

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	13mΩ@10V	25A
	16mΩ@4.5V	
-40V	22mΩ@-10V	-20A
	31mΩ@-4.5V	



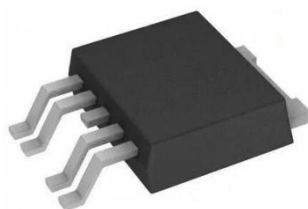
Feature

- High power and current handing capability
- Lead free product is acquired
- Surface mount package
- 100% Single Pluse avalanche energy Test

Applications

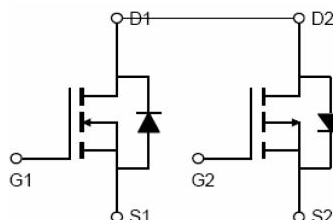
- Battery Protection
- Load Switch
- Power Management

Package

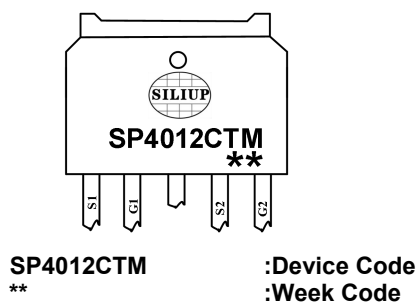


TO-252-4L

Circuit diagram



Marking



Order Information

Device	Package	Unit/Tape
SP4012CTM	TO-252-4L	2500

Absolute maximum ratings (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Value		Units
		N-Channel	P-Channel	
Drain-Source Voltage	V_{DS}	40	-40	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current ($T_C=25^\circ\text{C}$)	I_D	25	-20	A
Continuous Drain Current ($T_C=100^\circ\text{C}$)	I_D	17	-13	A
Pulsed Drain Current	I_{DM}	100	-80	A
Single Pulse Avalanche Energy ¹	E_{AS}	29	48	mJ
Power Dissipation ($T_C=25^\circ\text{C}$)	P_D	40		W
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	3.1		$^\circ\text{C/W}$
Storage Temperature Range	T_{STG}	-55 to 150		$^\circ\text{C}$
Operating Junction Temperature Range	T_J	-55 to 150		$^\circ\text{C}$

N-Channel Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=250uA	40	-	-	V
Drain-Source Leakage Current	IDSS	VDS=32V , VGS=0V , TJ=25℃	-	-	1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID =250uA	1.0	1.5	2.0	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=10V , ID=7A	-	13	16	mΩ
		VGS=4.5V , ID=6A	-	16	22	
Dynamic characteristics						
Input Capacitance	Ciss	VDS=15V , VGS=0V , f=1MHz	-	1061	-	pF
Output Capacitance	Coss		-	110	-	
Reverse Transfer Capacitance	Crss		-	95	-	
Total Gate Charge	Qg	VDS=32V , VGS=4.5V , ID=7A	-	25	-	nC
Gate-Source Charge	Qgs		-	6.3	-	
Gate-Drain Charge	Qgd		-	4.6	-	
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=20V, VGS=10V , RG=3Ω, ID=7A	-	7.8	-	nS
Rise Time	Tr		-	10.7	-	
Turn-Off Delay Time	Td(off)		-	25.8	-	
Fall Time	Tf		-	4.6	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	IS		-	-	25	A
Reverse Recovery Time	Trr	IS=20A, di/dt=100A/us, TJ=25℃	-	12.5	-	nS
Reverse Recovery Charge	Qrr		-	9	-	nC

Note :

