

## 30V Complementary MOSFET

### DESCRIPTION

The SMC4549M is the N+P channel complementary mode power field effect transistors, using trench technology provide excellent RDS(ON) and low gate charge high current capability.

### PART NUMBER INFORMATION

**SMC 4549 M - TR G**  
 a      b      c      d      e

- a : Company name.
- b : Product Serial number.
- c : Package code                      M:SOP-8
- d : Handling code                      TR:Tape&Reel
- e : Green produce code    G:RoHS Compliant

### FEATURES

#### N-Channel

**$V_{DS}=30V, I_D=7.8A$**

$R_{DS(ON)}=16m\Omega(Typ.)@V_{GS}=10V$

$R_{DS(ON)}=20m\Omega(Typ.)@V_{GS}=4.5V$

#### P-Channel

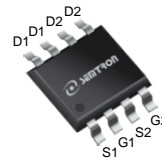
**$V_{DS}=-30V, I_D=-7A$**

$R_{DS(ON)}=20m\Omega(Typ.)@V_{GS}=-10V$

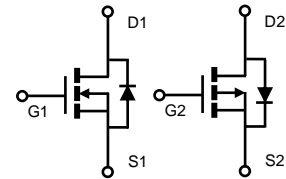
$R_{DS(ON)}=26m\Omega(Typ.)@V_{GS}=-4.5V$

### APPLICATIONS

- ◆ Load Switch.
- ◆ Battery Protection Management



SOP-8



N-ch

P-ch

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ Unless otherwise noted)

Symbol	Parameter	Rating		Units	
		N-ch	P-ch		
$V_{DSS}$	Drain-Source Voltage	30	-30	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V	
$I_D$	Continuous Drain Current	$T_A=25^\circ C$	7.8	-7	A
		$T_A=70^\circ C$	6.4	-5.8	A
$I_{DM}$	Pulsed Drain Current <sup>A</sup>	31.2	-28	A	
$I_{AS}$	Avalanche Current <sup>A</sup>	15	-20	A	
$E_{AS}$	Single Pulse Avalanche energy $L=0.3mH$ <sup>AF</sup>	33	60	mJ	
$P_D$	Power Dissipation <sup>B</sup>	$T_A=25^\circ C$	2	2	W
		$T_A=70^\circ C$	1.3	1.3	W
$T_J$	Operation Junction Temperature	-55/150		$^\circ C$	
$T_{STG}$	Storage Temperature Range	-55/150		$^\circ C$	

### THERMAL RESISTANCE

Symbol	Parameter	Typ	Max	Units
$R_{\theta JA}$	Thermal Resistance Junction to Ambient <sup>B</sup>	$t \leq 10s$	62	$^\circ C/W$
	Thermal Resistance Junction to Ambient <sup>BD</sup>	Steady-State	90	

## ■ N-ch ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ Unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250 $\mu$ A	30			V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 $\mu$ A	1	1.5	2	V
I <sub>GSS</sub>	Gate Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = $\pm$ 20V			$\pm$ 100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, T <sub>J</sub> =25 $^\circ$ C			1	$\mu$ A
		V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =75 $^\circ$ C			10	
R <sub>DS(ON)</sub>	Drain-source On-Resistance <sup>D</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =8A V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A		16 20	20 26	m $\Omega$
G <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =6A		6		S
<b>Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage <sup>D</sup>	I <sub>S</sub> =1A, V <sub>GS</sub> =0V			1	V
I <sub>S</sub>	Diode Continuous Forward Current				8	A
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =6A, di/dt=100A/ $\mu$ s, T <sub>J</sub> =25 $^\circ$ C		12.5		ns
Q <sub>rr</sub>	Reverse Recovery Charge			3.2		nC
<b>Dynamic and Switching Parameters <sup>E</sup></b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =6A		12.7	17.8	nC
Q <sub>g</sub>	Total Gate Charge (4.5V)			6.2	8.7	
Q <sub>gs</sub>	Gate-Source Charge			2.4	3.4	
Q <sub>gd</sub>	Gate-Drain Charge			2	2.8	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz		550		pF
C <sub>oss</sub>	Output Capacitance			78		
C <sub>rss</sub>	Reverse Transfer Capacitance			62		
R <sub>g</sub>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz		2.4		$\Omega$
t <sub>d(on)</sub>	Turn-On Time	V <sub>DD</sub> =15V, V <sub>GEN</sub> =10V, R <sub>G</sub> =3.3 $\Omega$ , I <sub>D</sub> =1A		2.5	5	nS
t <sub>r</sub>				7.6	14	
t <sub>d(off)</sub>	Turn-Off Time			19.8	38	
t <sub>f</sub>				4.2	8	

