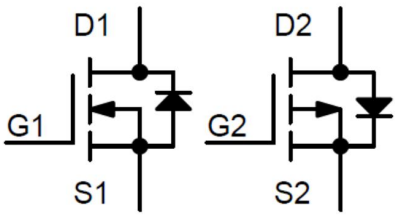
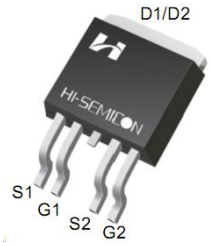
N-Ch and P-Ch Power MOSFET





GENERAL DESCRIPTION

Complementary Enhancement MOSFET in a TO-252-4L Package. The SFQ0420T4 uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge can be used in a wide variety of applications.

Features

- N-CHANNEL
  - V_{DS}=40V,I_D=25A
  - $R_{DS(on)(TYP)}$=13.8mΩ; (VGS=10V, ID=10A)
  - $R_{DS(on)(TYP)}$=18.8mΩ; (VGS=4.5V, ID=10A)
- P-CHANNEL
  - V_{DS}=-40V,I_D=-21A
  - $R_{DS(on)(TYP)}$=24.9mΩ; (VGS=-10V, ID=-10A)
  - $R_{DS(on)(TYP)}$=31.2mΩ; (VGS=-4.5V, ID=-10A)

Applications

- Power faction correction (PFC)
- Switched mode power supplies (SMPS)
- Uninterruptible power supply (UPS)
- LED lighting power

ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SFQ0420T4	T0-252-4L	SFQ0420T4	Pb Free	Reel

ABSOLUTE MAXIMUM RATINGS (T_J=25°C unless otherwise noted)

Characteristics		Symbol	N-CHANNEL	P-CHANNEL	Unit
Drain-Source Voltage		V_{DS}	40	-30	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Drain Current	T_C = 25°C	I_D	25	-21	A
	T_C = 100°C		20	-16.8	
Drain Current Pulsed(Note 1)		I_{DM}	87.5	-73.5	A
Power Dissipation(T_C=25°C)		P_D	35		W
Operation Junction Temperature Range		T_J	-55 to +150		°C
Storage Temperature Range		T_{stg}	-55 to +150		°C
Maximum lead temperature for soldering purposes,1/8" from case for 5 seconds		TL	300		℃

THERMAL CHARACTERISTICS

Characteristics	Symbol	MAX	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.4	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	°C/W

N-Ch ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B_{VDSS}	V_{GS}=0V, I_D=250μA	40	48.6	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=40V, V_{GS}=0V	--	2.5	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{DS}=0V	--	2.7	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=-20V, V_{DS}=0V	--	-0.5	-100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}= V_{DS}, I_D=250μA	1	1.57	2.5	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=10A	--	13.8	16	mΩ
		V_{GS}=4.5V, I_D=10A	--	18.8	25	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V, ID=10A	10	14.7	20	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=20V	--	1512	--	pF
Output Capacitance	C_{oss}	V_{GS}=0V	--	208	--	
Reverse Transfer Capacitance	C_{rss}	f=1.0MHZ	--	142	--	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V; V_{GS}=10V	--	5.8	--	nS
Turn-on Rise Time	t_r	R_G=3Ω	--	12.5	--	
Turn-off Delay Time	$t_{d(off)}$	(Note 2.3)	--	21	--	
Turn-off Fall Time	t_f		--	6.7	--	
Total Gate Charge	Q_g	V_{DS}=20V, I_D=10A	--	23	--	nC
Gate-Source Charge	Q_{gs}	V_{GS}=10V	--	5.1	--	
Gate-Drain Charge	Q_{gd}	(Note 2.3)	--	4.6	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	25	A
Pulsed Source Current	I_{SM}		--	--	87.5	
Diode Forward Voltage	V_{SD}	I_S=10A,V_{GS}=0V	--	0.86	1.4	V

NOTE:

1.Pluse width limited by maximum junction temperature

2.Pulse Test: Pulse width ≤300μs, Duty cycle≤2%

3.Essentially independent of operating temperature

P-Ch ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B_{VDSS}	V_{GS}=0V, I_D=-250μA	-40	-46.3	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=-40V, V_{GS}=0V	--	-4.1	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{DS}=0V	--	0.6	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=-20V, V_{DS}=0V	--	-4.8	-100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}= V_{DS}, I_D=-250μA	-1.0	-1.5	-2.5	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	V_{GS}=-10V, I_D=-10A	--	24.9	35	mΩ
		V_{GS}=-4.5V, I_D=-10A	--	31.2	50	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V, ID=-10A	12	16.8	22	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=-20V V_{GS}=0V f=1.0MHZ	--	1217	--	pF
Output Capacitance	C_{oss}		--	198	--	
Reverse Transfer Capacitance	C_{rss}		--	125	--	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-20V; V_{GS}=-10V R_G=6.0Ω (Note 2.3)	--	11.5	--	nS
Turn-on Rise Time	t_r		--	13.8	--	
Turn-off Delay Time	$t_{d(off)}$		--	32.7	--	
Turn-off Fall Time	t_f		--	17.9	--	
Total Gate Charge	Q_g	V_{DS}=-20V, I_D=-7A V_{GS}=-10V (Note 2.3)	--	23.5	--	nC
Gate-Source Charge	Q_{gs}		--	3.7	--	
Gate-Drain Charge	Q_{gd}		--	3.1	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	-21	A
Pulsed Source Current	I_{SM}		--	--	-73.5	
Diode Forward Voltage	V_{SD}	I_S=-10A,V_{GS}=0V	--	-0.91	-1.4	V

NOTE:

1.Pluse width limited by maximum junction temperature

2.Pulse Test: Pulse width ≤300μs, Duty cycle≤2%

3.Essentially independent of operating temperature

N-Channel Typical Performance Characteristics

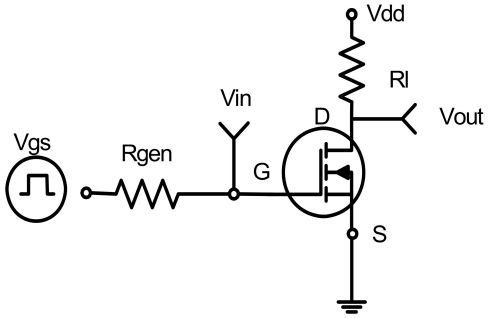


Figure 1 Switching Test Circuit

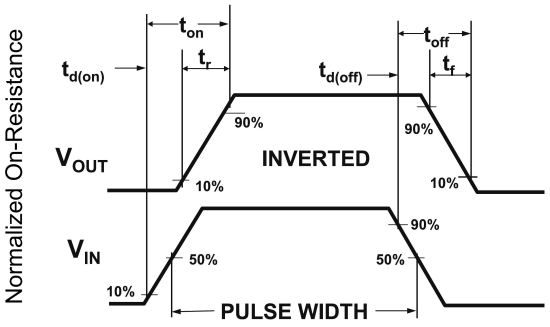


Figure 2 Switching Waveforms

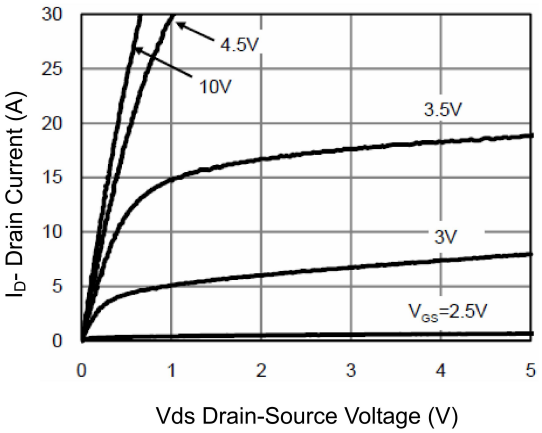


Figure 3 Output Characteristics

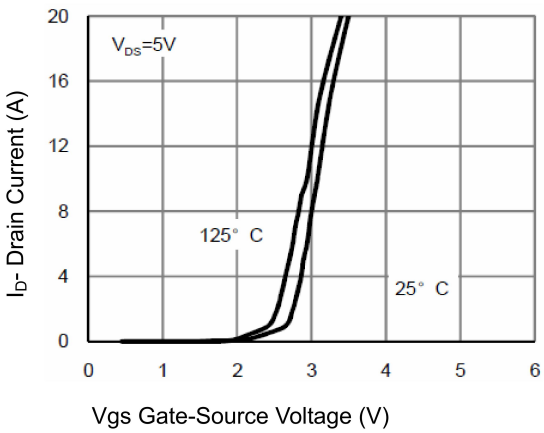


Figure 4 Transfer Characteristics

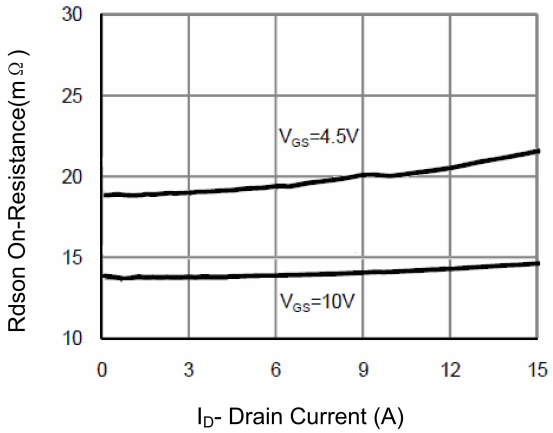