1. The EAS test condition is $V_{DD}=20V$, $V_{GS}=10V$, $L=0.1\text{mH}$, $R_G=25\Omega$

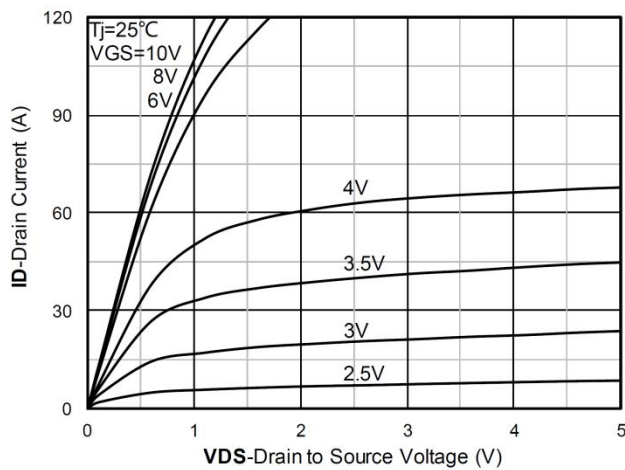
P-Channel Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=-250uA	-40	-	-	V
Drain-Source Leakage Current	IDSS	VDS=-32V , VGS=0V , TJ=25℃	-	-	-1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID =-250uA	-1	-1.5	-2.0	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=-10V , ID=-5A	-	22	28	mΩ
		VGS=-4.5V , ID=-4A	-	31	41	
Dynamic characteristics						
Input Capacitance	Ciss	VDS=-15V , VGS=0V , f=1MHz	-	1415	-	pF
Output Capacitance	Coss		-	204	-	
Reverse Transfer Capacitance	Crss		-	112	-	
Total Gate Charge	Qg	VDS=-15V , VGS=-4.5V , ID=-1A	-	23.5	-	nC
Gate-Source Charge	Qgs		-	3.4	-	
Gate-Drain Charge	Qgd		-	4.3	-	
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=-15V, VGS=-10V , RG=3Ω, ID=-1A	-	11	-	nS
Rise Time	Tr		-	16.7	-	
Turn-Off Delay Time	Td(off)		-	35	-	
Fall Time	Tf		-	19	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=-1A , TJ=25℃	-	-	-1.2	V
Maximum Body-Diode Continuous Current	IS		-	-	-20	A
Reverse Recovery Time	Trr	IS=-15A, di/dt=100A/us, TJ=25℃	-	28	-	nS
Reverse Recovery Charge	Qrr		-	36	-	nC

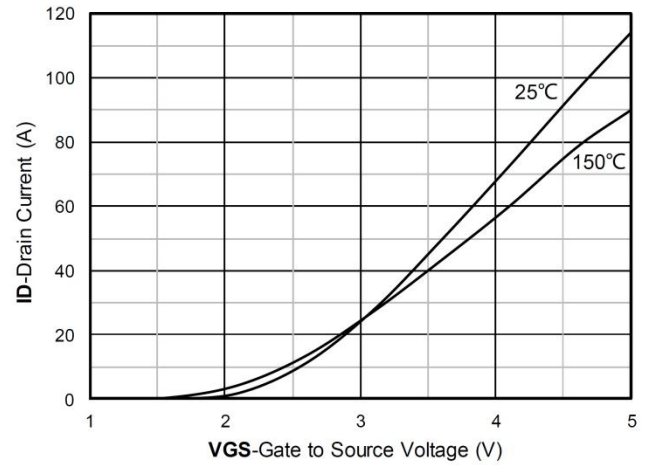
Note :

