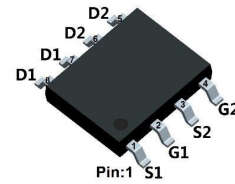


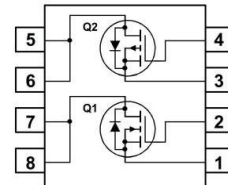
Features

- 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°C)

Parameter	Symbol	Value		Unit
		NMOS	PMOS	
Drain-Source Voltage	V_{DSS}	60	-60	V
Drain Current-continuous	I_D	$T_C=25^{\circ}\text{C}$	5	A
		$T_C=70^{\circ}\text{C}$	3.5	A
Drain Current-pulse (note 1)	I_{DM}	20	-24	A
Gate-Source Voltage	V_{GS}	± 25	± 25	V
Avalanche Current, single pulse(L=0.5mH)	I_{AS}	3.4	-4.6	A
Avalanche Energy, single pulse(L=0.5mH)	E_{AS}	14.45	26.45	mJ
Power Dissipation (SOP-8)	P_D	$T_C=25^{\circ}\text{C}$	2.0	W
		$T_C=70^{\circ}\text{C}$	1.6	W
Maximum Junction Temperature	T_J	150		$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-50 ~ 150		$^{\circ}\text{C}$

*Drain current limited by maximum junction temperature

N-Channel Electrical Characteristics

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Drain-Source Voltage	BV_{DSS}	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	60	-	-	V

Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=48V, V_{GS}=0V, T_C=25^{\circ}C$	--	--	0.1	μA
		$V_{DS}=24V, T_C=125^{\circ}C$	--	--	100	μA
Gate body leakage current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 25V$	--	--	± 100	nA
On-Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.8	1.3	1.8	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=4A, T_C=25^{\circ}C$	--	66	86	m Ω
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_D=3A, T_C=25^{\circ}C$	--	77	100	m Ω
Dynamic Characteristics						
Input capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V, f=1.0MHz$	-	915	-	pF
Output capacitance	C_{oss}		-	70	-	pF
Reverse transfer capacitance	C_{rss}		-	45	-	pF
Gate Resistance	R_G	$V_{DS}=0V, V_{GS}=0V, f=1.0MHz$	-	6	-	Ω
Forward Transfer Admittance	g_{fs}	$V_{DS} = 10V, I_D = 4A$	2.0	-	-	S

Electrical Characteristics($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Switching-Characteristics						
Turn-On delay time	$t_{d(on)}$	$V_{DD}=30V,$ $I_D=1A,$ $R_G=6\Omega$ $V_{GS}=10V$ $R_L=30\Omega$	-	9	17	ns
Turn-On rise time	t_r		-	6	12	ns
Turn-Off delay time	$t_{d(Off)}$		-	25	46	ns
Turn-Off rise time	t_f		-	5	10	ns
Total Gate Charge	Q_g	$V_{DS}=30V, I_D=5A,$ $V_{GS}=10V$	-	19	27	nC
Gate-Source charge	Q_{gs}		-	4.4	-	nC
Gate-Drain charge	Q_{gd}		-	4.4	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=2A$	-	0.82	1.2	V

Reverse Recovery Time	T_{rr}	$I_{ds}=2A,$ $di_{sd}/dt=100A/us$		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}	$I_D=-250\mu A, V_{GS}=0V$	-60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-36V, V_{GS}=0V,$ $T_C=25^\circ C$	-	-	-1	μA
		$V_{DS}=-36V, T_C=125^\circ C$	-	-	-100	μA
Gate body leakage current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 25V$	-	-	± 10	nA

On-Characteristics

Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.6	-2.3	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-6A,$ $T_C=25^\circ C$	-	83	105	m Ω
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-4A,$ $T_C=25^\circ C$	-	106	140	m Ω

Dynamic Characteristics

Input capacitance	C_{iss}	$V_{DS}=-22.5V, V_{GS}=0V,$ $f=1.0MHz$	-	1210	-	pF
Output capacitance	C_{oss}		-	70	-	pF
Reverse transfer capacitance	C_{rss}		-	50	-	pF
Gate Resistance	R_G	$V_{gs}=0V, V_{ds}=0V,$ $F=1MHz$	-	6	-	Ω
Forward Transfer Admittance	g_{fs}	$V_{DS}=-10V, I_D=-3A$	2.8	--	--	S

Electrical Characteristics($T_{CASE}=25^\circ C$ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Type	Max	Units
Switching-Characteristics						
Turn-On delay time	$t_{d(on)}$	$V_{DD}=-22.5V,$ $I_{DS}=-1A,$ $R_G=6\Omega$ $V_{GS}=-10V$ $RL=30\Omega$	--	9	17	ns
Turn-On rise time	t_r		-	8	15	ns
Turn-Off delay time	$t_{d(Off)}$		-	45	86	ns
Turn-Off rise time	t_f		-	17	32	ns

