



Description

The SM409T9RL uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

$V_{DS} = -60V, I_D = -30A$

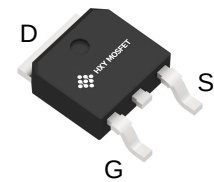
$R_{DS(ON)} < 33m\Omega @ V_{GS} = -10V$

Application

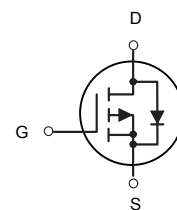
PWM applications

Load switch

Power management



TO-252-2L
(DPAK)



P-Channel MOSFET

Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
SM409T9RL	TO-252-2L(DPAK)	HXY MOSFET	2500

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

Symbol	Parameter	Limit	Unit
V_{DS}	Drain-Source Voltage ($V_{GS} = 0V$)	-60	V
V_{GS}	Gate-Source Voltage ($V_{DS} = 0V$)	± 20	V
I_D	Drain Current-Continuous($T_C = 25^\circ C$)	-30	A
	Drain Current-Continuous($T_C = 100^\circ C$)	-25.5	A
$I_{DM} (pulse)$	Drain Current-Continuous@ Current-Pulsed (Note 1)	-144	A
P_D	Maximum Power Dissipation($T_C = 25^\circ C$)	79	W
	Maximum Power Dissipation($T_C = 100^\circ C$)	39.5	W
E_{AS}	Avalanche energy (Note 2)	196	mJ
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 175	$^\circ C$



Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=-250\mu A$	-60			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-60V$, $V_{GS}=0V$			-1	μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu A$	-1	-1.8	-2.5	V
g_{FS}	Forward Transconductance	$V_{DS}=-5V$, $I_D=-15A$		35		S
$R_{DS(ON)}$	Drain-Source On-State Resistance	$V_{GS}=-10V$, $I_D=-15A$		29	33	m Ω
		$V_{GS}=-4.5V$, $I_D=-10A$		35	46	m Ω
C_{iss}	Input Capacitance	$V_{DS}=-25V$, $V_{GS}=0V$, $f=1.0MHz$		4026		pF
C_{oss}	Output Capacitance			134		pF
C_{rss}	Reverse Transfer Capacitance			98		pF
$t_{d(on)}$	Turn-on Delay Time	$V_{GS}=-10V$, $V_{DS}=-30V$, $R_L=1.5\Omega$, $R_{GEN}=3\Omega$		12.2		nS
t_r	Turn-on Rise Time			10		nS
$t_{d(off)}$	Turn-Off Delay Time			64		nS
t_f	Turn-Off Fall Time			14		nS
Q_g	Total Gate Charge	$V_{GS}=-10V$, $V_{DS}=-30V$, $I_D=-20A$		68		nC
Q_{gs}	Gate-Source Charge			10.5		nC
Q_{gd}	Gate-Drain Charge			13		nC
I_{SD}	Source-Drain Current (Body Diode)				30	A
V_{SD}	Forward on Voltage (Note 3)	$V_{GS}=0V$, $I_S=-15A$			-1.2	V
t_{rr}	Reverse Recovery Time	$I_F=-20A$, $di/dt=100A/\mu s$		26		ns
Q_{rr}	Reverse Recovery Charge	$I_F=-20A$, $di/dt=100A/\mu s$		29		nC

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

Notes 2. E_{AS} condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=40V$, $V_G=-10V$, $R_g=25\Omega$, $L=0.5mH$.

Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.



Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

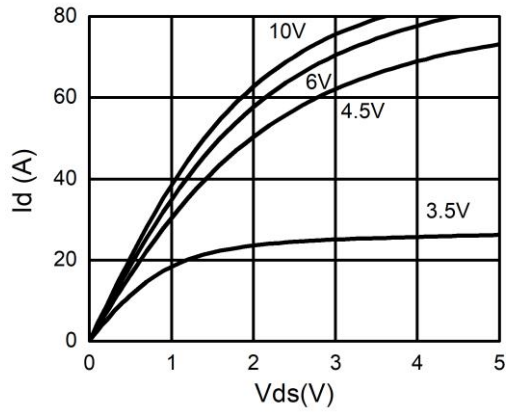


Figure 2. Transfer Characteristics

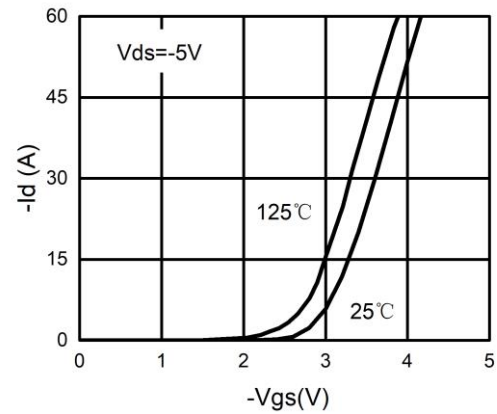


Figure 3. Power Dissipation

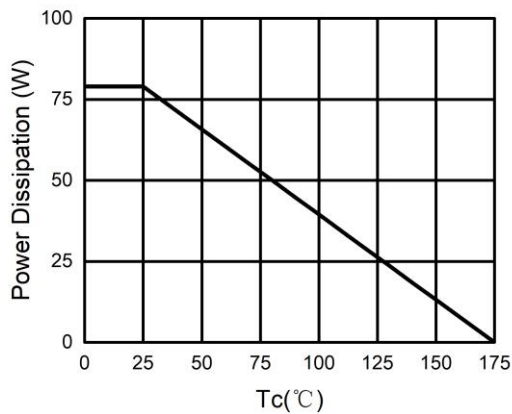


Figure 4. Drain Current

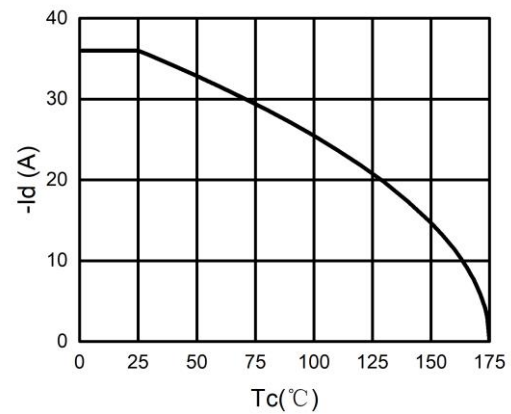


Figure 5. BV_{DSS} vs Junction Temperature

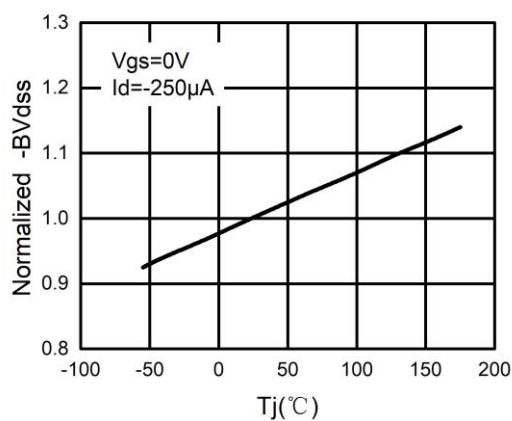


Figure 6. $R_{DS(ON)}$ vs Junction Temperature

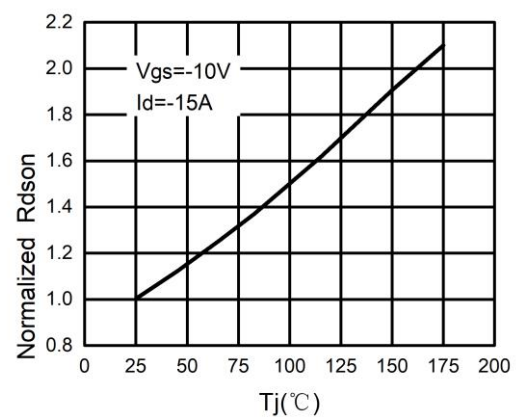