1. The EAS test condition is $V_{DD}=-20V$, $V_{GS}=-10V$, $L=0.1mH$, $R_G=25\Omega$

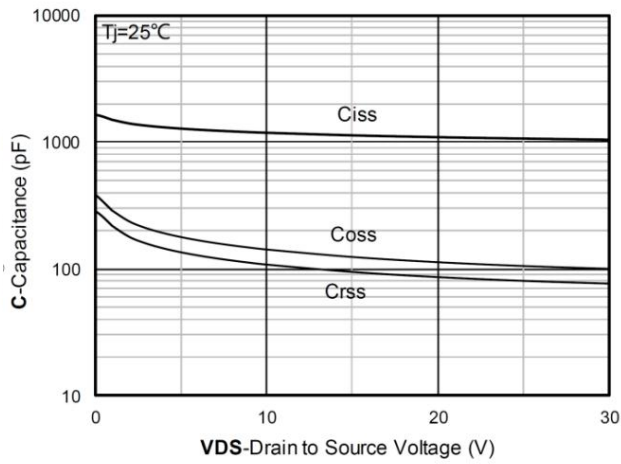
N-Channel Typical Characteristics



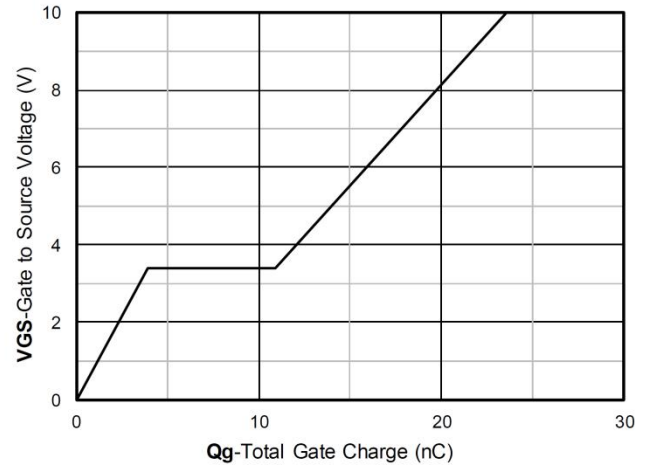
Output Characteristics



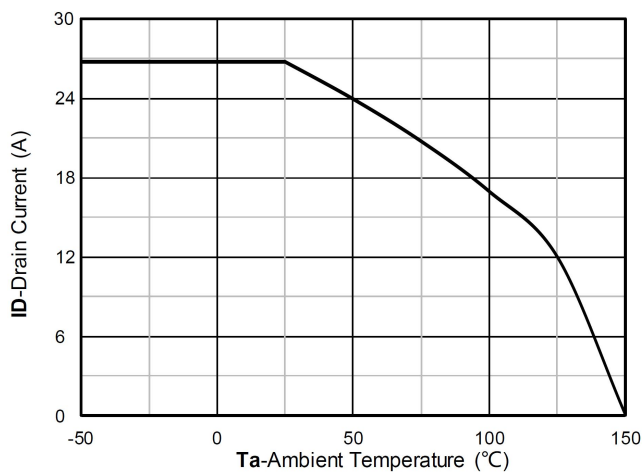
Transfer Characteristics



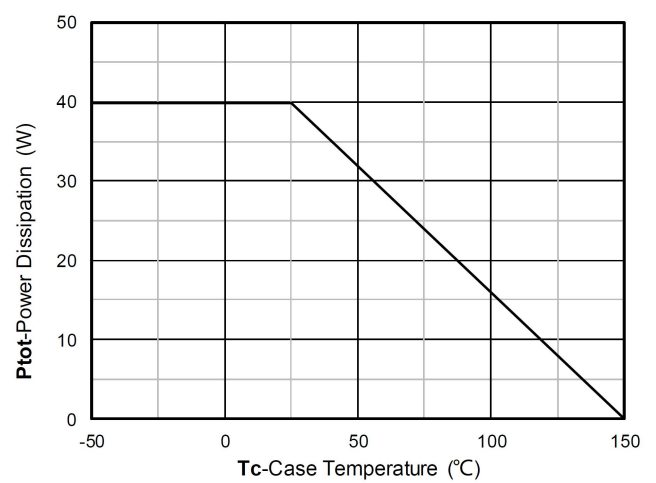
