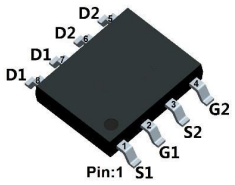
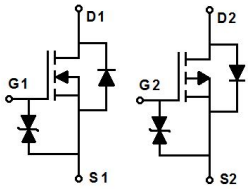
Features

- N+P Channel
- Very Low on-resistance
- SOP8 Package
- Pb-Free,RoHS Complicant



Applications

- Charging switch for portable devices.
- Small brushless DC motor drive.
- Load Switch for Portable Devices.
- DC-to-DC converters.
- Level shifted.



Absolute Ratings (Tc=25℃)

Parameter	Symbol		Value		Unit
			NMOS	PMOS	
Drain-Source Voltage	V_{DSS}		30	-30	V
Drain Current-continuous	I_D	T_C=25℃	3.5	-3.5	A
		T_C=70℃	2.8	-2.8	A
Drain Current-pulse (note 1)	I_{DM}		14	-12	A
Gate-Source Voltage	V_{GS}		±12	±12	V
Avalanche Current, single pulse(L=0.5mH)	I_{AS}		5.4	-4.2	A
Avalanche Energy, single pulse(L=0.5mH)	E_{AS}		7.29	4.41	mJ
Power Dissipation (SOP-8)	P_D	T_C=25℃	2.0		W
		T_C=70℃	1.6		W
Maximum Junction Temperature	T_J		150		℃
Storage Temperature Range	T_{STG}		-50 ~ 150		℃

*Drain current limited by maximum junction temperature

N-Channel Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Drain-Source Voltage	BV_{DSS}	I_D=250μA,V_{GS}=0V	30	-	-	V

Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=30V,V_{GS}=0V，T_C=25℃	--	--	1	μA
		V_{DS}=24V,T_C =125℃	--	--	100	μA
Gate body leakage current	I_{GSS}	V_{DS}=0V,V_{GS}=±12V	--	--	±10	μA
On-Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.0	--	2.5	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V,I_D=3A，T_C=25℃	--	70	100	mΩ
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=4.5V,I_D=2A，T_C=25℃	--	90	140	mΩ
Dynamic Characteristics						
Input capacitance	C_{iss}	V_{DS}=15V, V_{GS}=0V, f=1.0MHz	-	85	-	pF
Output capacitance	C_{oss}		-	40	-	pF
Reverse transfer capacitance	C_{rss}		-	20	-	pF
Gate Resistance	R_G	V_{DS}=0V, V_{GS}=0V, f=1.0MHZ	-	3.3	-	Ω
Forward Transfer Admittance	g_{fs}	V_{DS} = 10V, I_D = 3A	2.0	-	-	S

Electrical Characteristics(T_{CASE}=25℃ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Switching-Characteristics						
Turn-On delay time	$t_{d(on)}$	V_{DD}=15V, I_D=1A, R_G=3.3Ω V_{GS}=10V	-	4	-	ns
Turn-On rise time	t_r		-	8	-	ns
Turn-Off delay time	$t_{d(Off)}$		-	18	-	ns
Turn-Off rise time	t_f		-	3	-	ns
Total Gate Charge	Q_g	V_{DS}=15V,I_D=3.4A, V_{GS}=5V	-	1.9	-	nC
Gate-Source charge	Q_{gs}		-	0.8	-	nC
Gate-Drain charge	Q_{gd}		-	0.4	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=2A	-	0.78	1.2	V

Reverse Recovery Time	T_{rr}	Ids=2A, disd/dt=100A/us		15		ns
Reverse Recovery Charge	Q_{rr}			9		nC

P-Channel Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Drain-Source Voltage	BV_{DSS}	I_D=-250μA,V_{GS}=0V	-30	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-30V,V_{GS}=0V，T_C=25℃	-	-	-1	μA
		V_{DS}=-24V,T_C =125℃	-	-	-100	μA
Gate body leakage current	I_{GSS}	V_{DS}=0V,V_{GS}=±12V	-	-	±10	nA
On-Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1.0	--	-2.5	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-10V,I_D=-3.0A，T_C=25℃	-	70	100	mΩ
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-4.5V,I_D=-3.0A，T_C=25℃	-	100	140	mΩ
Dynamic Characteristics						
Input capacitance	C_{iss}	V_{DS}=-15V, V_{GS}=0V, f=1.0MHz	-	410	-	pF
Output capacitance	C_{oss}		-	55	-	pF
Reverse transfer capacitance	C_{rss}		-	50	-	pF
Gate Resistance	R_G	Vgs=0V,Vds=0V，F=1MHz	-	6	-	Ω
Forward Transfer Admittance	g_{fs}	V_{DS}=-10V,I_D=-3A	1.4	--	--	S

Electrical Characteristics(T_{CASE}=25℃ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Switching-Characteristics						
Turn-On delay time	$t_{d(on)}$	V_{DD}=-15V, I_{DS}=-1A, R_G=3.3Ω V_{GS}=-1V	--	9	--	ns
Turn-On rise time	t_r		-	18	-	ns
Turn-Off delay time	$t_{d(Off)}$		-	35	-	ns
Turn-Off rise time	t_f		-	12	-	ns