Total Gate Charge	Q _g	V _{DS} =-22.5V,I _D =-5A, V _{GS} =-10V	-	22	31	nC
Gate-Source charge	Q _{gs}		-	2.8	-	nC
Gate-Drain charge	Q _{gd}		-	5	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Diode Forward Voltage	V _{SD}	V _{GS} =0V,I _S =-4A	-	-0.86	-1.2	V
Reverse Recovery time	T _{rr}	I _S =-4A, di _{sd} /dt=100A/us	-	15	-	ns
Reverse Recovery Charge	Q _{rr}		-	8	-	nC

Thermal Characteristic

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

Notes:

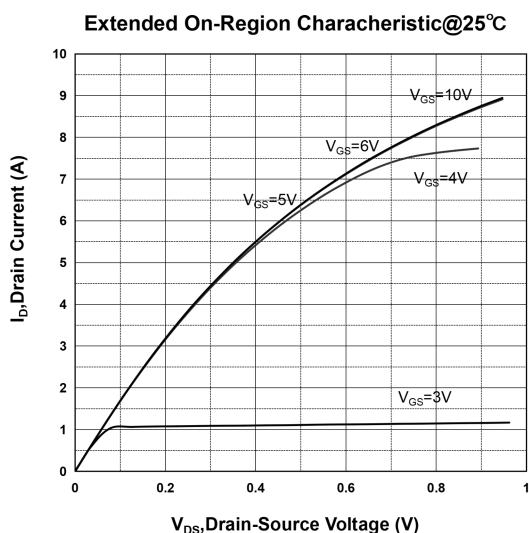
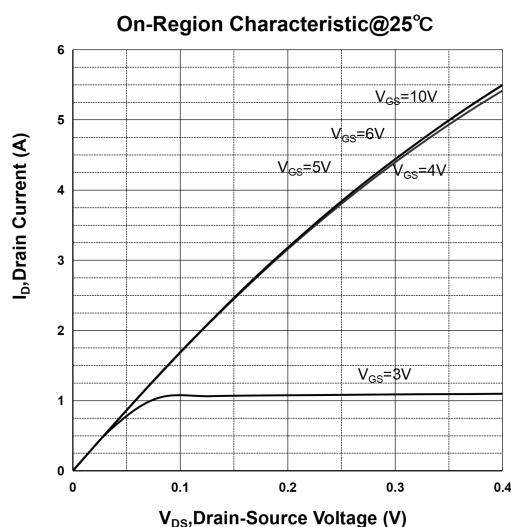
1. Pulse width limited by maximum junction temperature
2. Mounted on a ceramic board (30×30×0.8mm)
3. Mounted on a Cu board (40×40×0.8mm)

Order Message

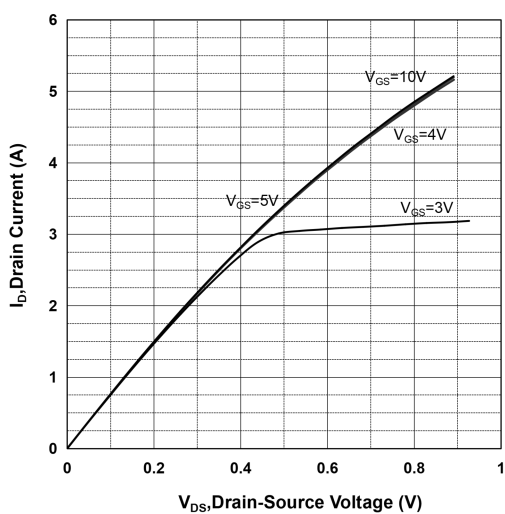
Marking	Package
MSPN4506S0	SOP8

ELECTRICAL CHARACTERISTICS (curves)