Capacitance Characteristics



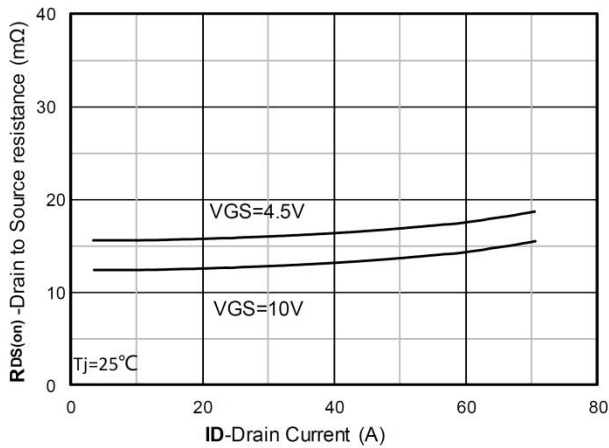
Gate Charge



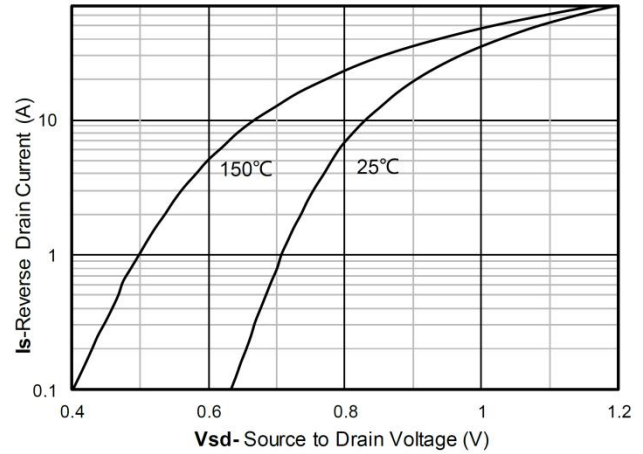
Current dissipation



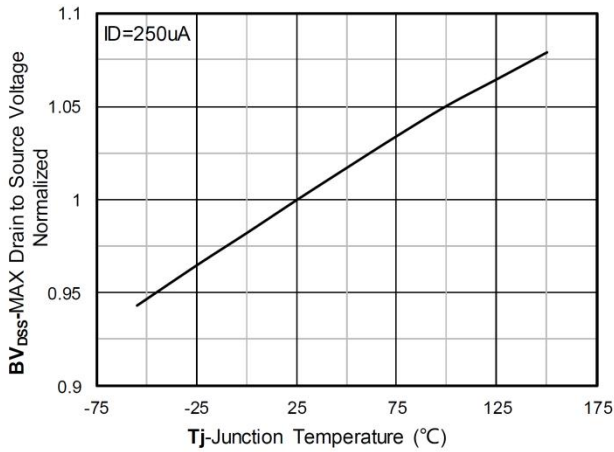
Power dissipation



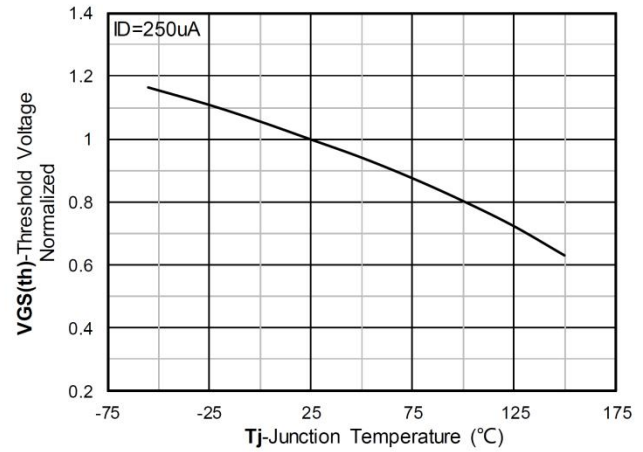
RDS(on) VS Drain Current



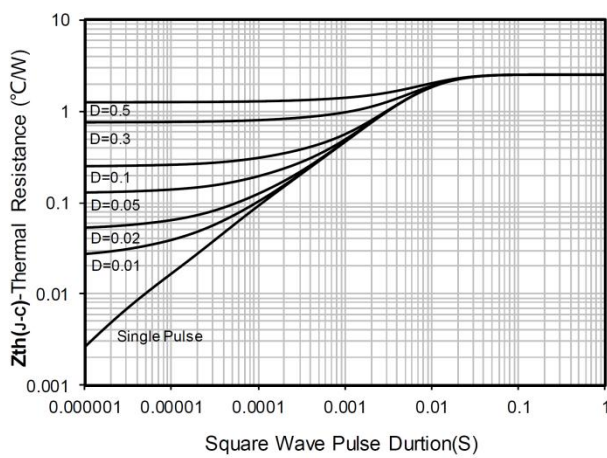
Forward characteristics of reverse diode