Total Gate Charge	Q_g	V_{DS}=-15V,I_D=-3.5A, V_{GS}=-5V	-	4.2	-	nC
Gate-Source charge	Q_{gs}		-	1.7	-	nC
Gate-Drain charge	Q_{gd}		-	1.1	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=-2A	-	-	-1.2	V
Reverse Recovery time	Trr	I_S=-2A, di_{sd}/dt=100A/us	-	15	-	ns
Reverse Recovery Charge	Qrr		-	8	-	nC

Thermal Characteristic

Parameter	Symbol	Value	Unit
		SOP8	
Thermal Resistance, Junction to Ambient	$R_{th}(J\text{-}A)^2$	60	℃/W
	$R_{th}(J\text{-}A)^3$	89.2	℃/W

Notes:

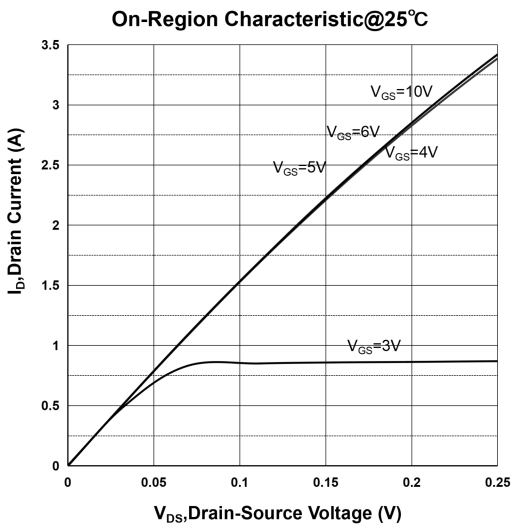
1. Pulse width limited by maximum junction temperature
2. Mounted on a ceramic board (30×30×0.8mm)
3. Mounted on a Cu board (40×40×0.8mm)

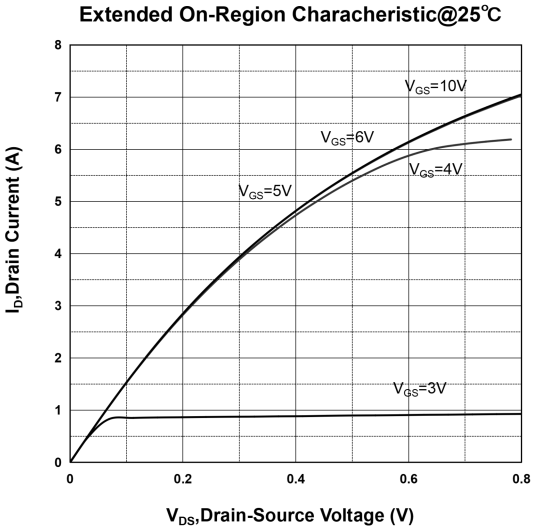
Order Message

Marking	Package
MSPN0403S0	SOP8

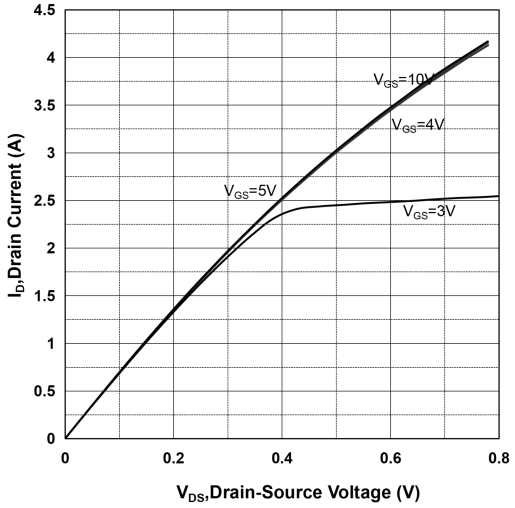
ELECTRICAL CHARACTERISTICS (curves)