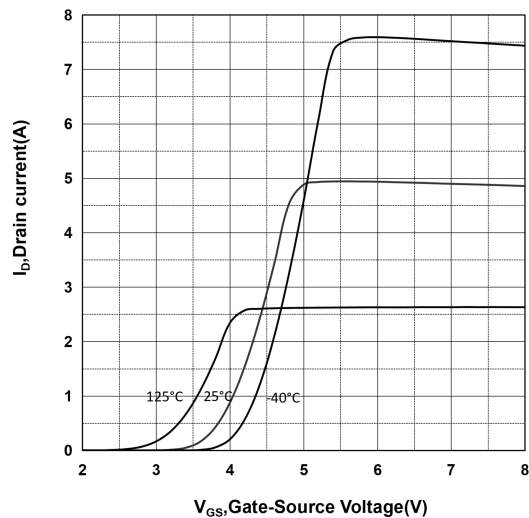
N-Channel



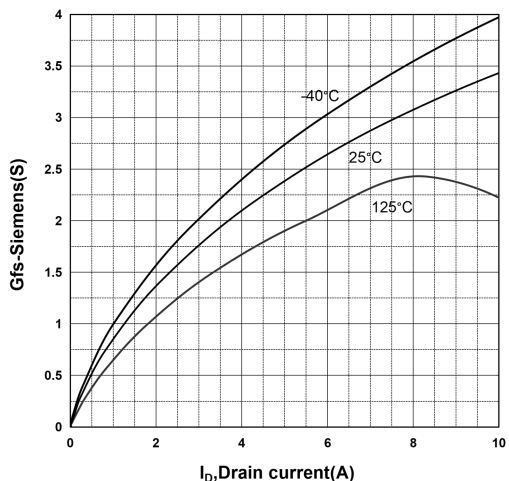
On-Region Characteristic@125°C



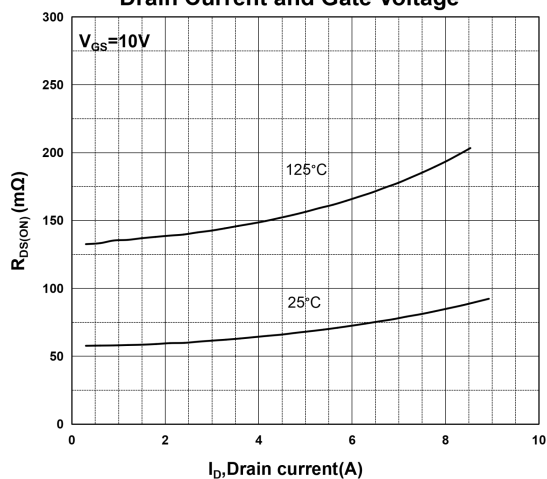
Transfer Characteristics



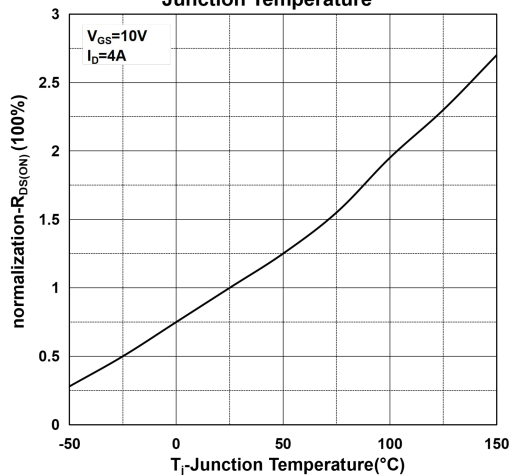
Transconductance



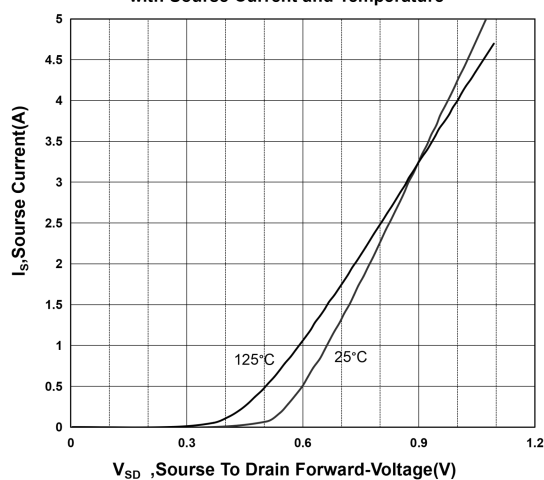
On-Resistance Variation vs Drain Current and Gate Voltage