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

- A. Surface mounted on FR4 board using 1 in<sup>2</sup> pad size.
- B. Pulsed width limited by maximum junction temperature, T<sub>J(MAX)</sub>=150 $^\circ$ C.
- C. Using  $\leq$  10s junction-to-ambient thermal resistance is base on T<sub>J(MAX)</sub>=150 $^\circ$ C.
- D. Pulse test width  $\leq$ 300 $\mu$ s and duty cycle  $\leq$  2%.
- E. Guaranteed by design, not subject to production testing.

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## ■ P-ch ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ Unless otherwise noted)

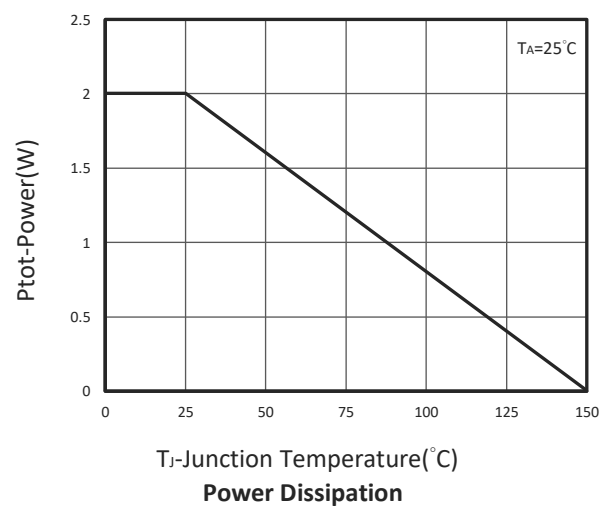
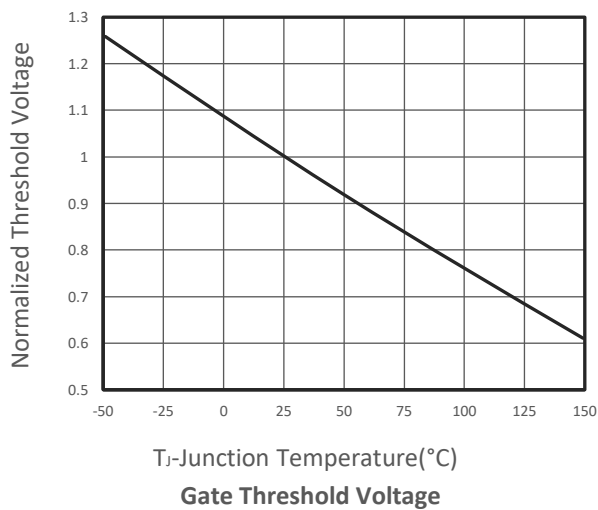
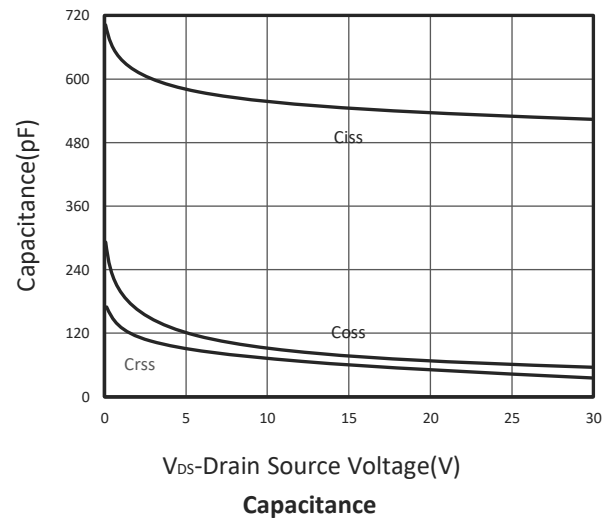
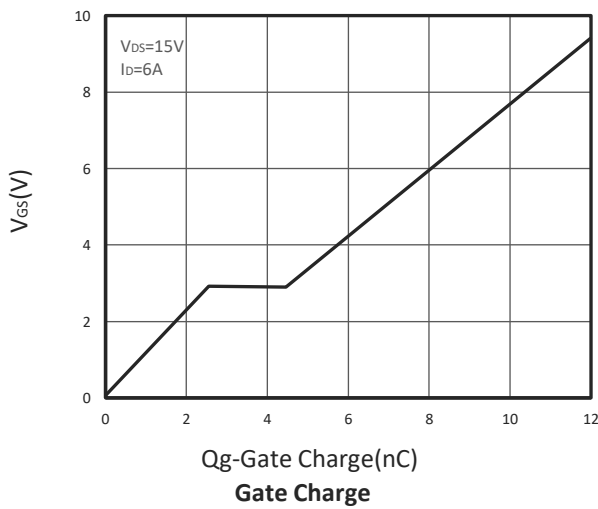
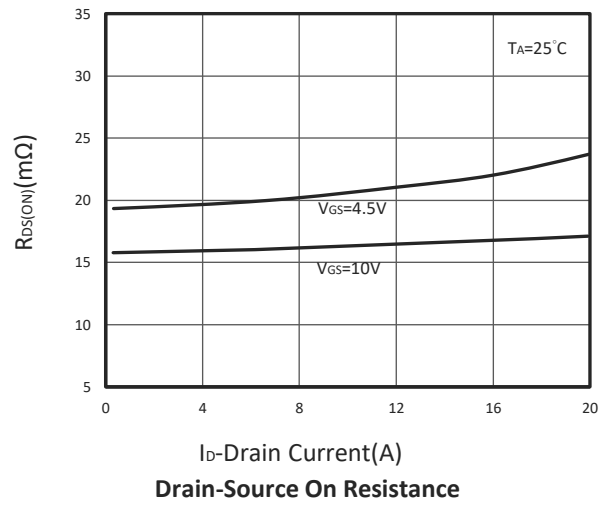
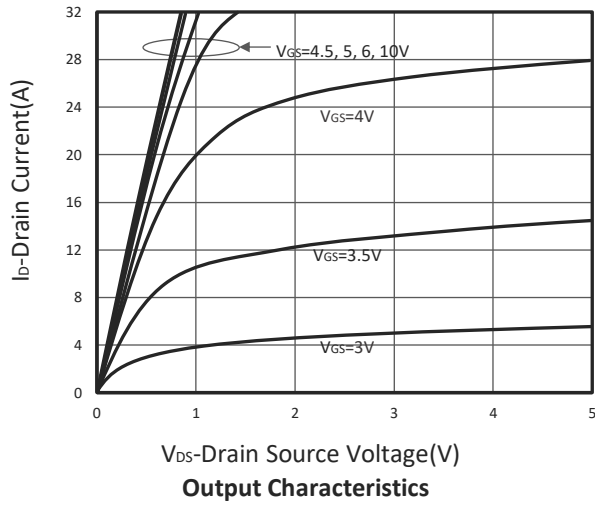
Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250 $\mu$ A	-30			V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250 $\mu$ A	-1	-1.6	-2.5	V
I <sub>GSS</sub>	Gate Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = $\pm$ 20V			$\pm$ 100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, T <sub>J</sub> =25 $^\circ$ C			-1	$\mu$ A
		V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =75 $^\circ$ C			-10	