N-Channel

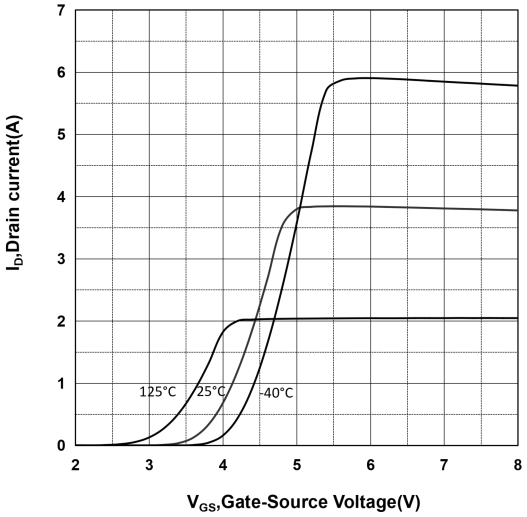




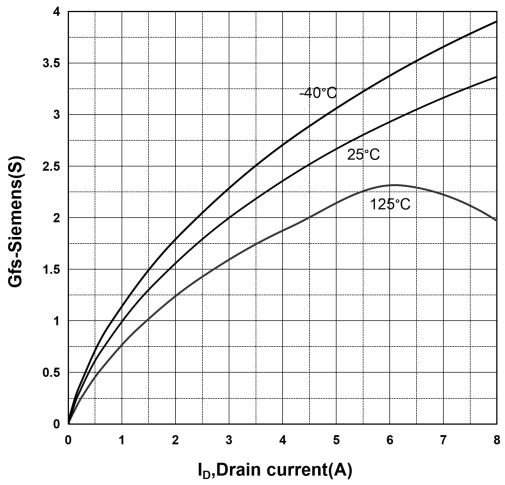
On-Region Characteristic@125℃



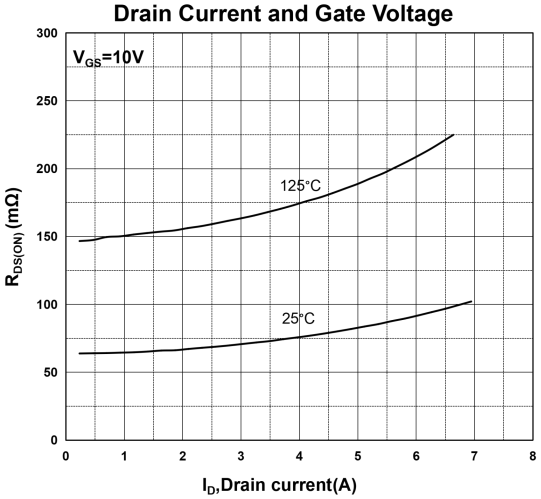
Transfer Characteristics



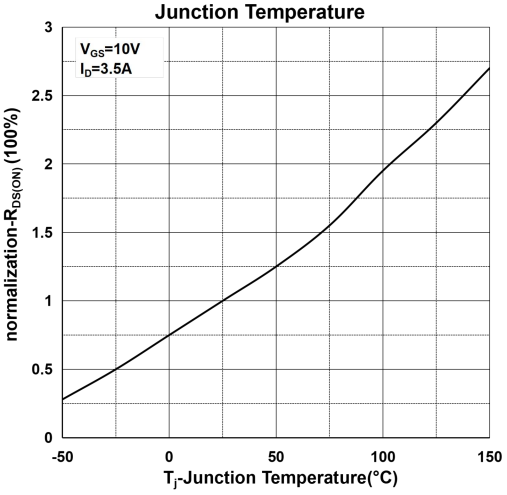
Transconductance



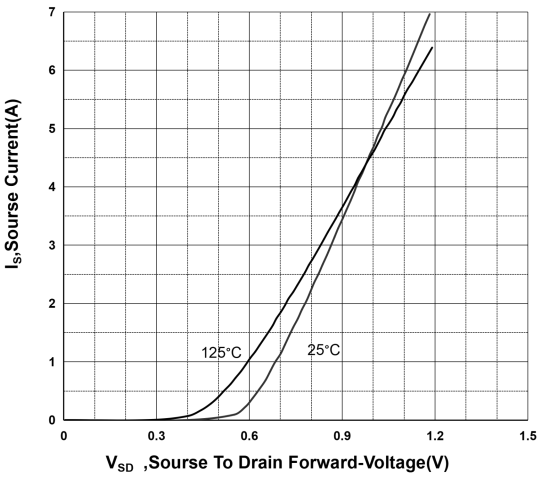
On-Resistance Variation vs Drain Current and Gate Voltage



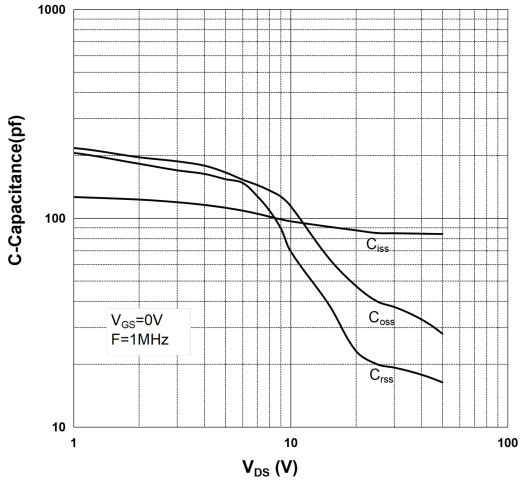
Normalization On-Resistance Variation vs Junction Temperature



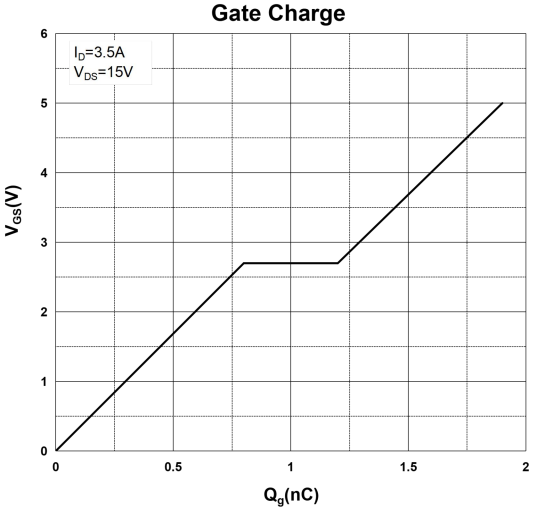
Body Diode Forward Voltage Variation with Sourse Current and Temperature