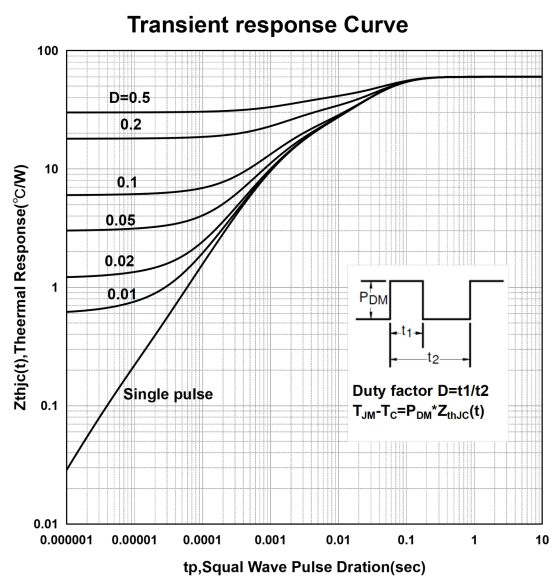
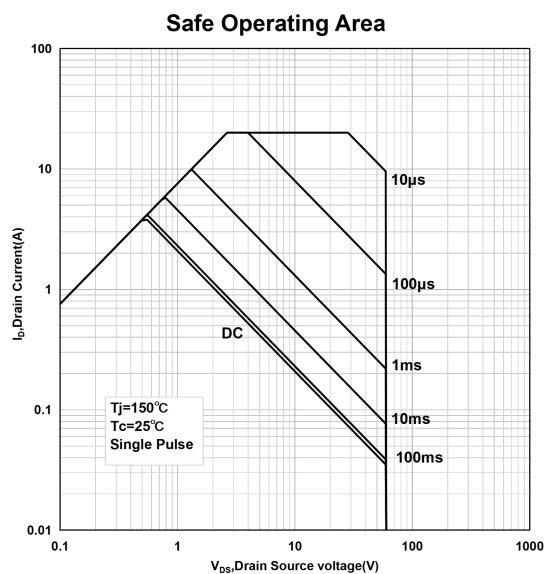
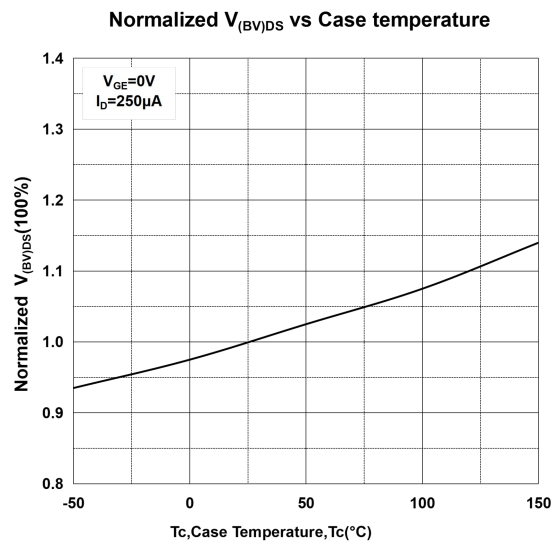
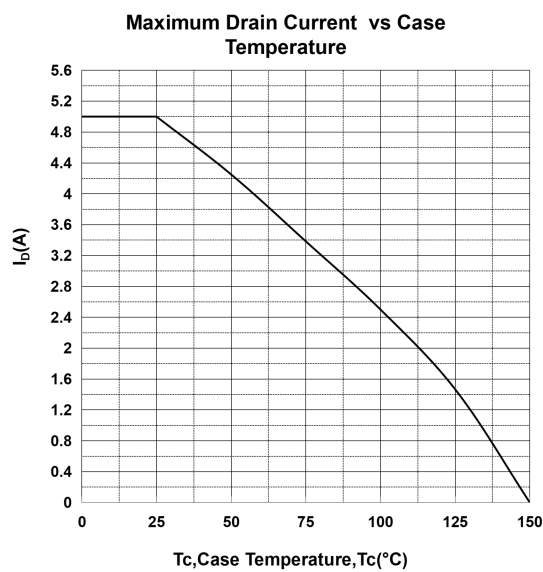
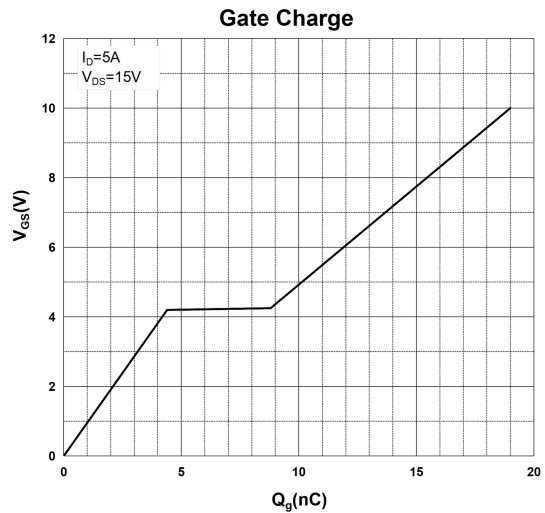
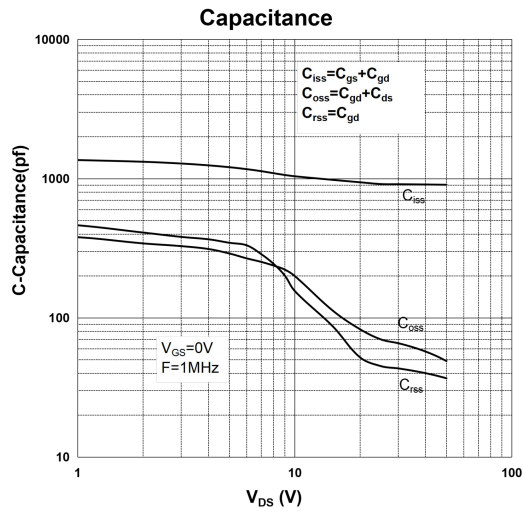