R <sub>DS(ON)</sub>	Drain-source On-Resistance <sup>D</sup>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-7A V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5.6A		20 26	25 32	m $\Omega$
G <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-7A		12.5		S
<b>Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage <sup>D</sup>	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V			-1	V
I <sub>S</sub>	Diode Continuous Forward Current				-7	A
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =-7A, di/dt=100A/ $\mu$ s		11		ns
Q <sub>rr</sub>	Reverse Recovery Charge			5.8		nC
<b>Dynamic and Switching Parameters<sup>E</sup></b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-7A		23.6	33	nC
Q <sub>g</sub>	Total Gate Charge (4.5V)			11.5	16.1	
Q <sub>gs</sub>	Gate-Source Charge			4.2	5.9	
Q <sub>gd</sub>	Gate-Drain Charge			4.4	6.2	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz		1280		pF
C <sub>oss</sub>	Output Capacitance			175		
C <sub>rss</sub>	Reverse Transfer Capacitance			125		
t <sub>d(on)</sub>	Turn-On Time	V <sub>DD</sub> =-15V, V <sub>GEN</sub> =-10V, R <sub>G</sub> =3.3 $\Omega$ , I <sub>D</sub> =-1A		6.1	12	nS
t <sub>r</sub>				14	27	
t <sub>d(off)</sub>	Turn-Off Time			34	65	
t <sub>f</sub>				13.2	25	

