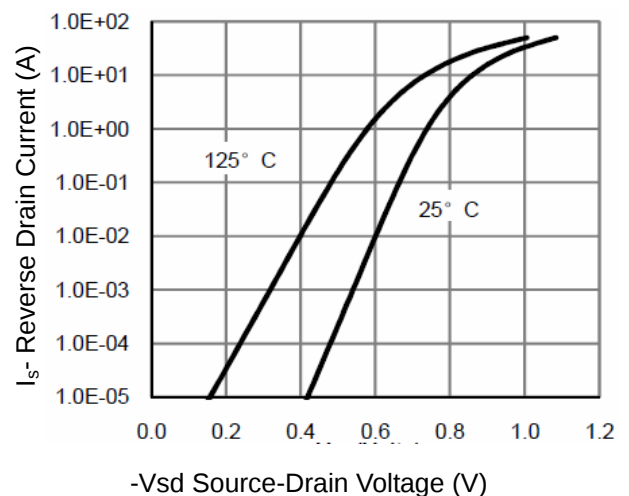


Figure 6 Source- Drain Diode Forward

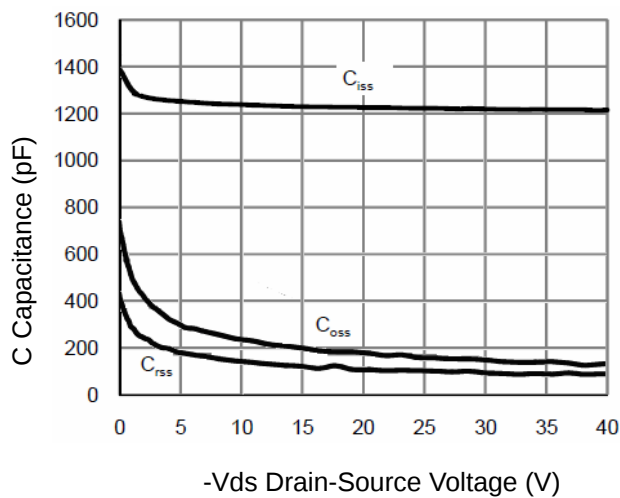


Figure 7 Capacitance vs Vds

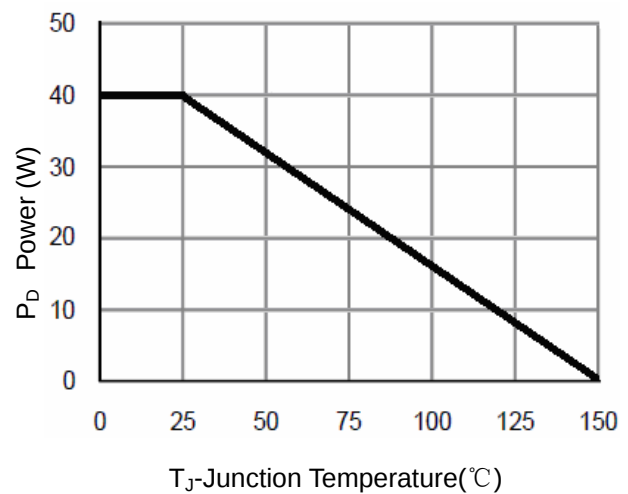


Figure 9 Power Dissipation

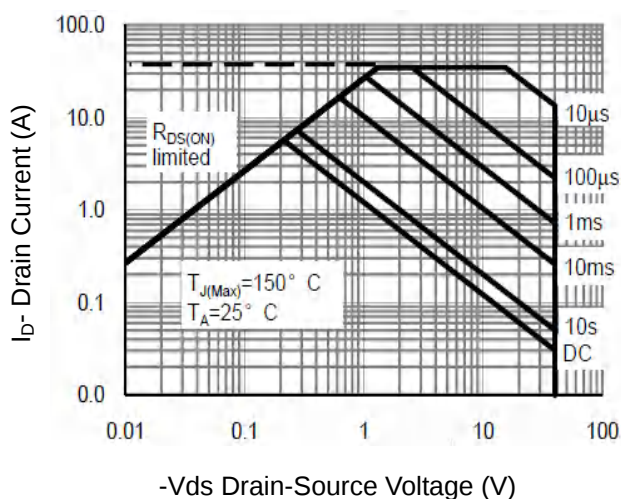


Figure 8 Safe Operation Area

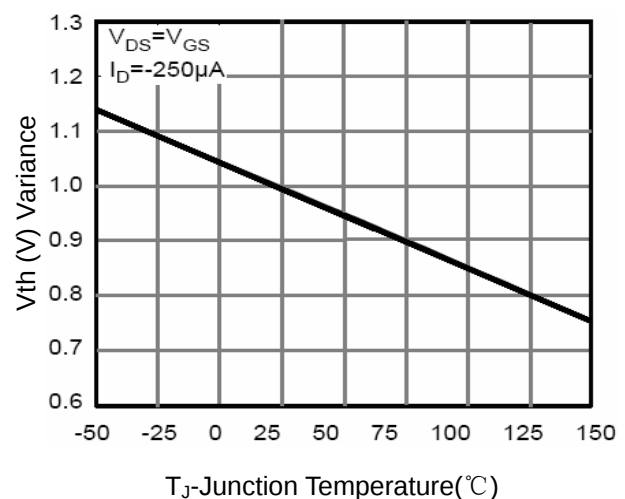