Figure 7. Gate Charge Waveforms

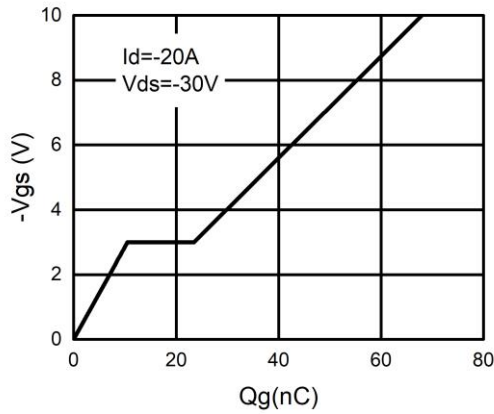


Figure 8. Capacitance

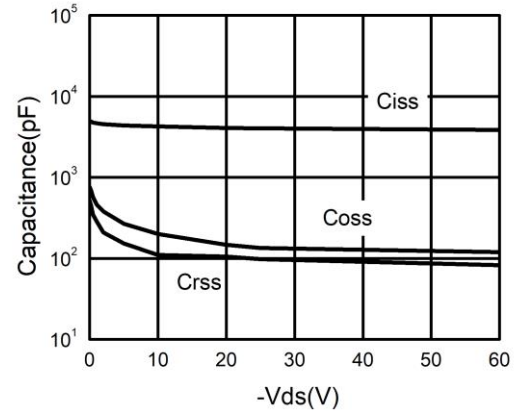


Figure 9. Body-Diode Characteristics

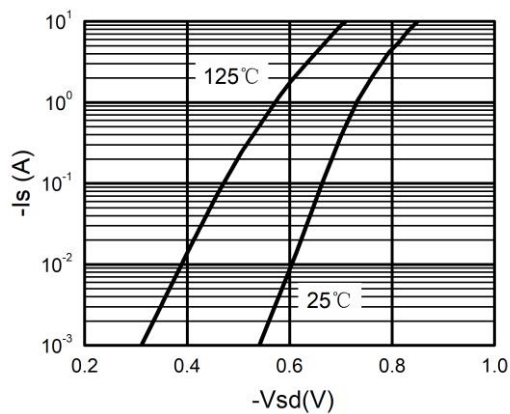
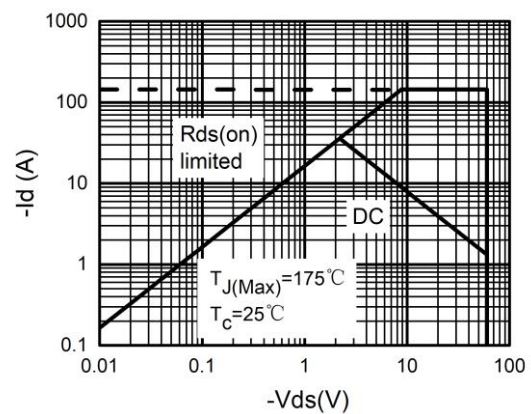
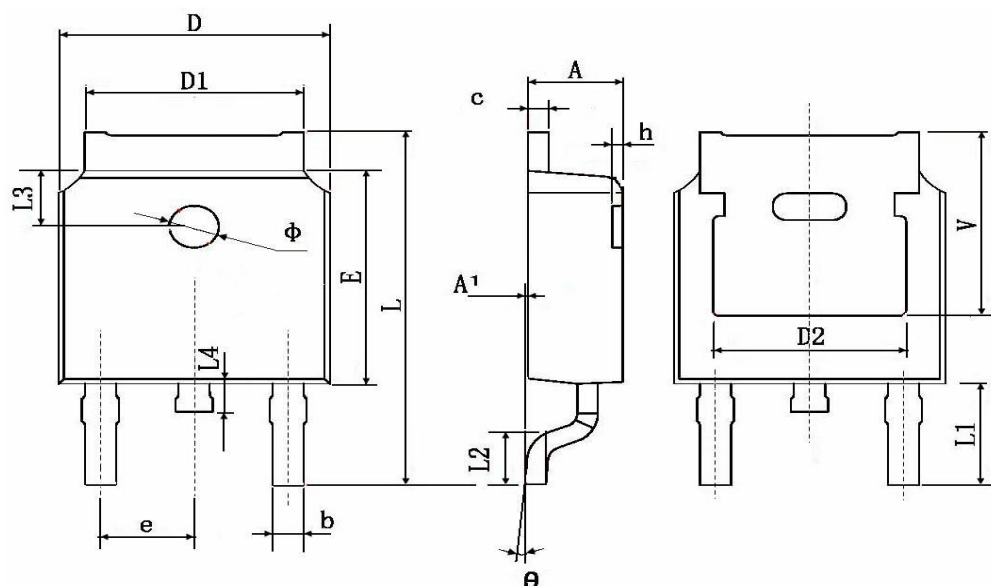


Figure 10. Maximum Safe Operating Area





TO-252-2L(DPAK) Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	



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