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

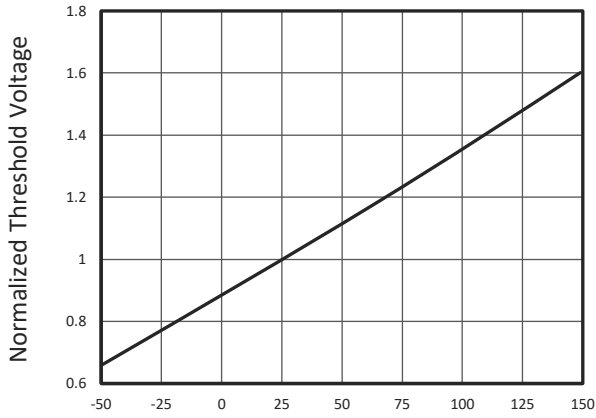
- A. Surface mounted on FR4 board using 1 in<sup>2</sup> pad size.
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- C. Using  $\leq$  10s junction-to-ambient thermal resistance is base on T<sub>J(MAX)</sub>=150 $^\circ$ C.
- D. Pulse test width  $\leq$ 300 $\mu$ s and duty cycle  $\leq$  2%.
- E. Guaranteed by design, not subject to production testing.

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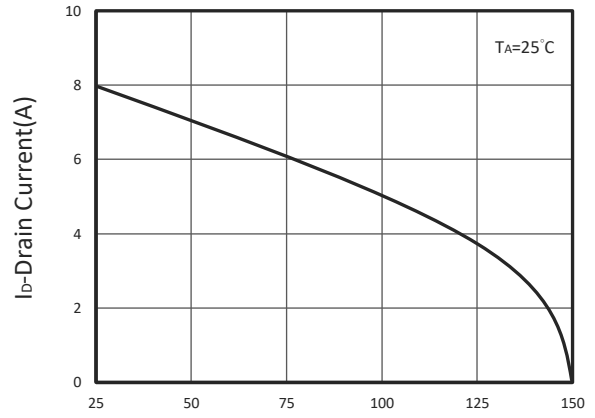
## N-ch TYPICAL CHARACTERISTICS