Normalization On-Resistance Variation vs Junction Temperature

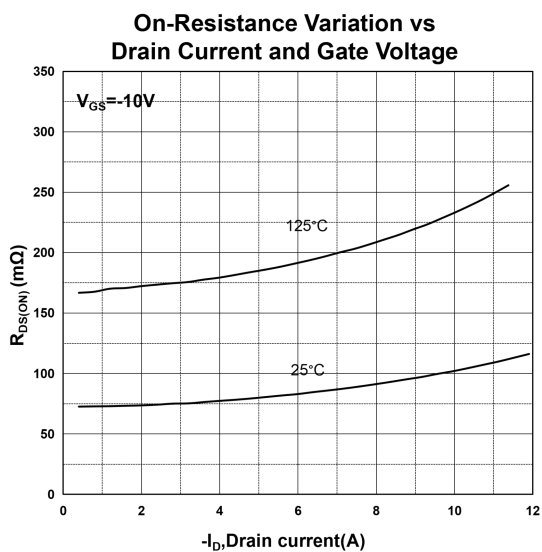
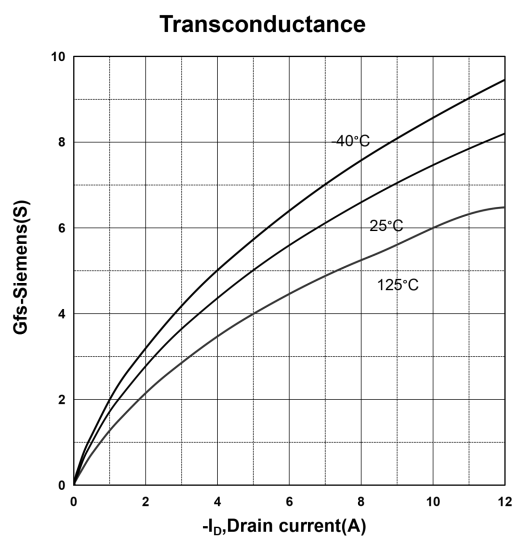
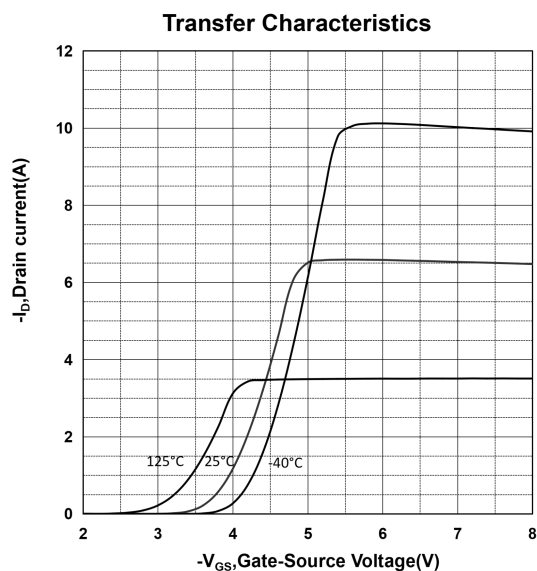
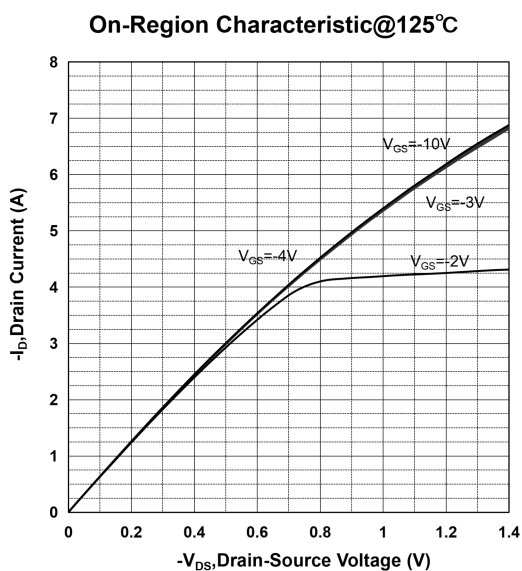
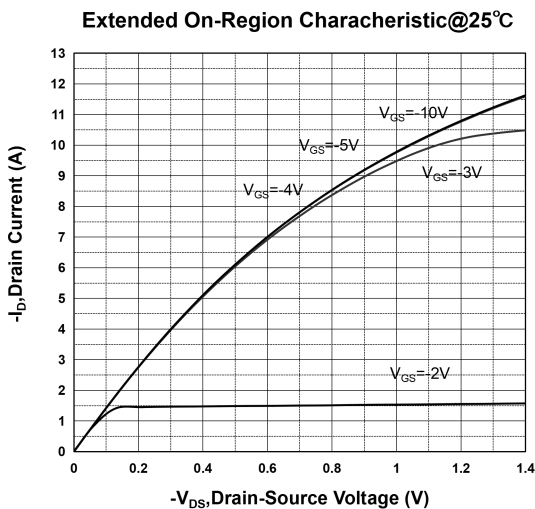
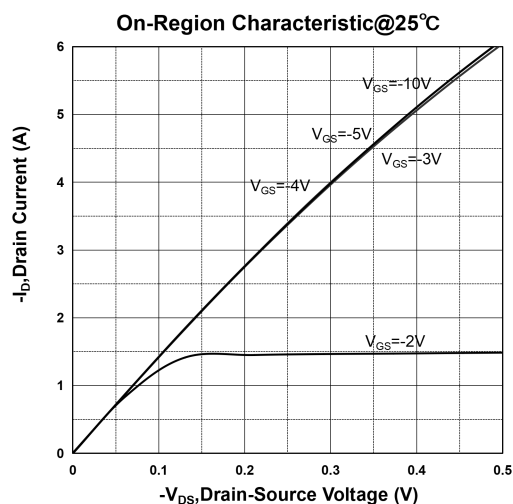