Figure 10 $V_{GS(th)}$ vs Junction Temperature

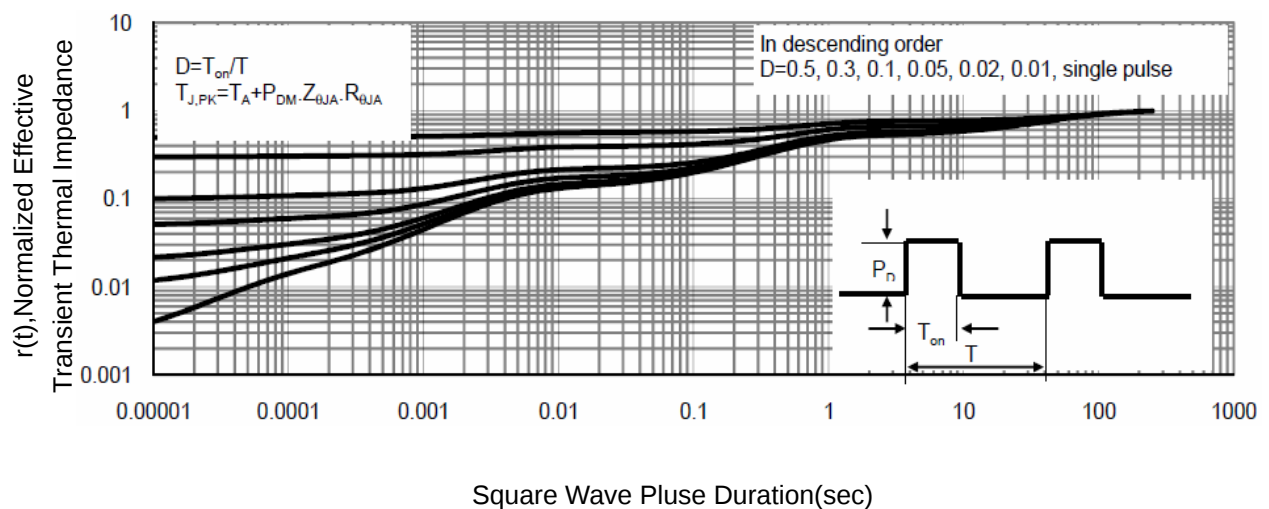
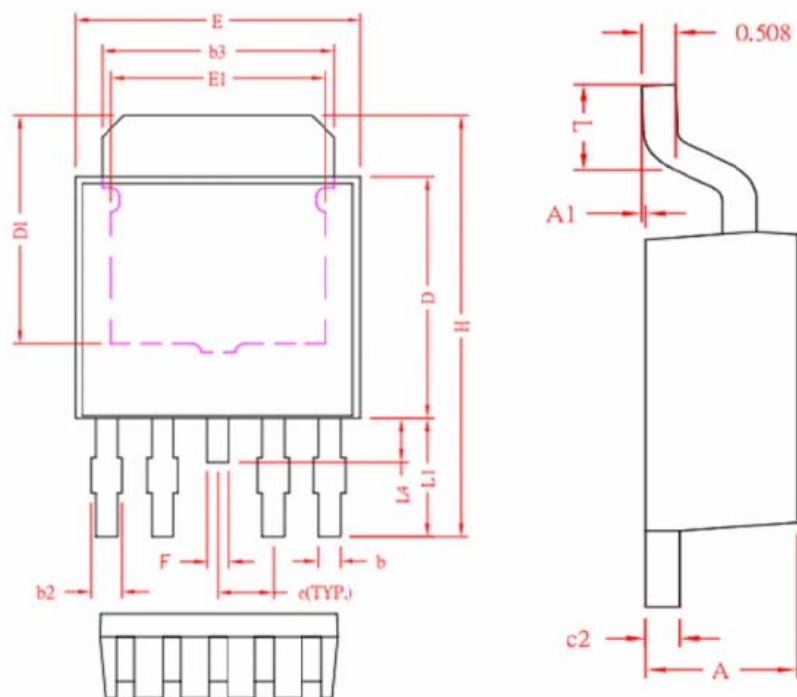


Figure 11 Normalized Maximum Transient Thermal Impedance



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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