

Features

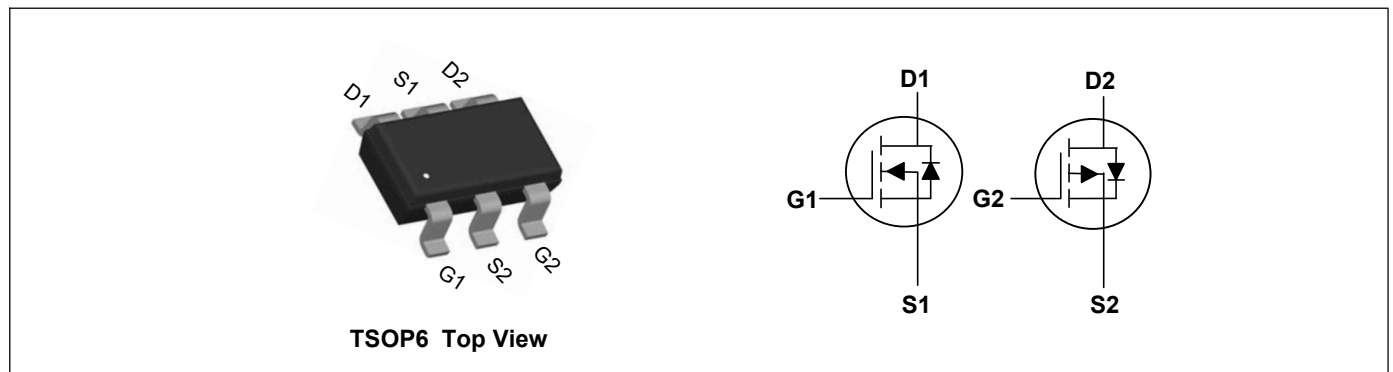
- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Green Device Available

Product Summary

	N-Ch	P-Ch	
V_{DS}	20	-20	V
I_D	3.8	-2.5	A
$R_{DS(ON)}$ (at $V_{GS}=\pm 4.5V$)	50	70	mΩ
$R_{DS(ON)}$ (at $V_{GS}=\pm 2.5V$)	75	95	mΩ

Applications

- High Frequency Point-of-Load, Synchronous Buck Converter
- Networking DC-DC Power System
- Load Switch



Absolute Maximum Ratings($T_A=25^{\circ}C$, unless otherwise noted)

Parameter	Symbol	N-Ch	P-Ch	Units
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	± 12	± 12	V
Continuous Drain Current, $V_{GS} @ \pm 4.5V^1$	$I_D@T_A=25^{\circ}C$	3.8	-2.5	A
Continuous Drain Current, $V_{GS} @ \pm 4.5V^1$	$I_D@T_A=70^{\circ}C$	3	-2	A
Pulsed Drain Current ²	I_{DM}	15	-15	A
Total Power Dissipation ³	$P_D@T_C=25^{\circ}C$	1.1	1.1	W
Storage Temperature Range	T_{STG}	-55 to 150		$^{\circ}C$
Operating Junction Temperature Range	T_J	-55 to 150		$^{\circ}C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance Junction-Ambient ¹	$R_{\theta JA}$	---	110	$^{\circ}C/W$
Thermal Resistance Junction-Case ¹	$R_{\theta JC}$	---	70	$^{\circ}C/W$

N-Ch Electrical Characteristics (T_J=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250uA	20	---	---	V
Static Drain-Source On-Resistance ²	R _{DS(ON)}	V _{GS} =4.5V, I _D =4A	---	---	50	mΩ
		V _{GS} =2.5V, I _D =3A	---	---	75	mΩ
		V _{GS} =1.8V, I _D =2A	---	---	100	mΩ
Gate Threshold Voltage	V _{GS(th)}	V _{GS} =V _{DS} , I _D =250uA	0.35	---	1.0	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =16V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =16V, V _{GS} =0V, T _J =55°C	---	---	5	uA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±12V, V _{DS} =0V	---	---	±100	nA
Forward Transconductance	g _{fs}	V _{DS} =5V, I _D =4A	---	30	---	S
Total Gate Charge	Q _g	V _{DS} =15V, V _{GS} =4.5V, I _D =4A	---	8.6	---	nC
Gate-Source Charge	Q _{gs}		---	1.37	---	
Gate-Drain Charge	Q _{gd}		---	2.3	---	
Turn-On Delay Time	T _{d(on)}	V _{DD} =10V, V _{GS} =4.5V, R _G =3.3Ω, I _D =4A	---	5.2	---	ns
Rise Time	T _r		---	34	---	
Turn-Off Delay Time	T _{d(off)}		---	23	---	
Fall Time	T _f		---	9.2	---	
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, f=1MHz	---	670	---	pF
Output Capacitance	C _{oss}		---	75	---	
Reverse Transfer Capacitance	C _{rss}		---	68	---	