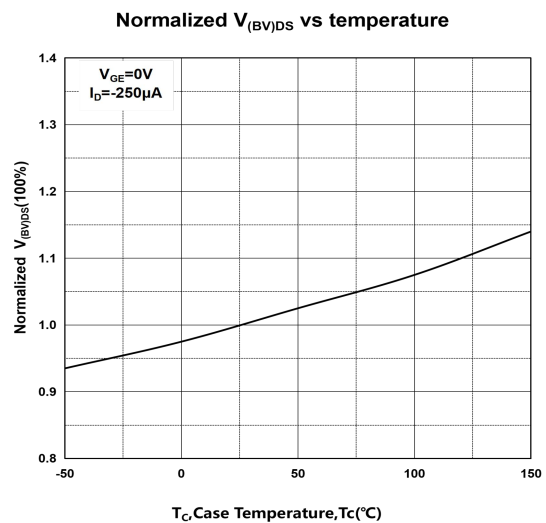
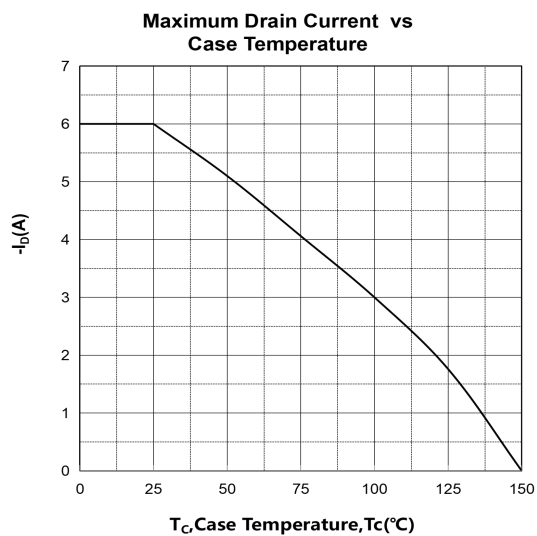
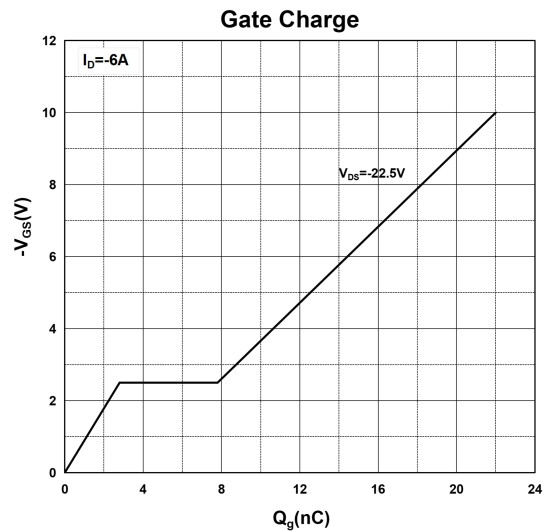
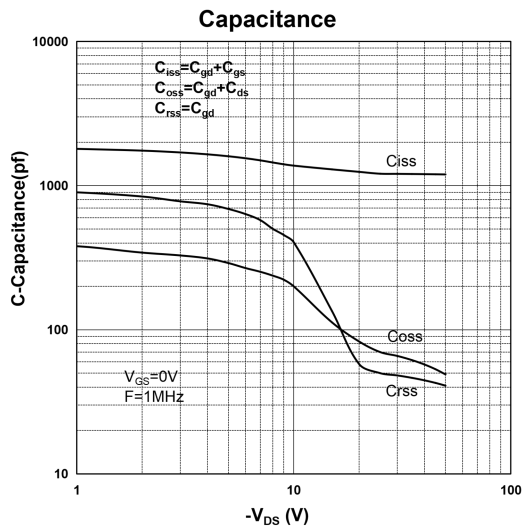
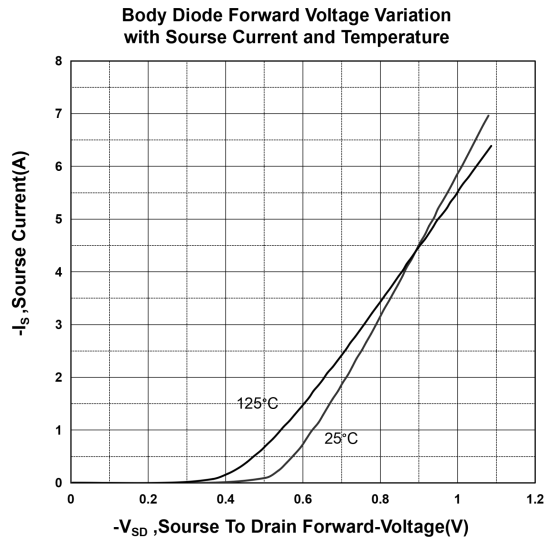
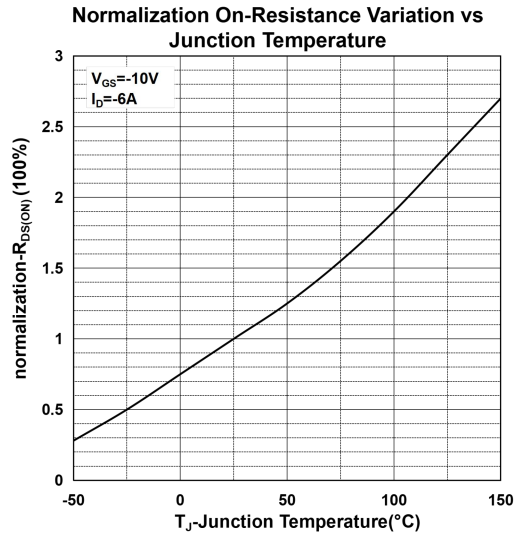
Body Diode Forward Voltage Variation with Source Current and Temperature