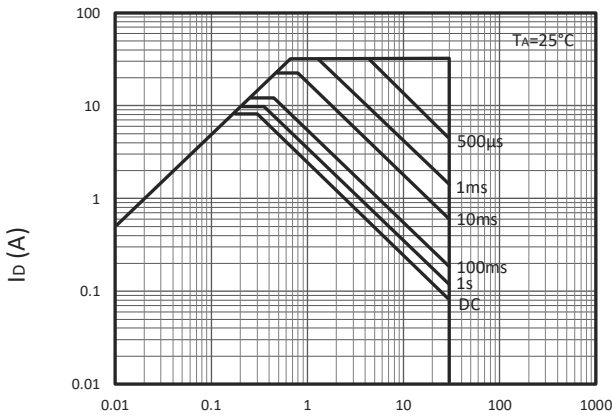
## N-ch TYPICAL CHARACTERISTICS



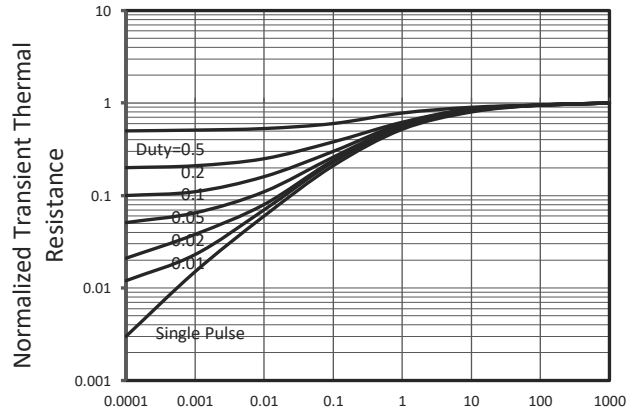
T<sub>J</sub>-Junction Temperature(°C)  
Gate Threshold Voltage



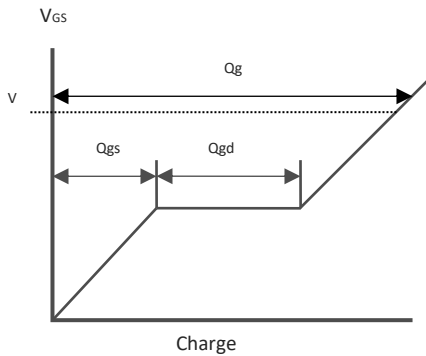
T<sub>J</sub>-Junction Temperature(°C)  
Drain Current vs T<sub>J</sub>



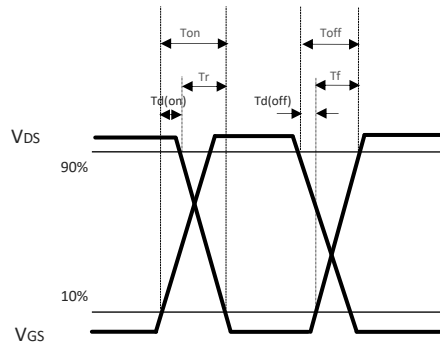
V<sub>DS</sub> Voltage (V)  
Maximum Safe Operation Area