Drain-Source Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Source Current ^{1,4}	I _S	V _G =V _D =0V, Force Current	---	---	1.5	A
Diode Forward Voltage ²	V _{SD}	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V
Reverse Recovery Time	t _{rr}	I _F =4A, di/dt=100A/μs, T _J =25°C	---	8.9	---	nS
Reverse Recovery Charge	Q _{rr}		---	1.7	---	nC

Note:

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

N-Ch Typical Characteristics

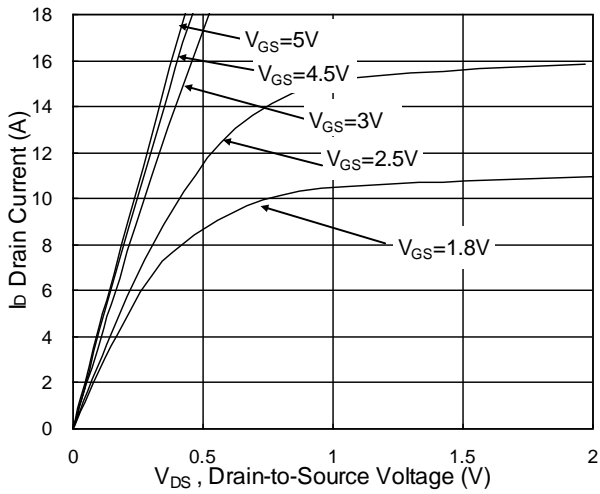


Fig.1 Typical Output Characteristics

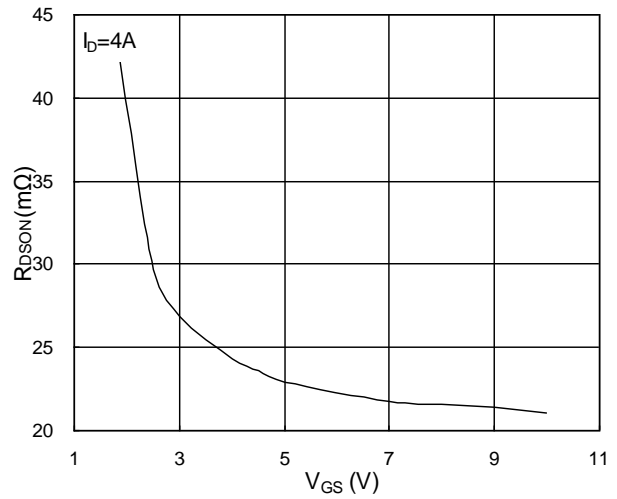


Fig.2 On-Resistance vs. G-S Voltage

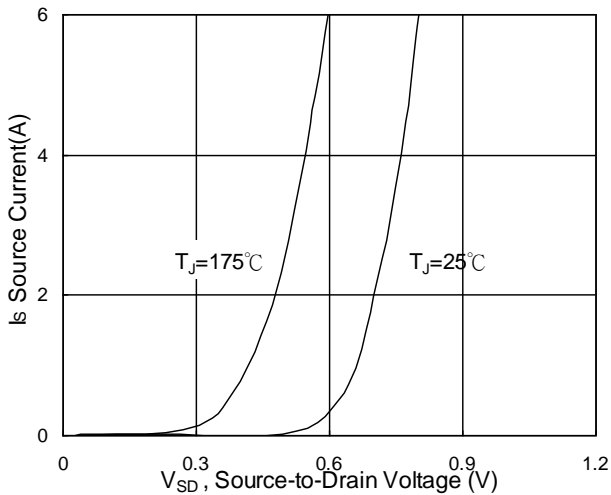


Fig.3 Source Drain Forward Characteristics

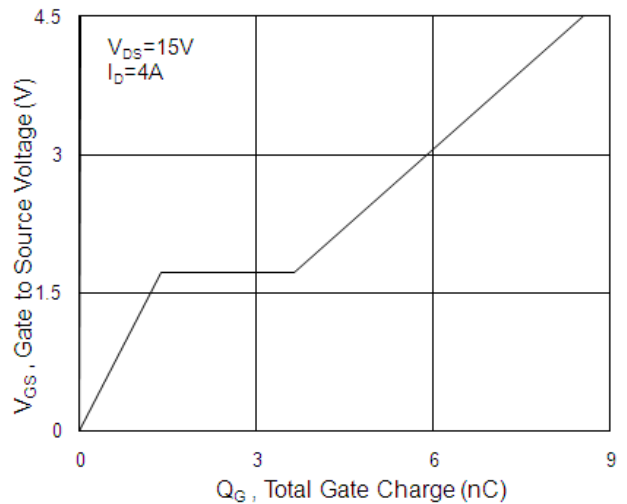


Fig.4 Gate-Charge Characteristics

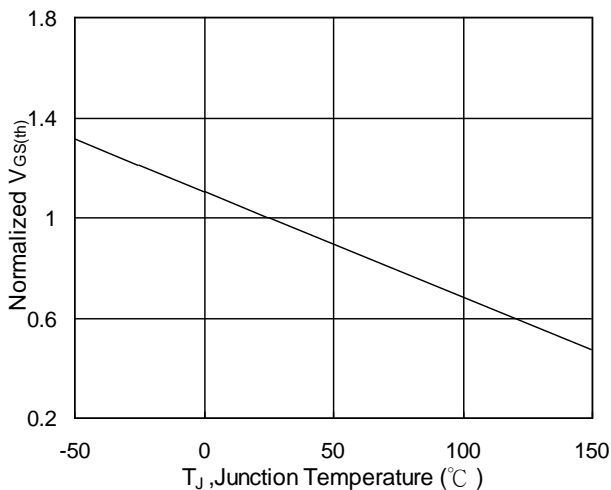


Fig.5 Normalized V_{GS(th)} vs. T_J

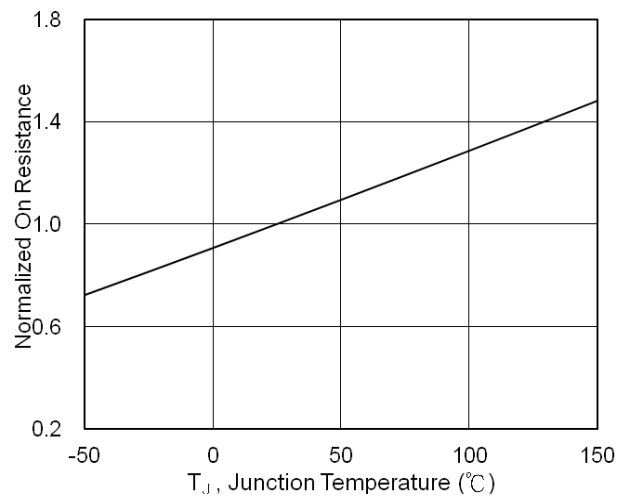


Fig.6 Normalized R_{DSON} vs. T_J

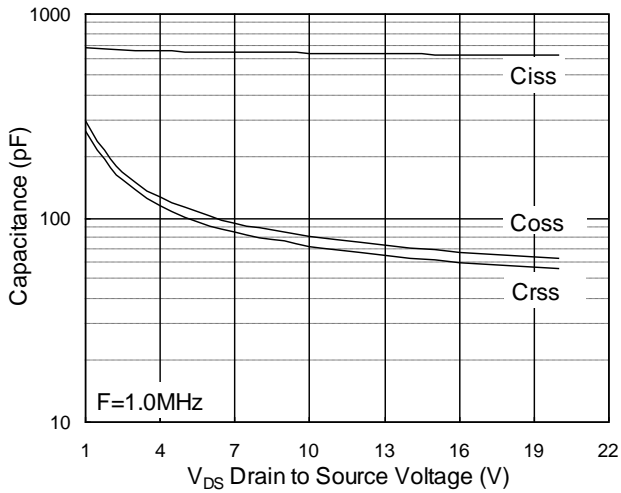