Figure 5 Drain-Source On-Resistance

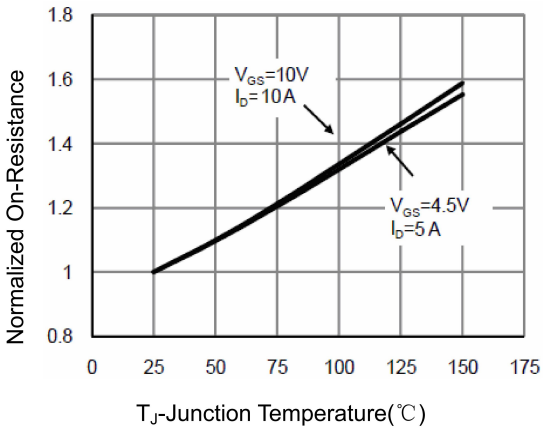


Figure 6 Drain-Source On-Resistance

N-Channel Typical Performance Characteristics

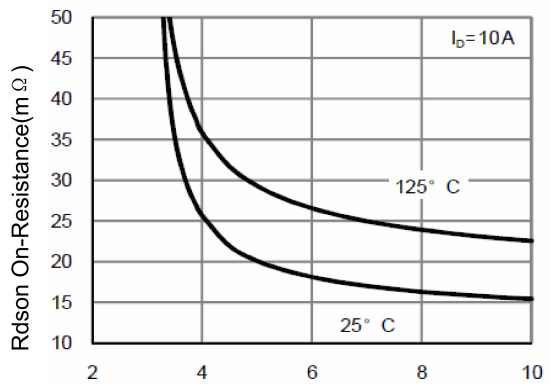


Figure7 Rdson vs Vgs

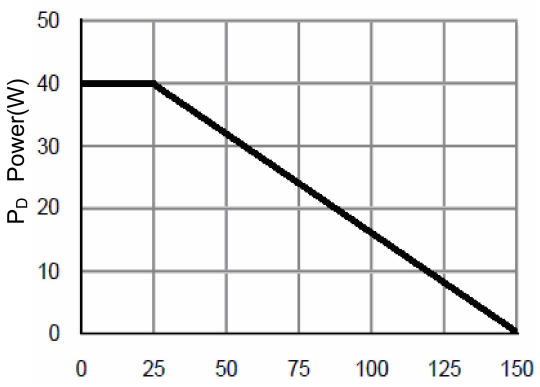


Figure 8 Power Dissipation

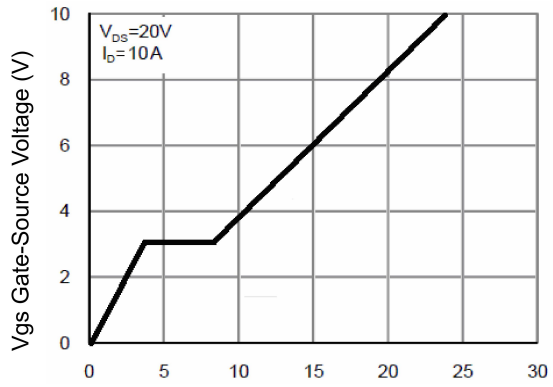


Figure 9 Gate Charge

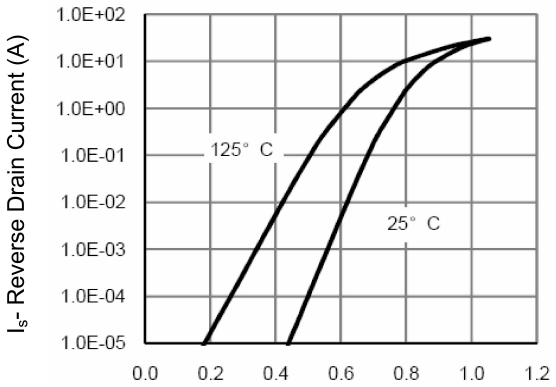


Figure 10 Source- Drain Diode Forward

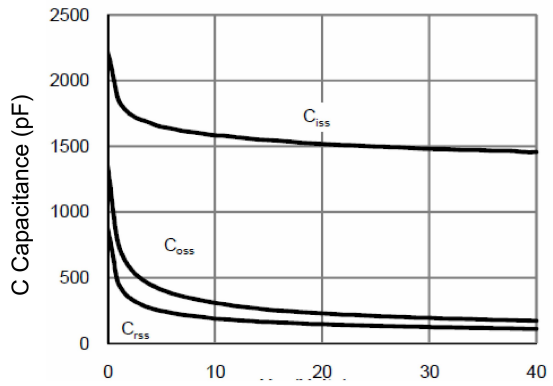


Figure 11 Capacitance vs Vds

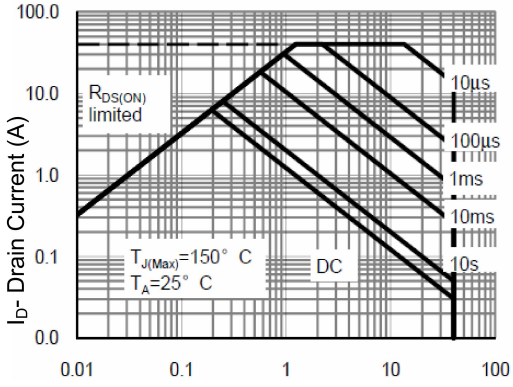