Square Wave Pulse Duration(Sec)  
Thermal Transient Impedance

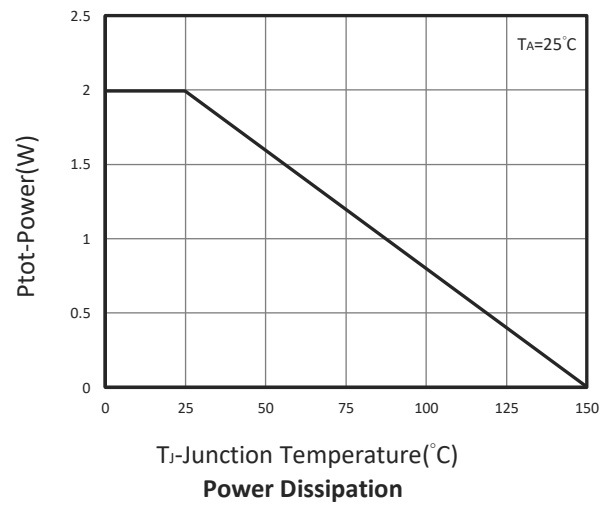
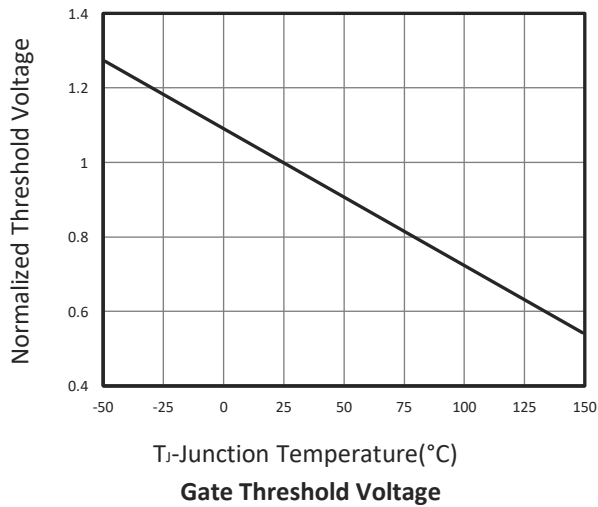
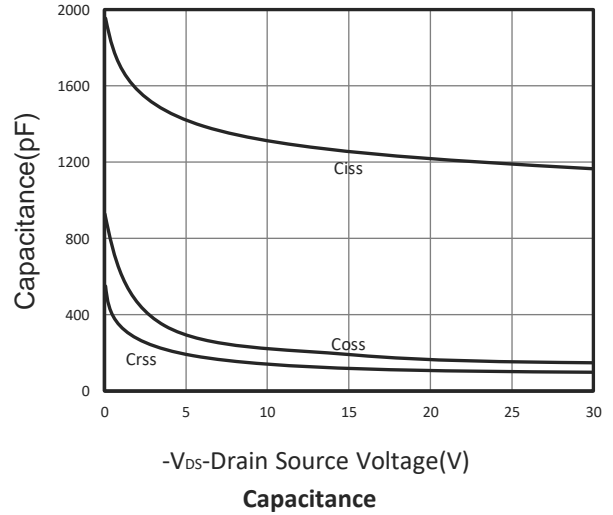
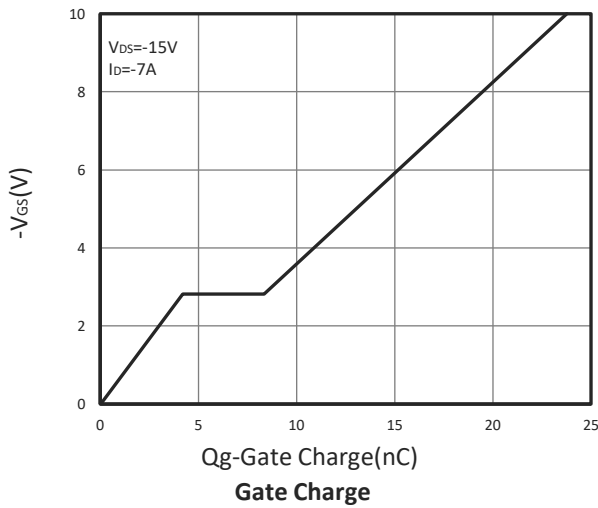
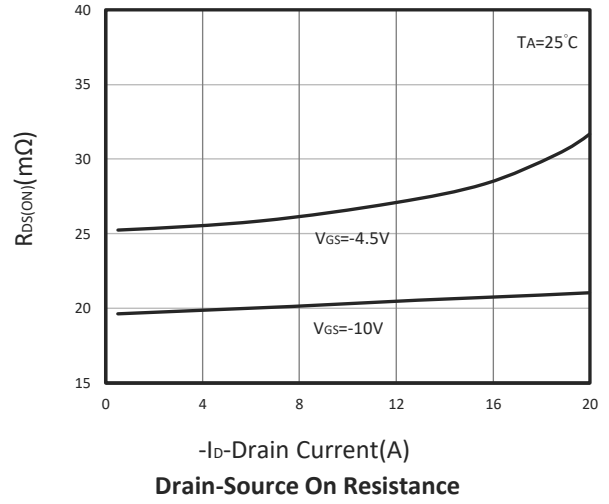
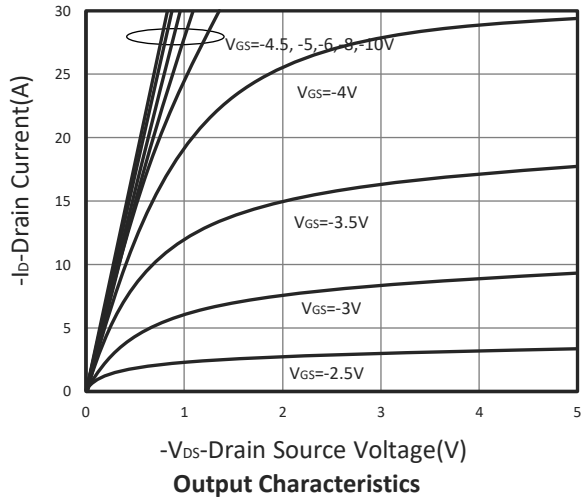