Fig.7 Capacitance

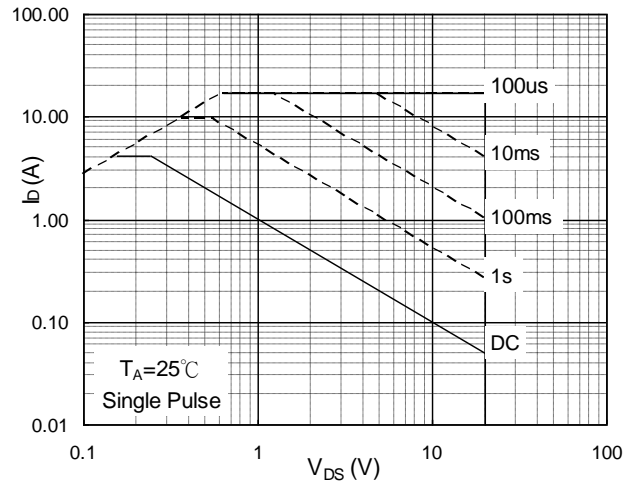


Fig.8 Safe Operating Area

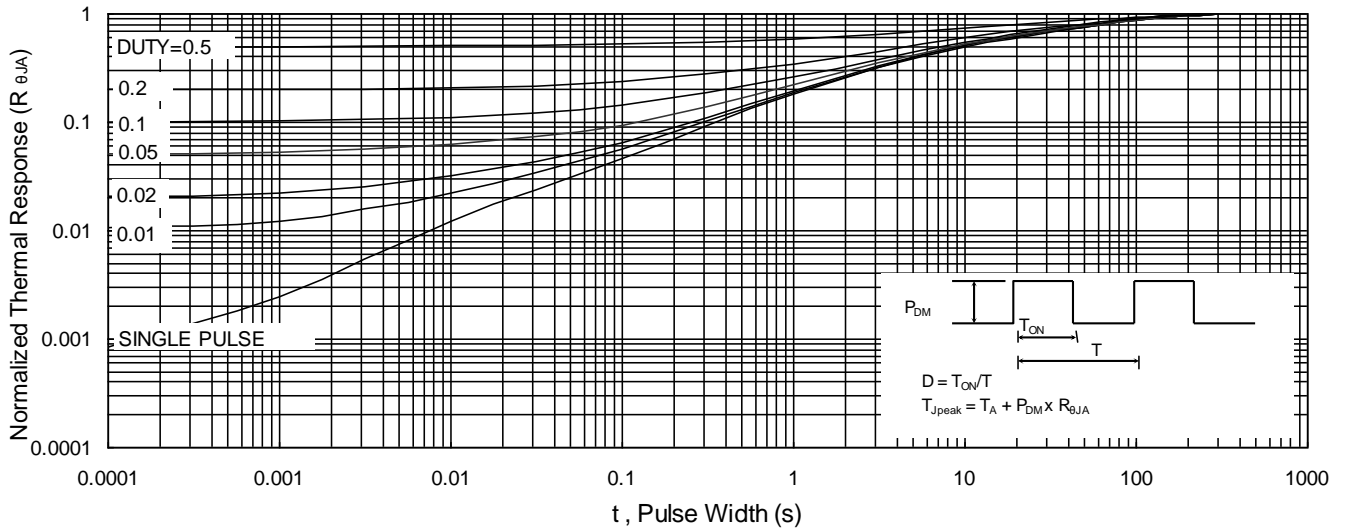


Fig.9 Normalized Maximum Transient Thermal Impedance

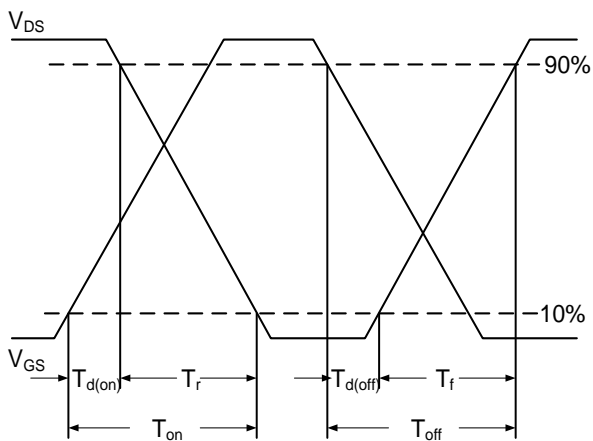


Fig.10 Switching Time Waveform

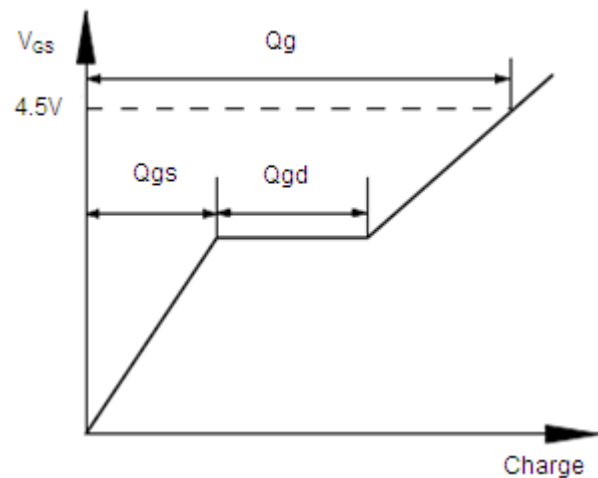


Fig.11 Gate Charge Waveform

P-Ch Electrical Characteristics (T_J=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-250uA	-20	---	---	V
Static Drain-Source On-Resistance ²	R _{DS(ON)}	V _{GS} =-4.5V, I _D =-2.5A	---	---	70	mΩ
		V _{GS} =-2.5V, I _D =-2A	---	---	95	mΩ
		V _{GS} =-1.8V, I _D =-1A	---	---	115	mΩ
Gate Threshold Voltage	V _{GS(th)}	V _{GS} =V _{DS} , I _D =-250uA	-0.4	---	-1.0	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =-16V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =-16V, V _{GS} =0V, T _J =55°C	---	---	5	uA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±12V, V _{DS} =0V	---	---	±100	nA