Figure 12 Safe Operation Area

P-Channel Typical Performance Characteristics

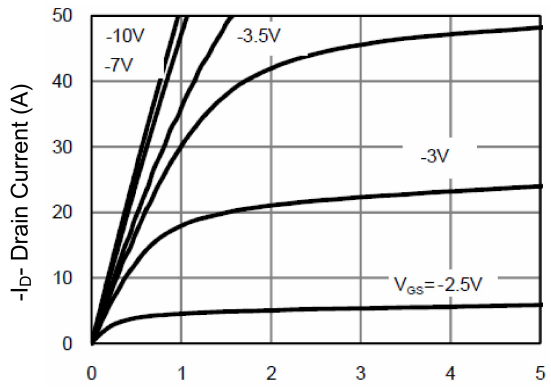


Figure 1 Output Characteristics

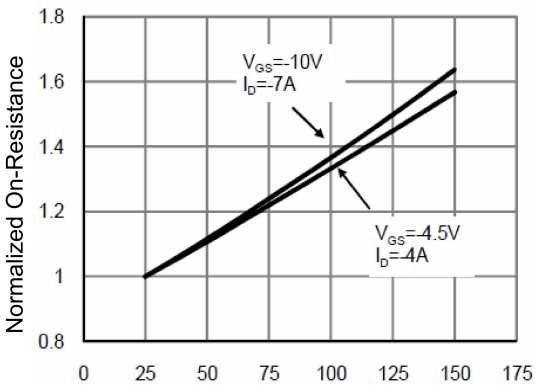


Figure 2 Rdson-Junction Temperature

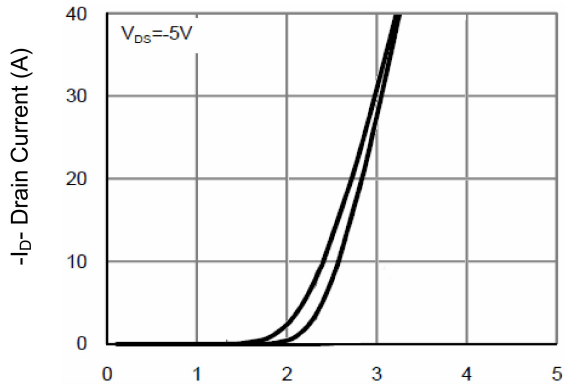


Figure 3 Transfer Characteristics

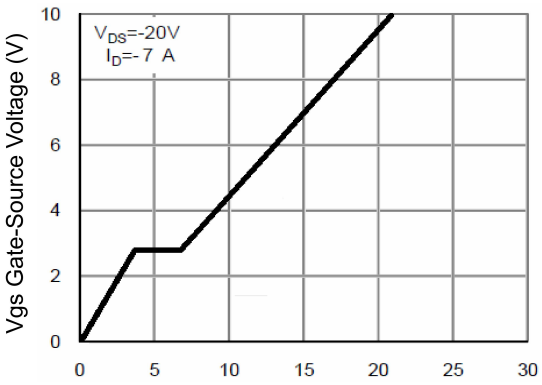


Figure 4 Gate Charge

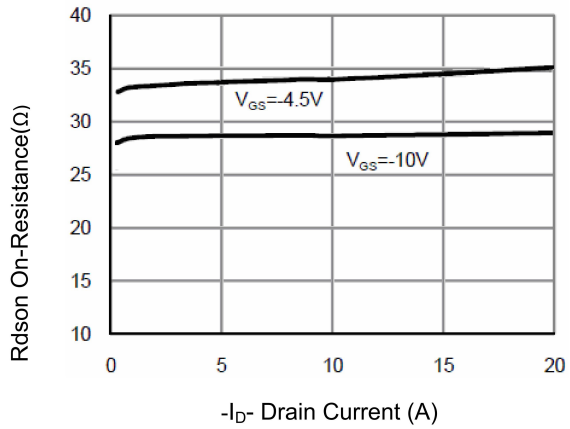


Figure 5 Rdson- Drain Current

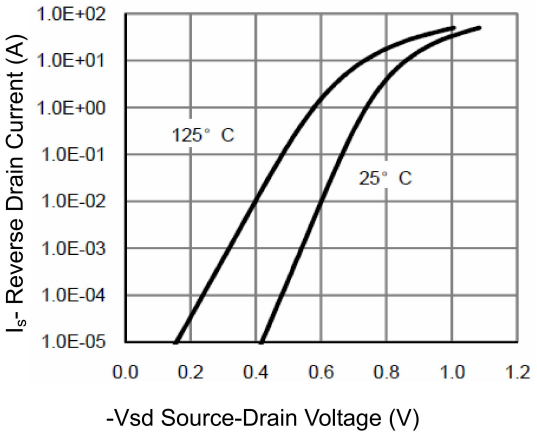
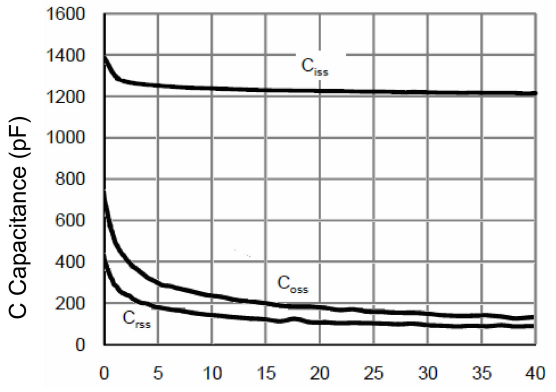