Gate Chrg Waveform

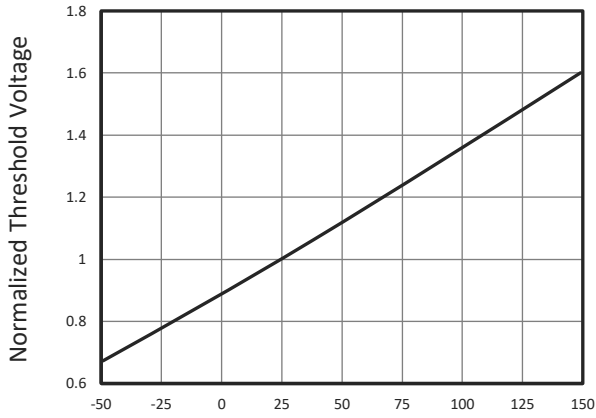


Switching Time Waveform

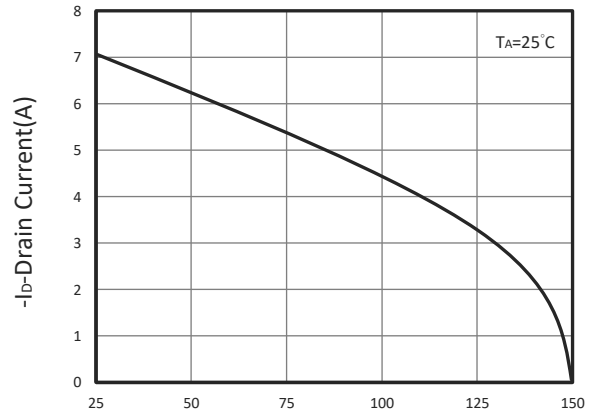
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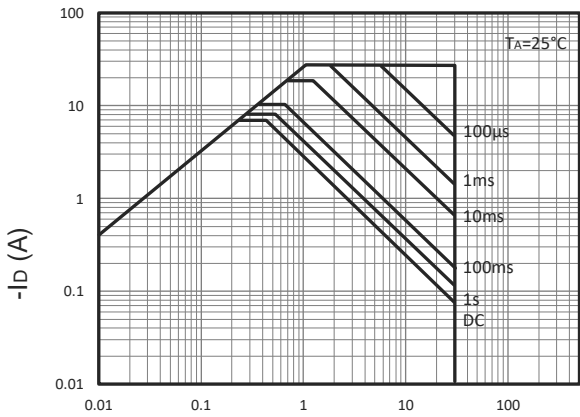
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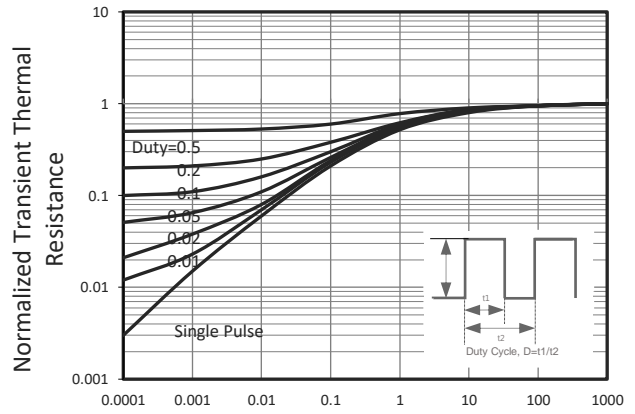
T<sub>J</sub>-Junction Temperature(°C)  
Gate Threshold Voltage