Forward Transconductance	g _{fs}	V _{DS} =-5V, I _D =-3A	---	9	---	S
Total Gate Charge	Q _g	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-3A	---	9.7	---	nC
Gate-Source Charge	Q _{gs}		---	2.05	---	
Gate-Drain Charge	Q _{gd}		---	2.43	---	
Turn-On Delay Time	T _{d(on)}	V _{DD} =-10V, V _{GS} =-4.5V, R _G =3.3Ω, I _D =-3A	---	4.8	---	ns
Rise Time	T _r		---	9.6	---	
Turn-Off Delay Time	T _{d(off)}		---	52	---	
Fall Time	T _f		---	8.4	---	
Input Capacitance	C _{iss}	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	686	---	pF
Output Capacitance	C _{oss}		---	90.8	---	
Reverse Transfer Capacitance	C _{rss}		---	80.4	---	

Drain-Source Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Source Current ^{1,4}	I _S	V _G =V _D =0V, Force Current	---	---	-1.5	A
Diode Forward Voltage ²	V _{SD}	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.2	V
Reverse Recovery Time	t _{rr}	I _F =-3A, di/dt=100A/μs, T _J =25°C	---	10.2	---	nS
Reverse Recovery Charge	Q _{rr}		---	2.5	---	nC

Note:

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

P-Ch Typical Characteristics

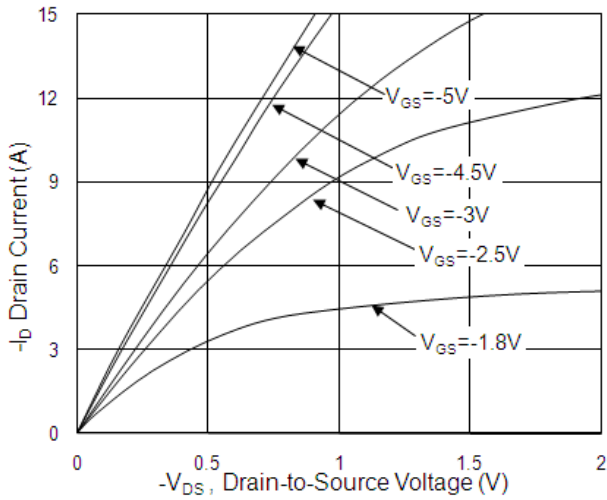


Fig.1 Typical Output Characteristics

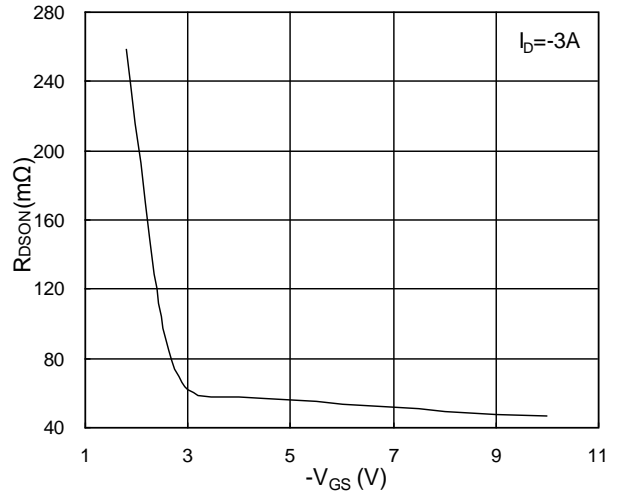


Fig.2 On-Resistance vs. G-S Voltage

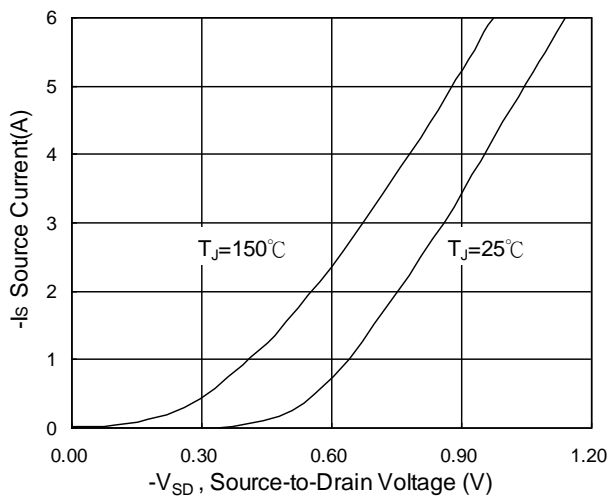


Fig.3 Source Drain Forward Characteristics