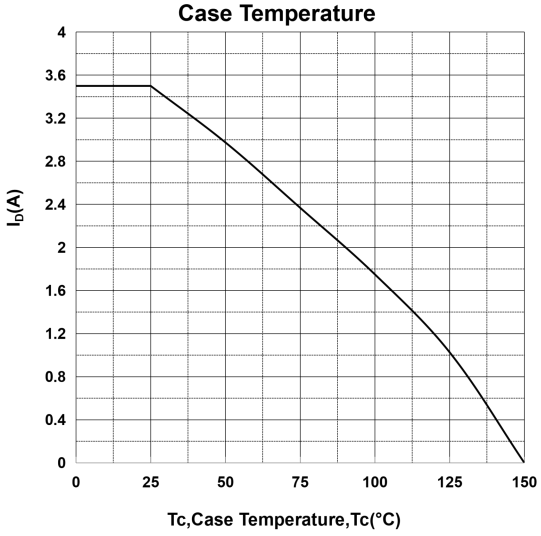
Capacitance



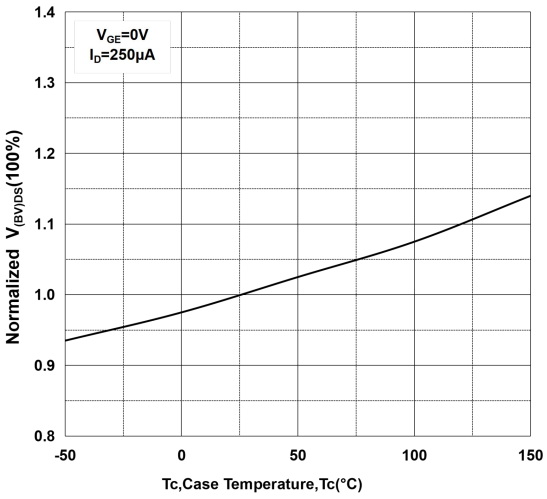
Gate Charge



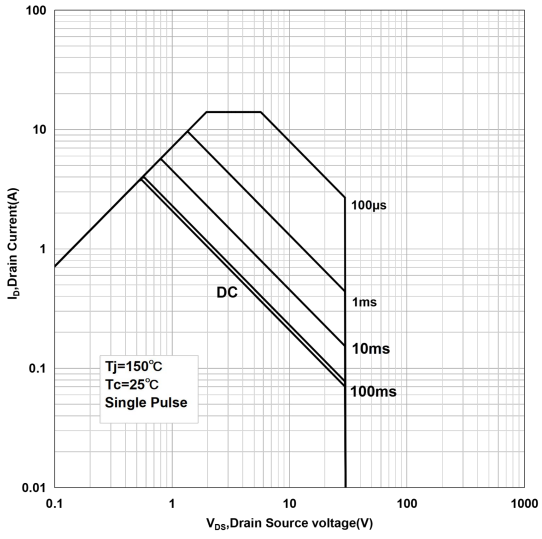
Maximum Drain Current vs Case Temperature