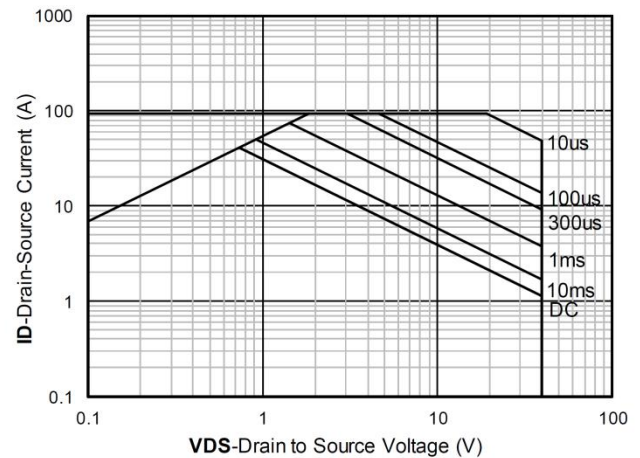
Normalized breakdown voltage



Normalized Threshold voltage

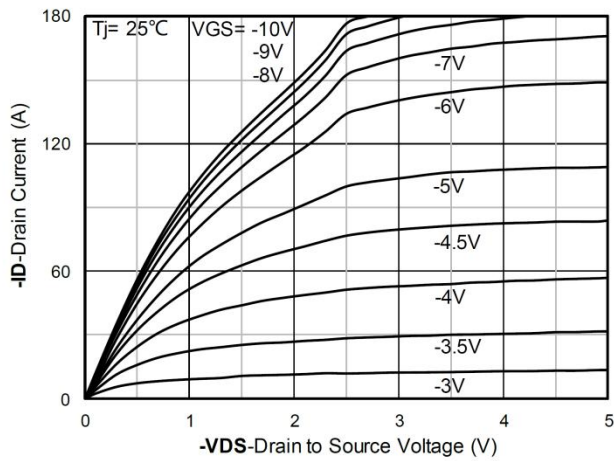


Maximum Transient Thermal Impedance

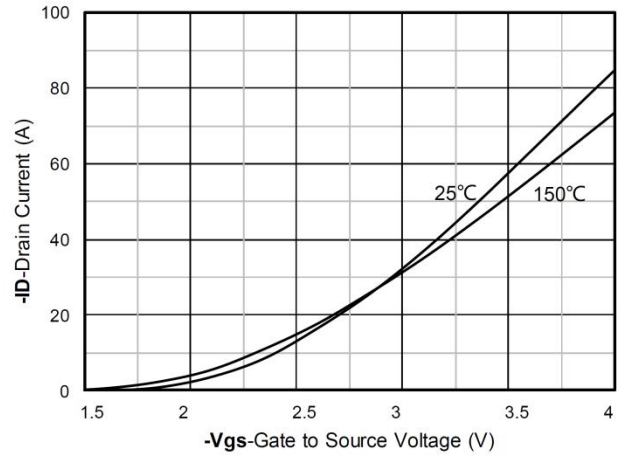


Safe Operation Area

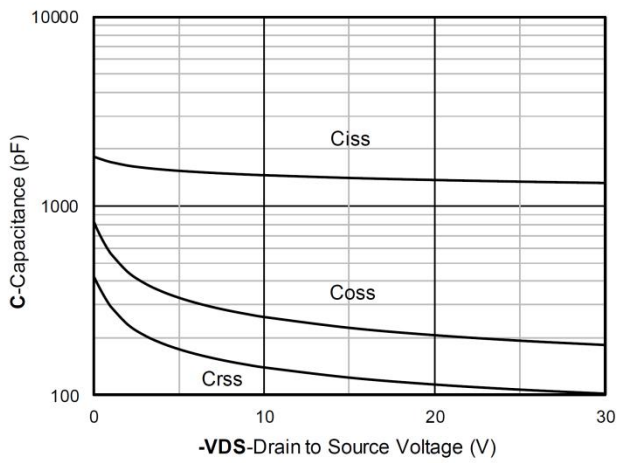