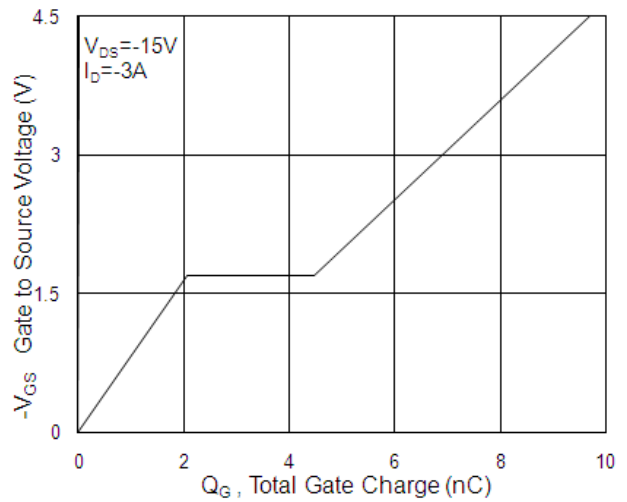


Fig.4 Gate-Charge Characteristics

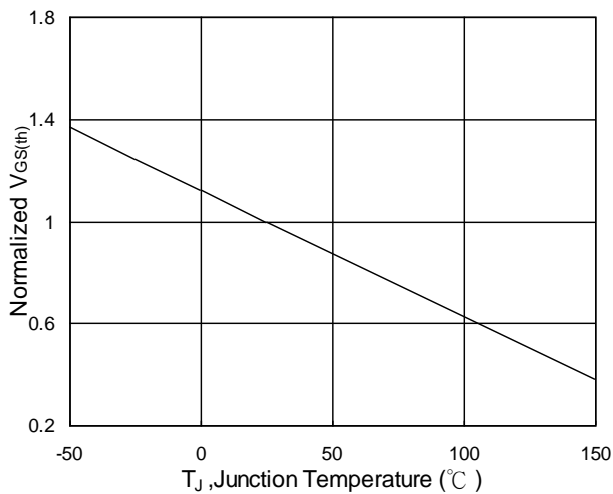


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

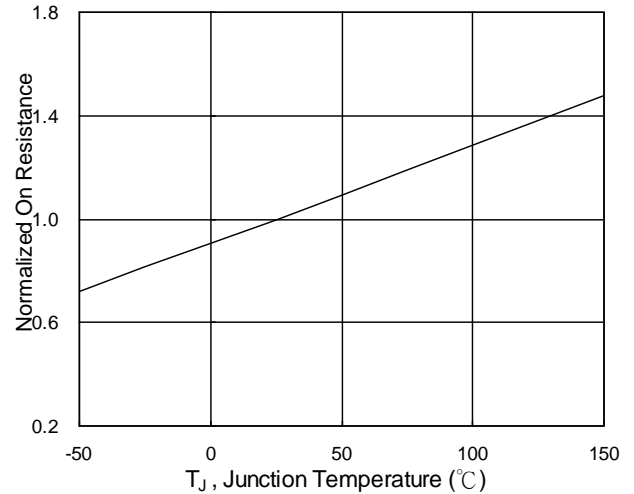


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

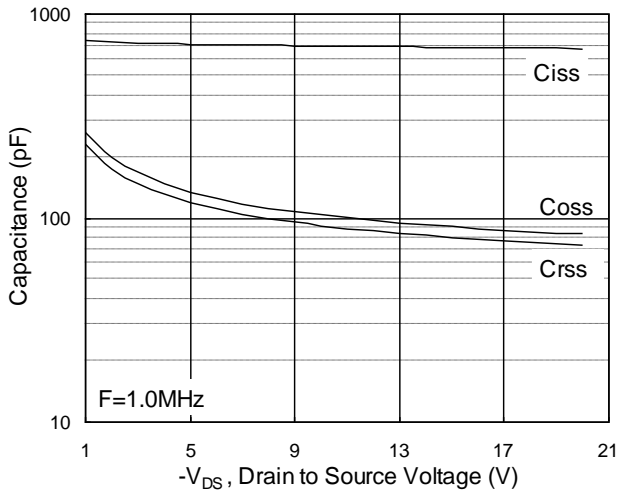