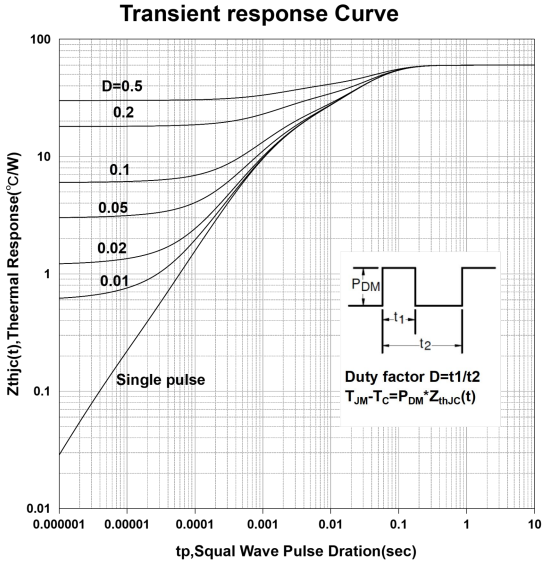
Normalized $V_{(BV)DS}$ vs temperature



Safe Operating Area

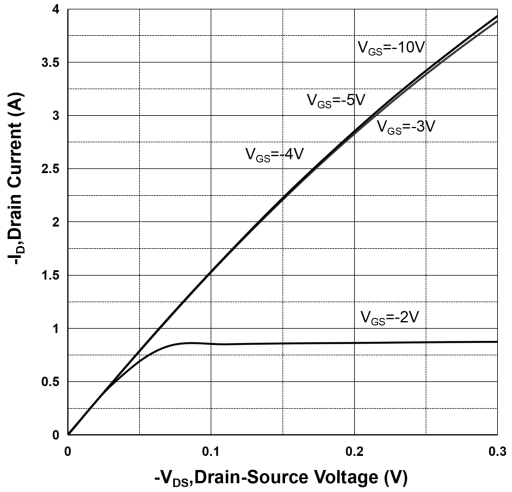


Transient response Curve

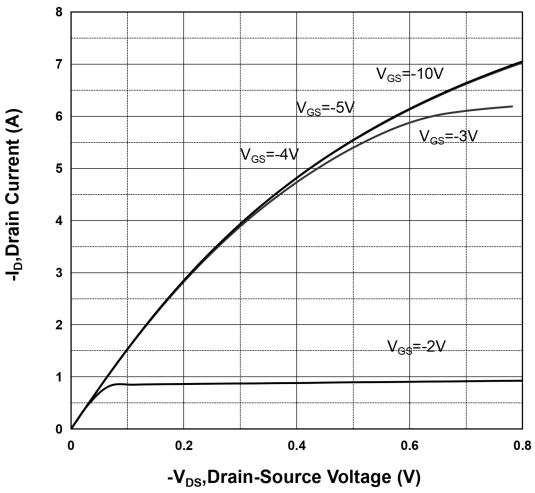


P-Channel

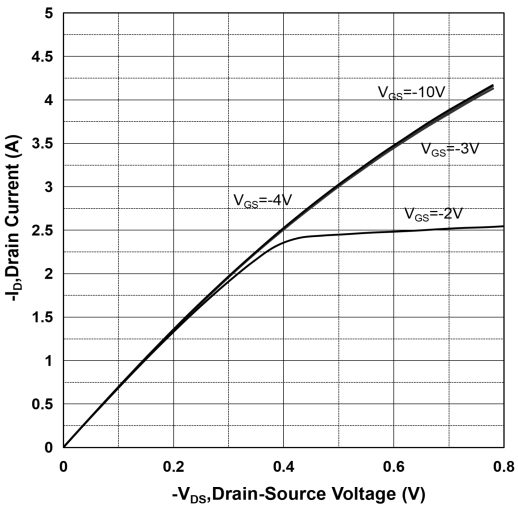
On-Region Characteristic@25℃



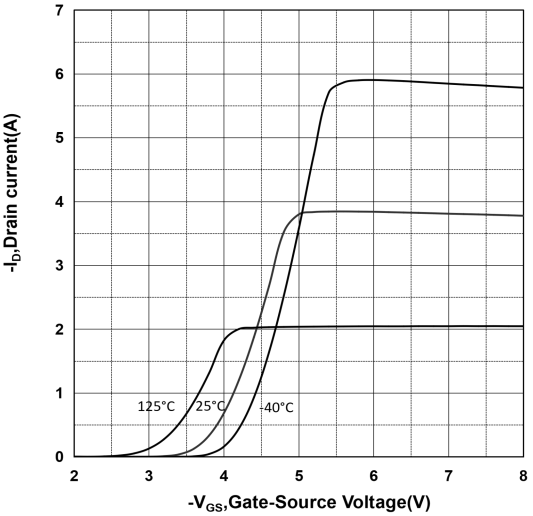
Extended On-Region Characheristic@25℃



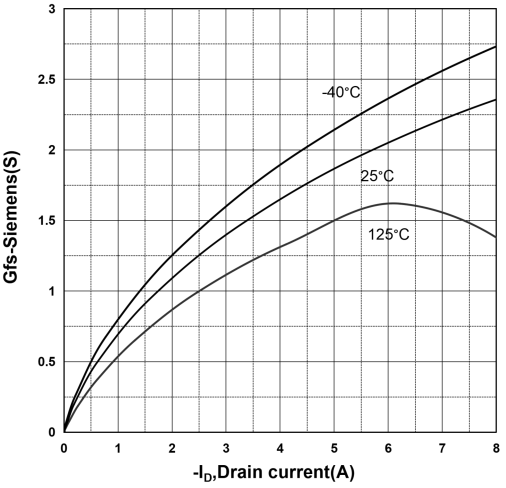
On-Region Characteristic@125℃