P-Channel Typical Characteristics



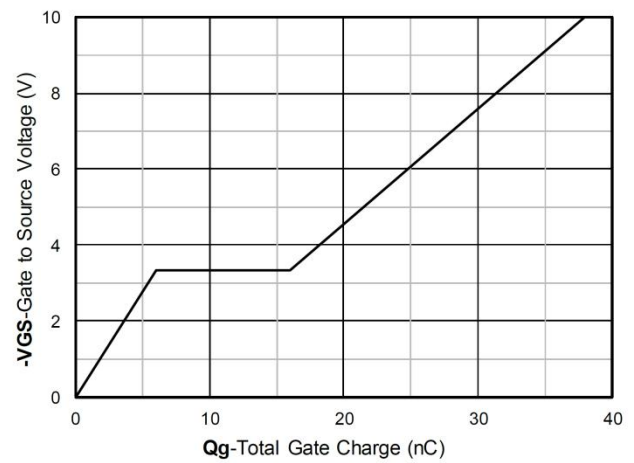
Output Characteristics



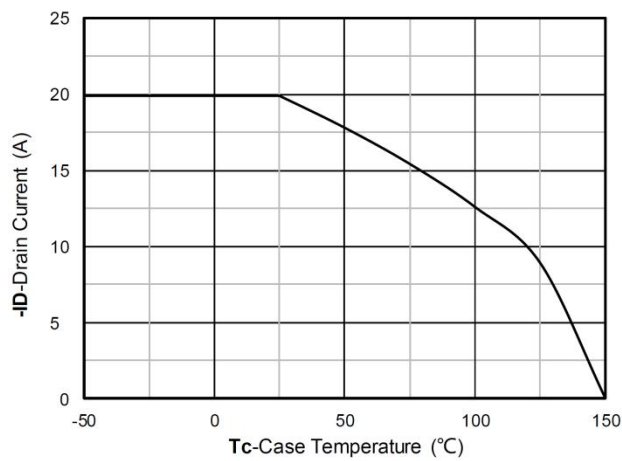
Transfer Characteristics



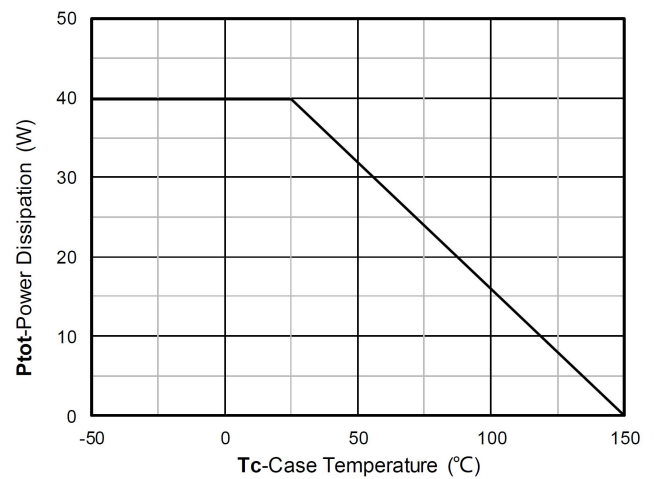
Capacitance Characteristics



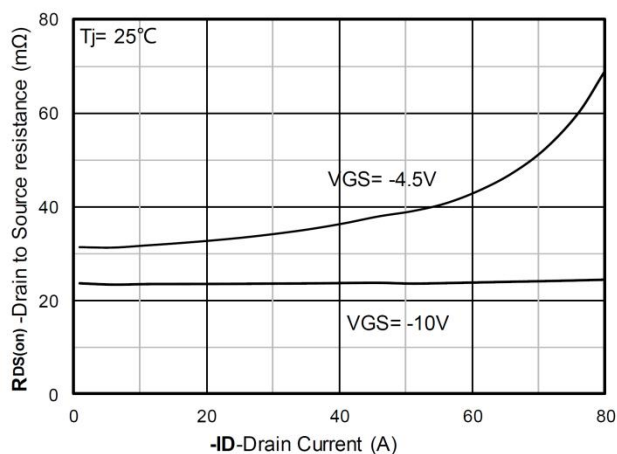
Gate Charge