Fig.7 Capacitance

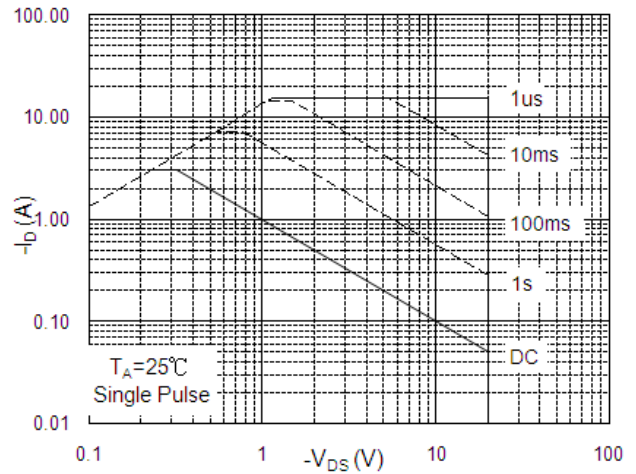


Fig.8 Safe Operating Area

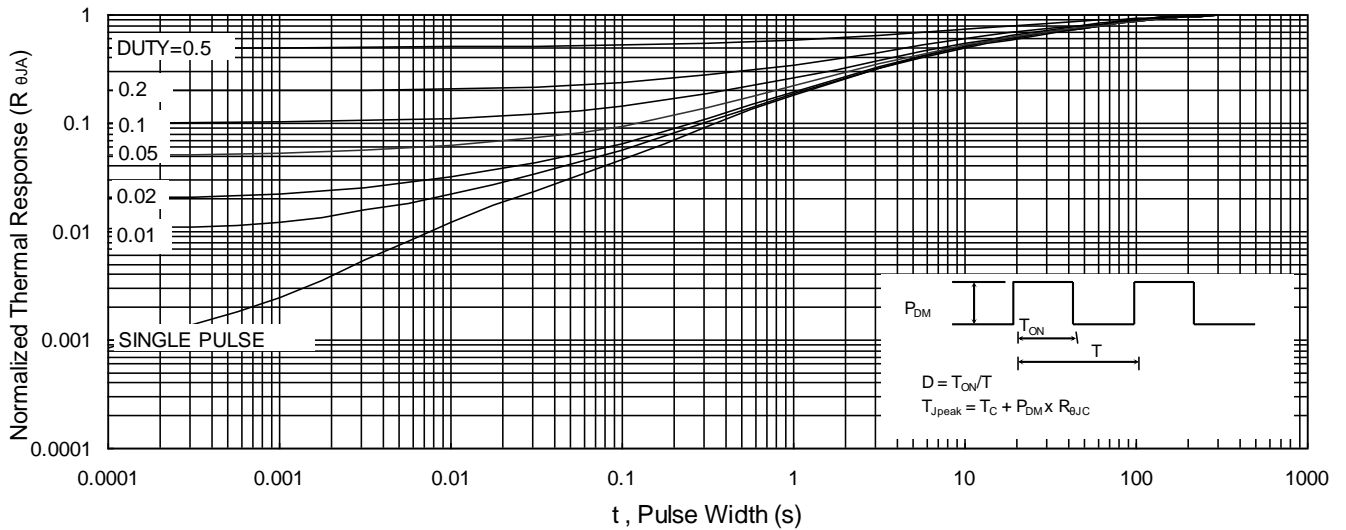


Fig.9 Normalized Maximum Transient Thermal Impedance

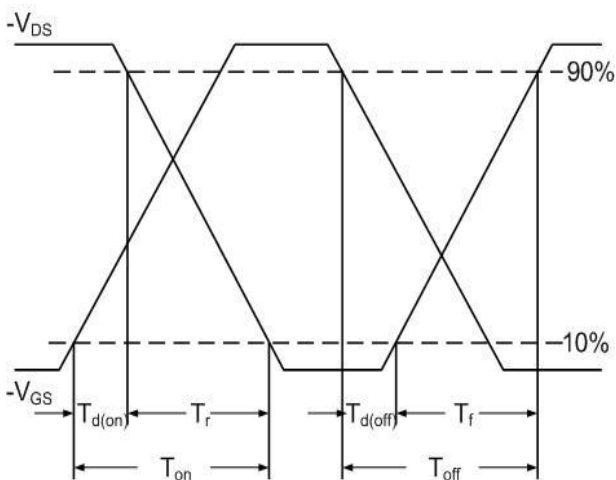


Fig.10 Switching Time Waveform

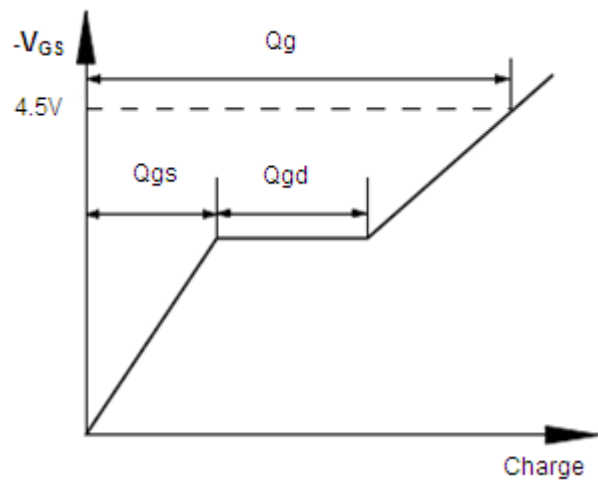
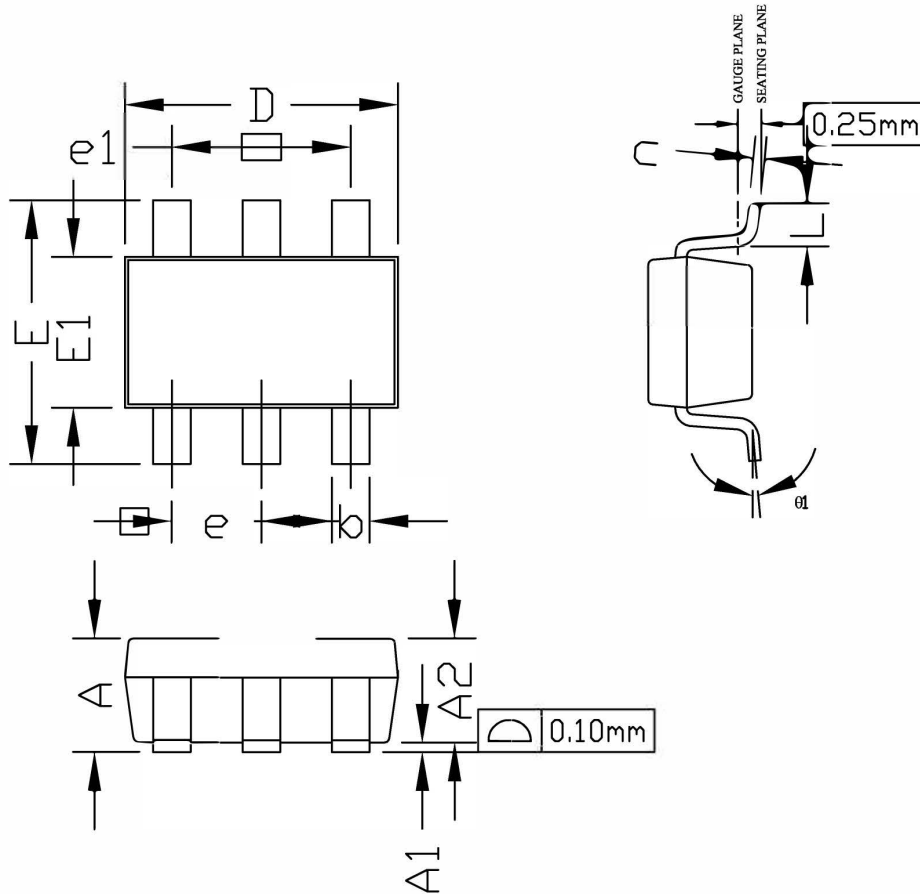


Fig.11 Gate Charge Waveform

TSOP6 Package Outline Dimensions



Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
A	0.80	1.00	1.25	E	2.50	2.80	3.10
A1	0.00	---	0.15	E1	1.50	1.60	1.70
A2	0.80	1.10	1.20	e	0.95 REF		
b	0.25	0.35	0.45	e1	1.90 REF		
c	0.08	0.13	0.20	L	0.30	0.45	0.60
D	2.70	2.90	3.10	theta1	0°		8°