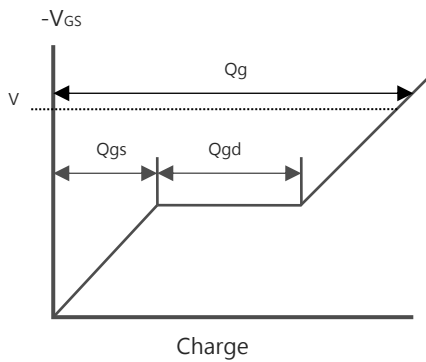
T<sub>J</sub>-Junction Temperature(°C)  
Drain Current vs T<sub>J</sub>



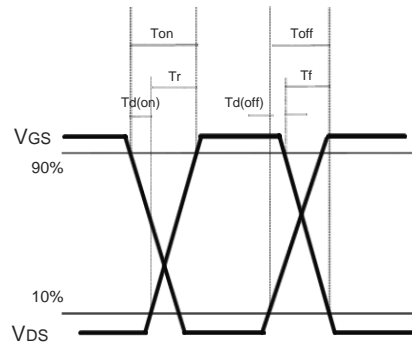
-V<sub>DS</sub> Voltage (V)  
Maximum Safe Operation Area



Square Wave Pulse Duration(Sec)  
Thermal Transient Impedance

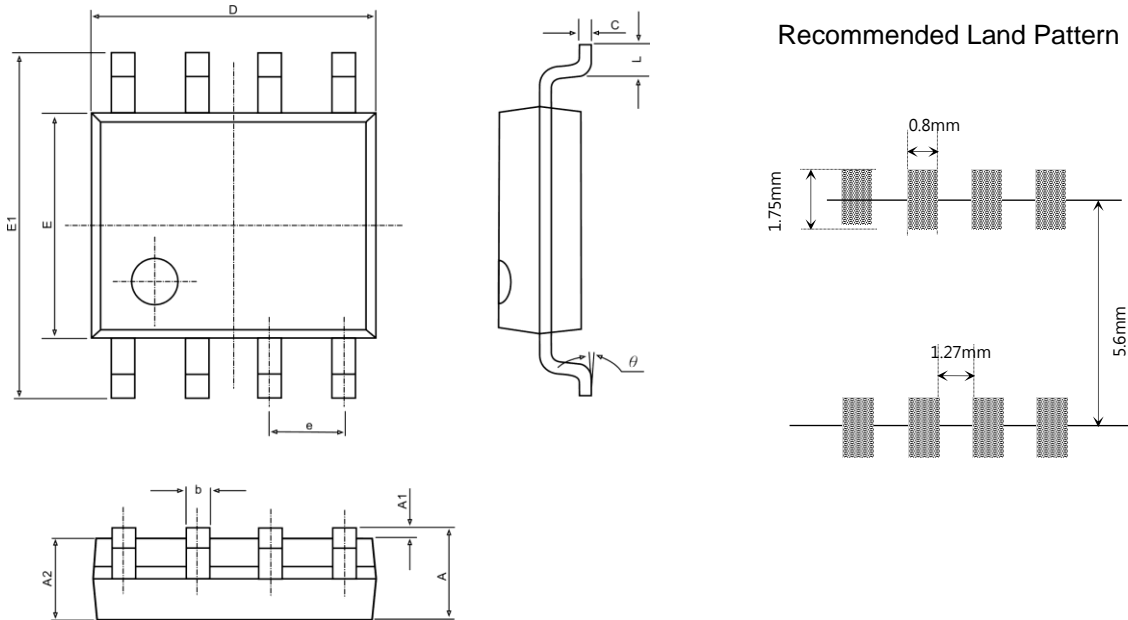


Gate Chrg Waveform



Switching Time Waveform

## ■ SOP-8 PACKAGE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.300	1.500	0.051	0.059
b	0.390	0.490	0.015	0.019
c	0.200	0.250	0.008	0.010
D	4.800	5.100	0.189	0.201
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 BSC		0.050 BSC	
L	0.500	0.800	0.020	0.031
θ	0°	8°	0°	8°