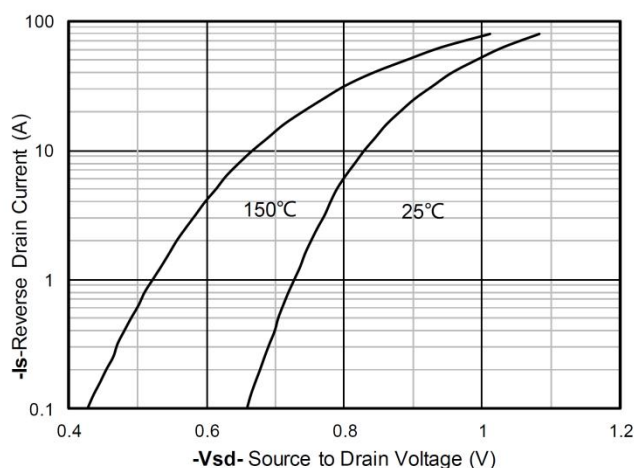
Current dissipation



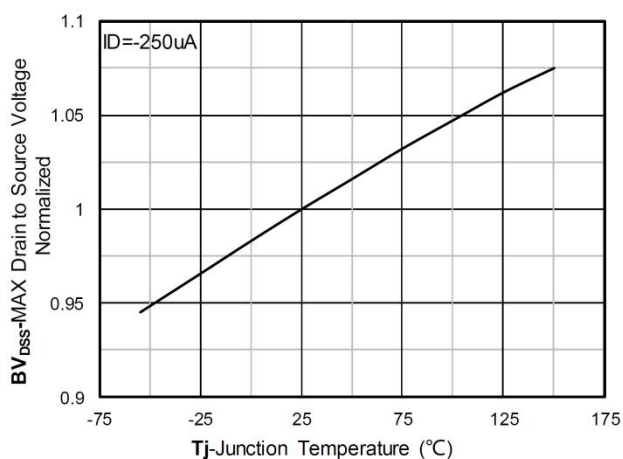
Power dissipation



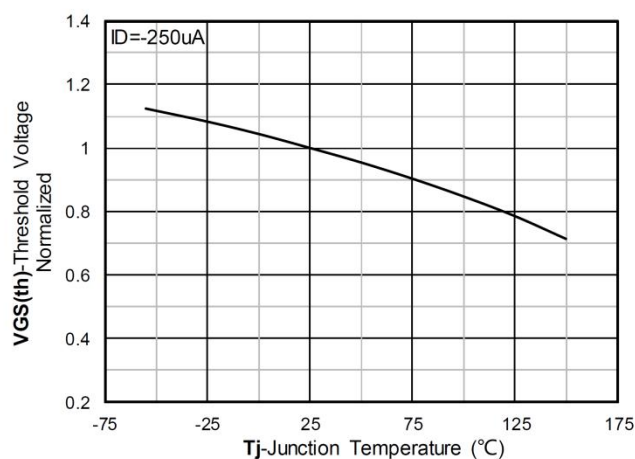
$R_{DS(on)}$ VS Drain Current



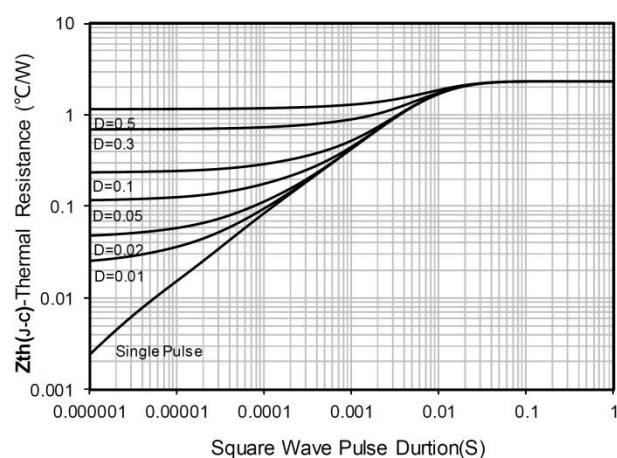
Forward characteristics of reverse diode