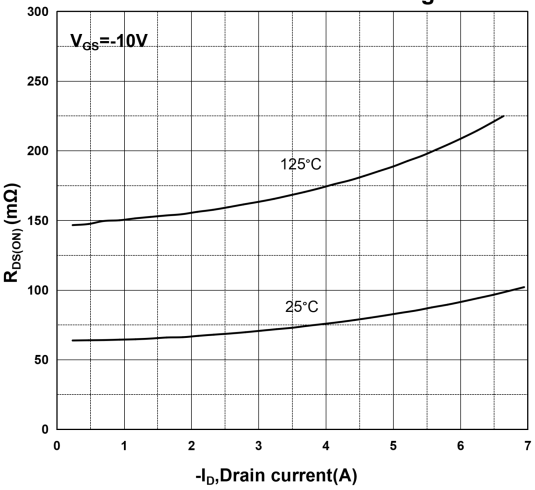
Transfer Characteristics



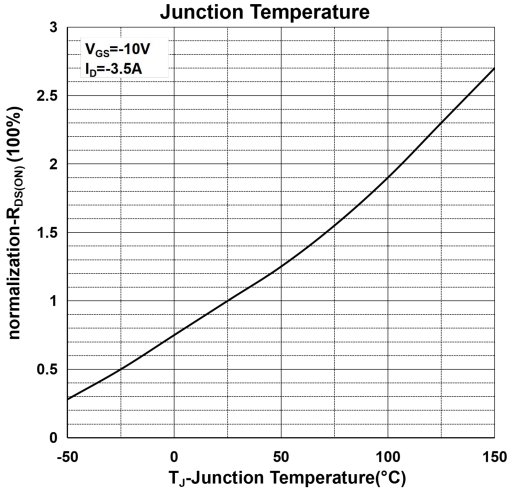
Transconductance



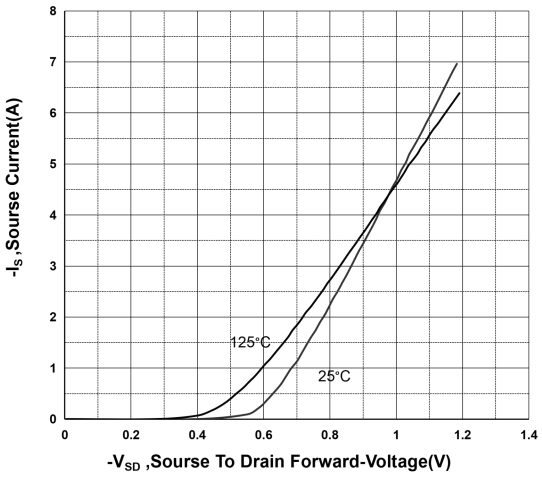
On-Resistance Variation vs
Drain Current and Gate Voltage



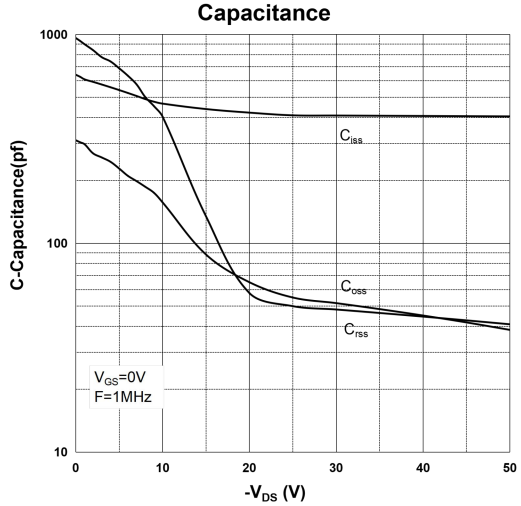
Normalization On-Resistance Variation vs Junction Temperature



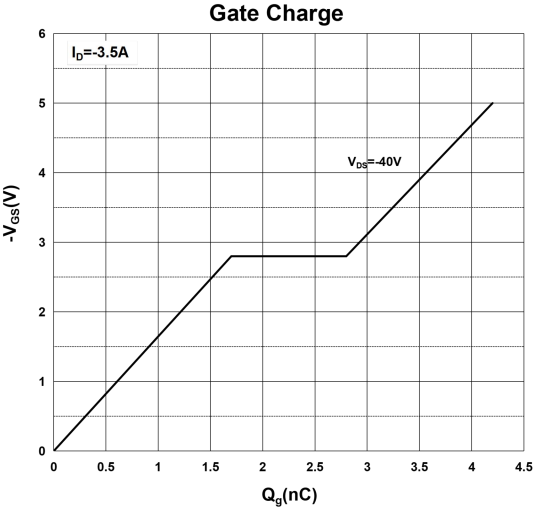
Body Diode Forward Voltage Variation with Sourse Current and Temperature