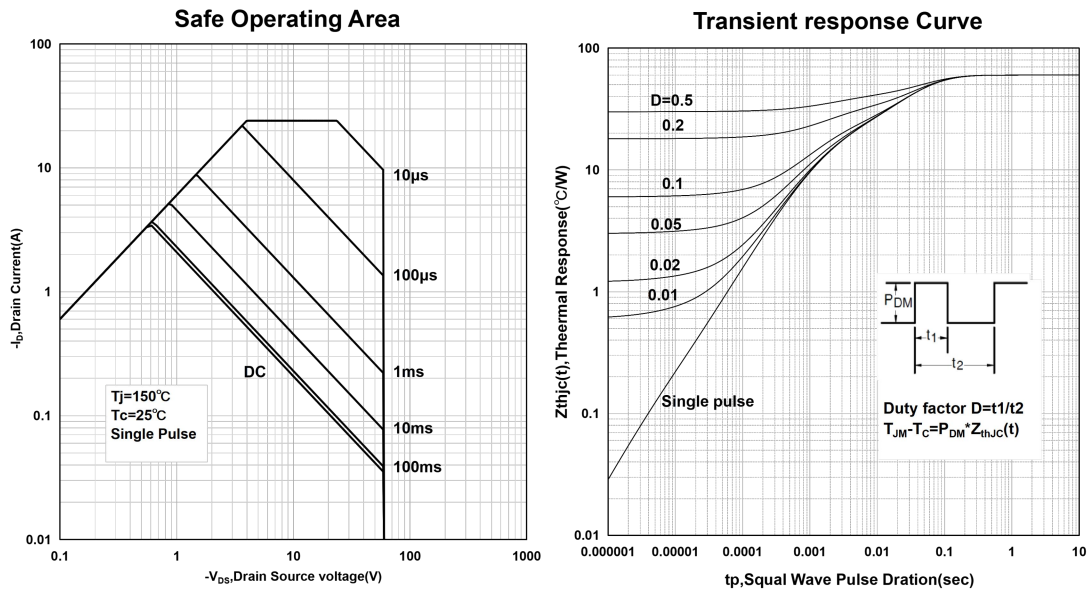




P-Channel







N-Chanel Measurement circuit

Fig.1-1 Switching Time Measurement Circuit

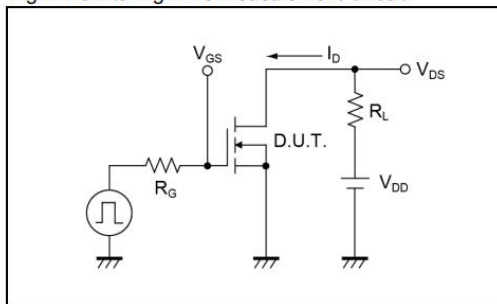


Fig.1-2 Switching Waveforms

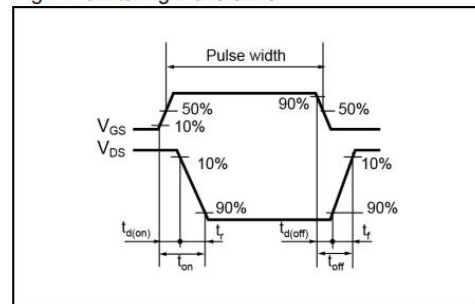


Fig.2-1 Gate Charge Measurement Circuit

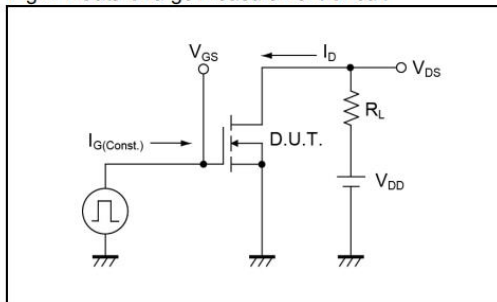
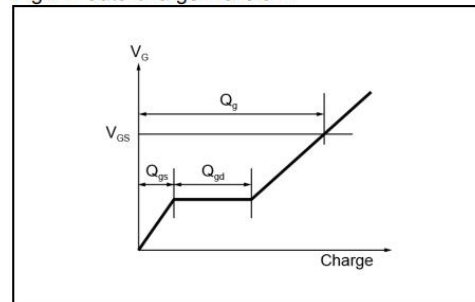