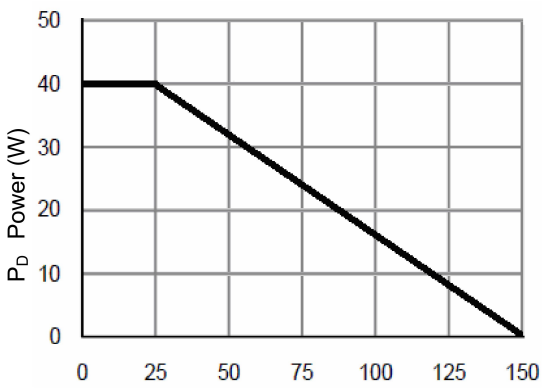
Figure 6 Source- Drain Diode Forward

P-Channel Typical Performance Characteristics



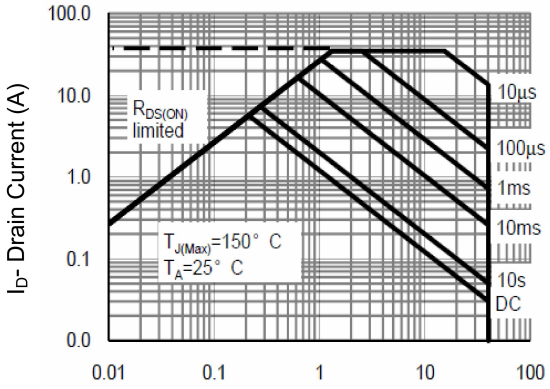
-Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds



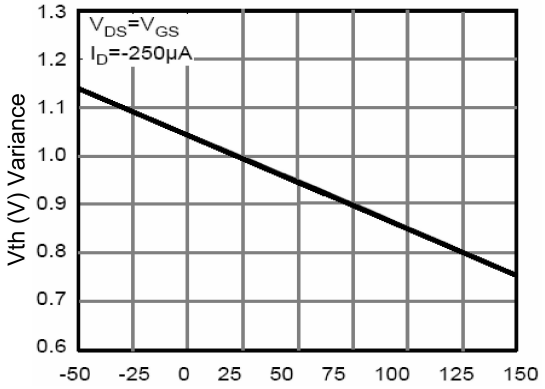
T_J-Junction Temperature(℃)

Figure 8 Power Dissipation



-Vds Drain-Source Voltage (V)

Figure 9 Safe Operation Area

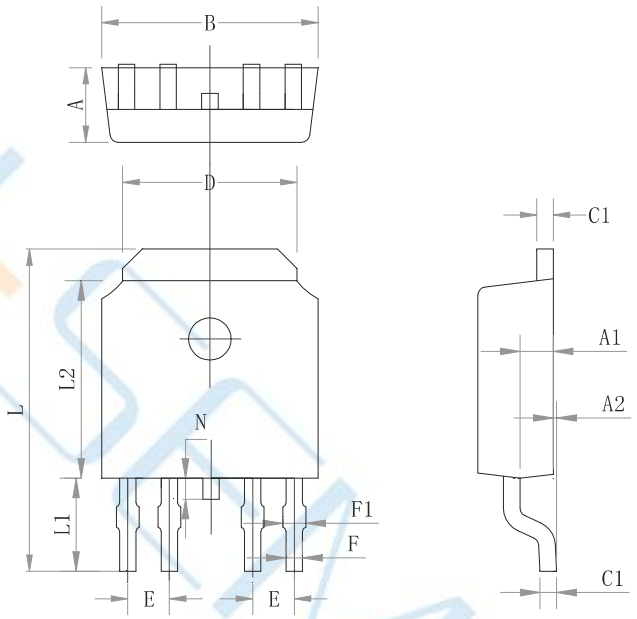


T_J-Junction Temperature(℃)

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

Package Dimensions of TO-252-4L

Unit:mm



Symbol	Min	Typ	Max
A	2.22	2.30	2.38
A1	0.93	1.01	1.08
A2	0.05	0.15	0.20
B	6.52	6.60	6.68
C	0.48	0.50	0.54
C1	0.48	0.50	0.54
D	5.22	5.32	5.42
E		1.27 TYP	
F	0.40	0.50	0.60
F1	0.50	0.60	0.70
L	9.77	9.97	10.17
L1	2.67	2.87	3.07
L2	6.02	6.10	6.18
N	0.55	0.65	0.75

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