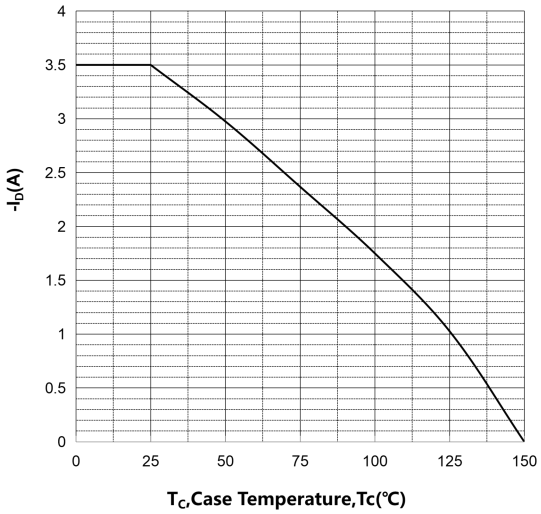
Capacitance



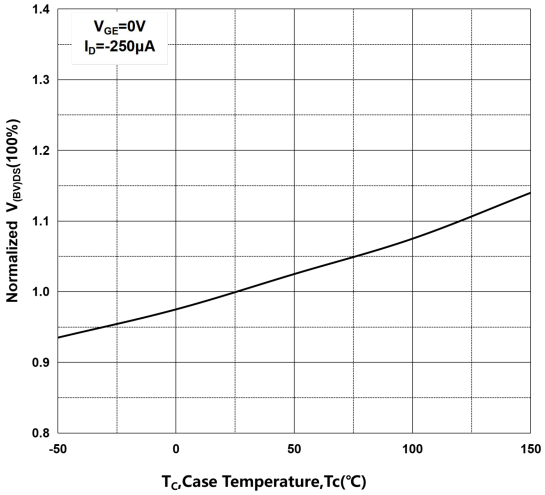
Gate Charge



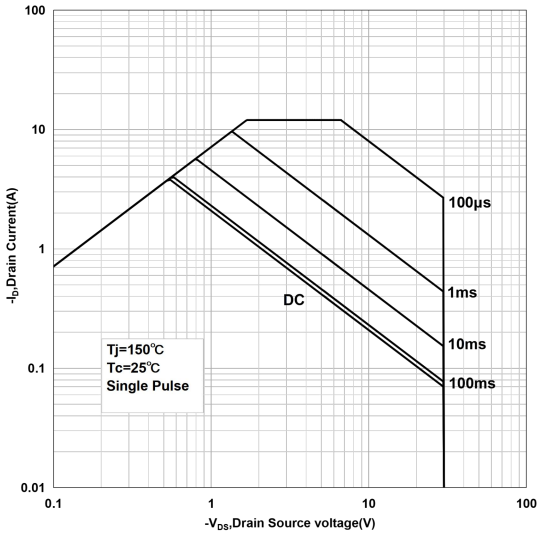
Maximum Drain Current vs Case Temperature



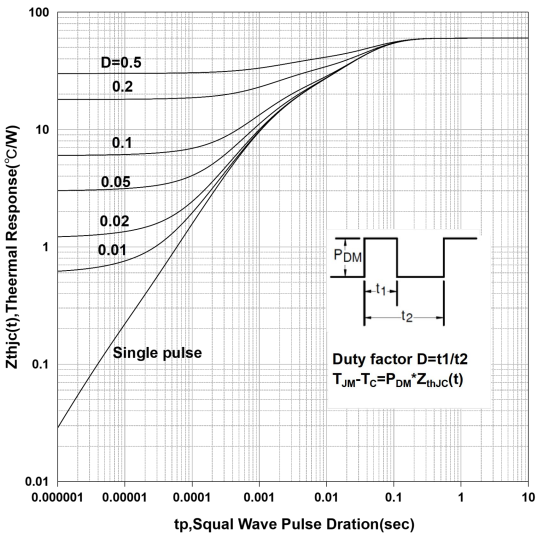
Normalized $V_{(BV)DS}$ vs temperature



Safe Operating Area



Transient response Curve



N-Chanel Measurement circuit

Fig.1-1 Switching Time Measurement Circuit

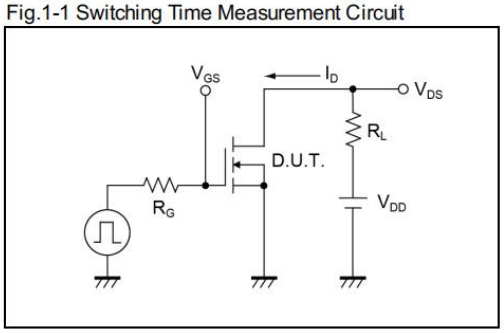


Fig.1-2 Switching Waveforms

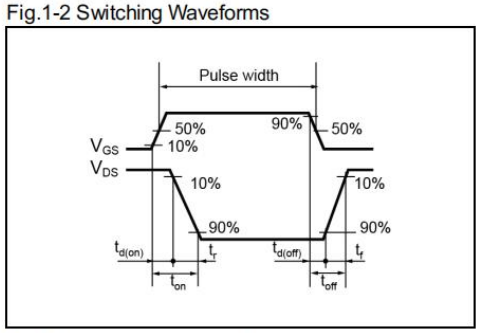


Fig.2-1 Gate Charge Measurement Circuit

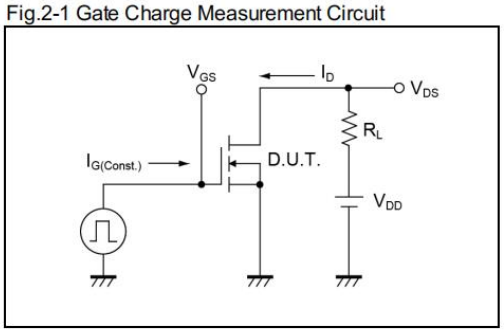
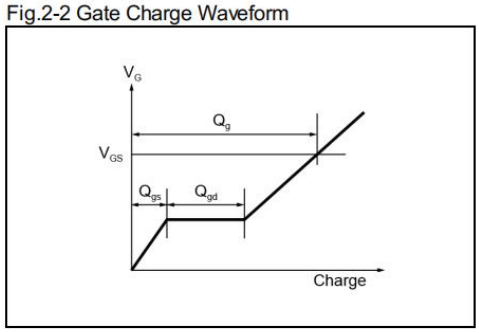