Fig.2-2 Gate Charge Waveform



P-Chanel Measurement circuit

Fig.3-1 Switching Time Measurement Circuit

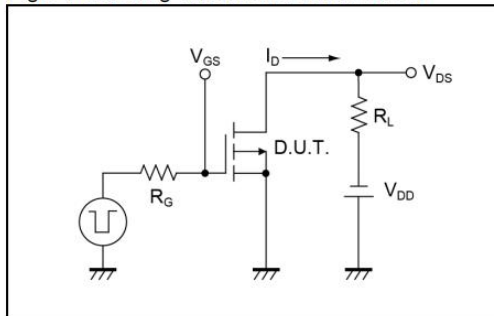


Fig.3-2 Switching Waveforms

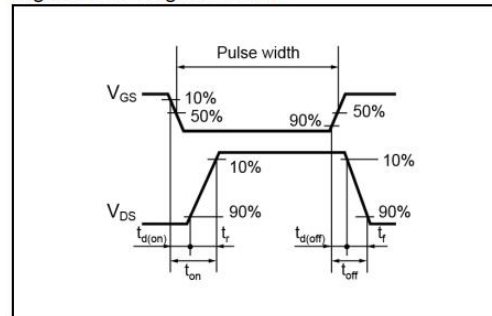


Fig.4-1 Gate Charge Measurement Circuit

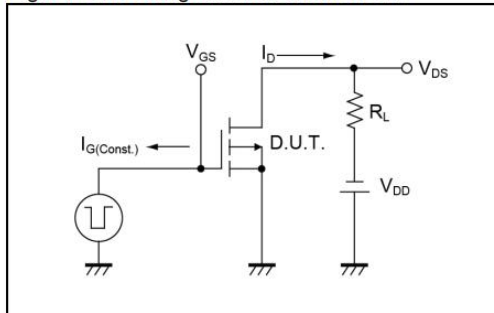
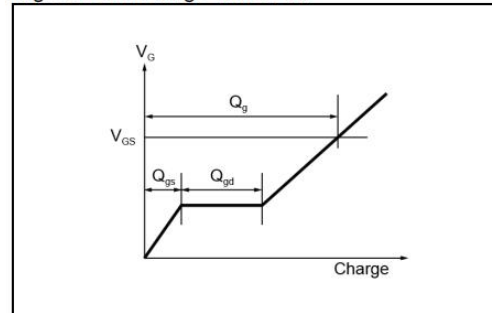
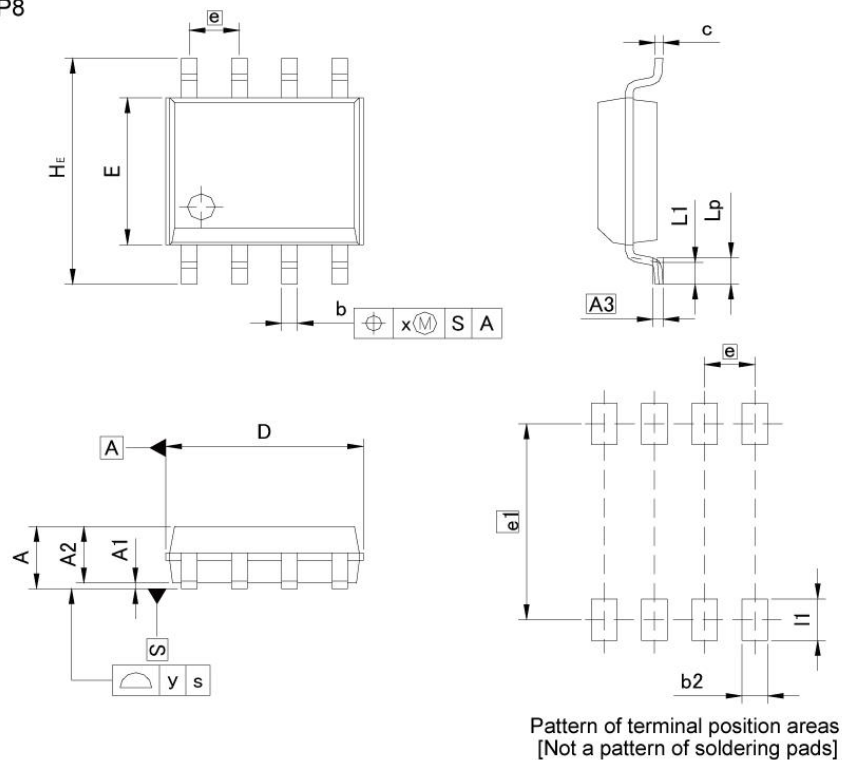


Fig.4-2 Gate Charge Waveform



PACKAGE MECHANICAL DATA

SOP8



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