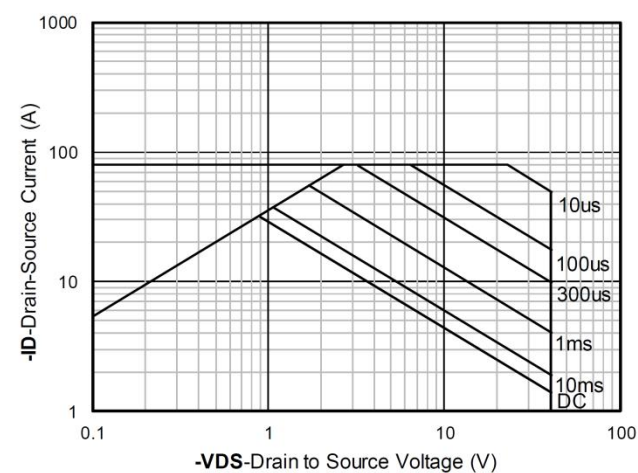
Normalized breakdown voltage



Normalized Threshold voltage

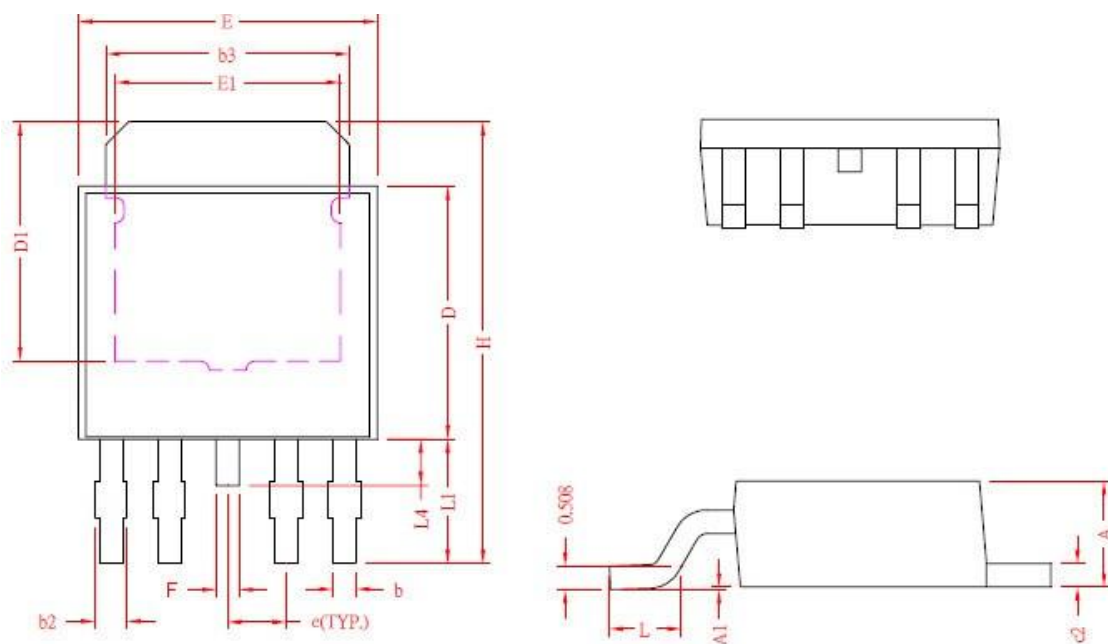


Maximum Transient Thermal Impedance



Safe Operation Area

TO-252-4L Package Information



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	2.20	2.40
A1	0	0.15
b	0.40	0.60
b2	0.50	0.80
b3	5.20	5.50
c2	0.45	0.55
D	5.40	5.80
D1	4.57	-
E	6.40	6.80
E1	3.81	-
e	1.27REF.	
F	0.40	0.60
H	9.40	10.20
L	1.40	1.77
L1	2.40	3.00
L4	0.80	1.20