Fig.2-2 Gate Charge Waveform



P-Chanel Measurement circuit

Fig.3-1 Switching Time Measurement Circuit

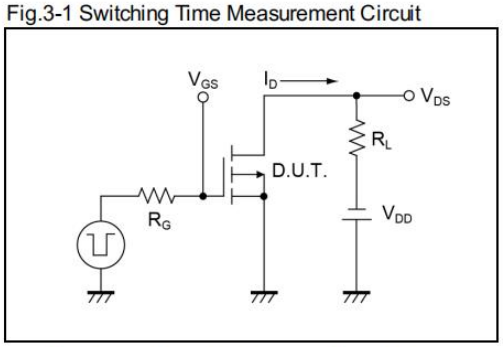


Fig.3-2 Switching Waveforms

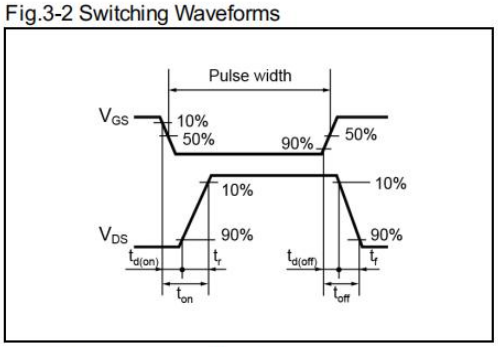


Fig.4-1 Gate Charge Measurement Circuit

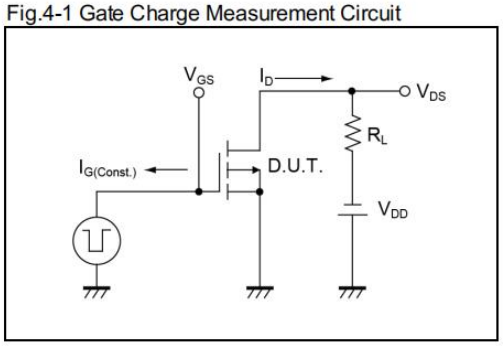
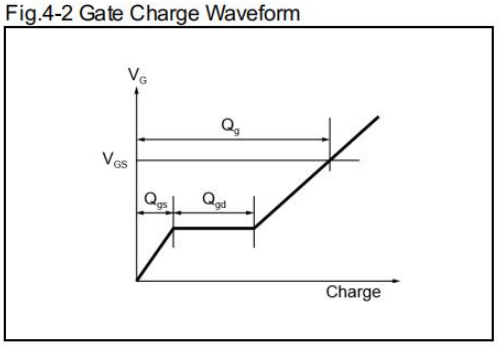
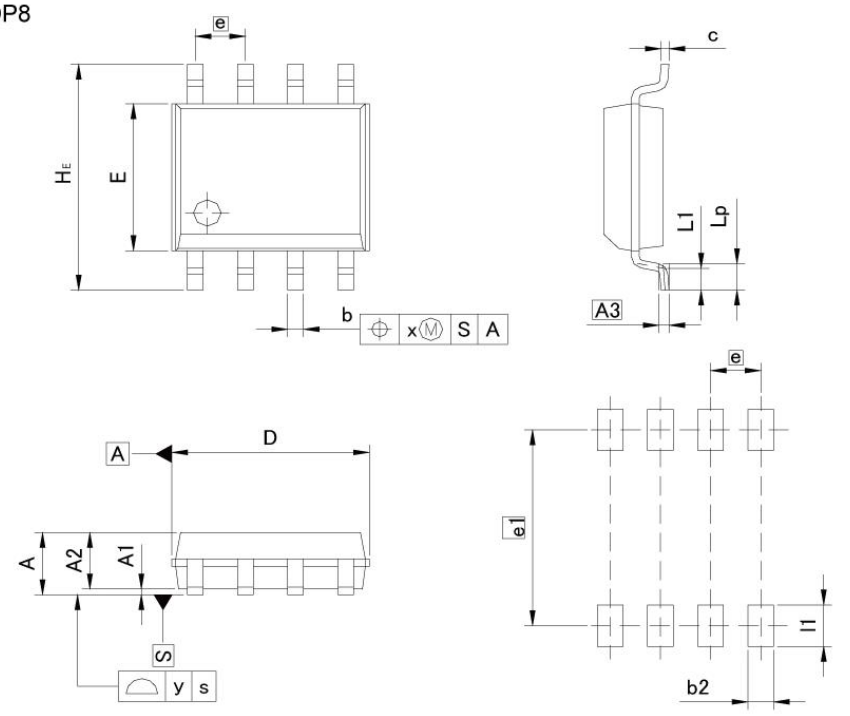


Fig.4-2 Gate Charge Waveform



PACKAGE MECHANICAL DATA

SOP8



Pattern of terminal position areas
[Not a pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	–	1.75	–	0.069
A1	0.15		0.006	
A2	1.40	1.60	0.055	0.063
A3	0.25		0.010	
b	0.30	0.50	0.012	0.020
c	0.10	0.30	0.004	0.012
D	4.80	5.20	0.189	0.205
E	3.75	4.05	0.148	0.159
e	1.27		0.050	
HE	5.70	6.30	0.224	0.248
L1	0.40	0.60	0.016	0.024
Lp	0.65	0.85	0.026	0.033
x	0.15		0.006	
y	0.10		0.004	

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	–	0.65	–	0.026
e1	5.15		0.203	
l1	–	1.15	–	0.045

Dimension in mm/inches