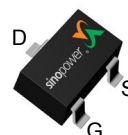


N-Channel Enhancement Mode MOSFET

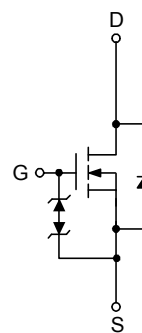
Features

- 100V/2A,
 $R_{DS(ON)} = 156m\Omega(max.) @ V_{GS}=10V$
 $R_{DS(ON)} = 176m\Omega(max.) @ V_{GS}=4.5V$
- ESD Protection
- 100% UIS + R_g Tested
- Reliable and Rugged
- Lead Free and Green Devices Available
 (RoHS Compliant)

Pin Description



Top View of SOT-23



N-Channel MOSFET

Applications

- Power Management in TV Inverter.

Ordering and Marking Information

SM2370NS □□-□□□ 	Package Code A : SOT-23 Operating Junction Temperature Range C : -55 to 150 °C Handling Code TR : Tape & Reel Assembly Material G : Halogen and Lead Free Device
SM2370NS A: A70XX	XX - Lot Code

Note : SINOPOWER lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. SINOPOWER lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020D for MSL classification at lead-free peak reflow temperature. SINOPOWER defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

SINOPOWER reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

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

Symbol	Parameter		Rating	Unit
Common Ratings				
V _{DSS}	Drain-Source Voltage		100	V
V _{GSS}	Gate-Source Voltage		±20	
T _J	Maximum Junction Temperature		150	°C
T _{STG}	Storage Temperature Range		-55 to 150	
I _S	Diode Continuous Forward Current	T _A =25°C	1	A
I _D	Continuous Drain Current	T _A =25°C	2	A
		T _A =70°C	1.6	
I _{DM} ^a	Pulsed Drain Current	T _A =25°C	8	A
P _D	Maximum Power Dissipation	T _A =25°C	1.38	W
		T _A =70°C	0.88	
R _{θJA} ^c	Thermal Resistance-Junction to Ambient	t ≤ 10s	90	°C/W
		Steady State	135	°C/W
I _{AS} ^b	Avalanche Current, Single pulse	L=0.5mH	5	A
E _{AS} ^b	Avalanche Energy, Single pulse	L=0.5mH	6.25	mJ

Note a : Pulse width limited by max. junction temperature.

Note b : UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature $T_J = 25^\circ\text{C}$).

Note c : Surface mounted on 1in^2 pad area.

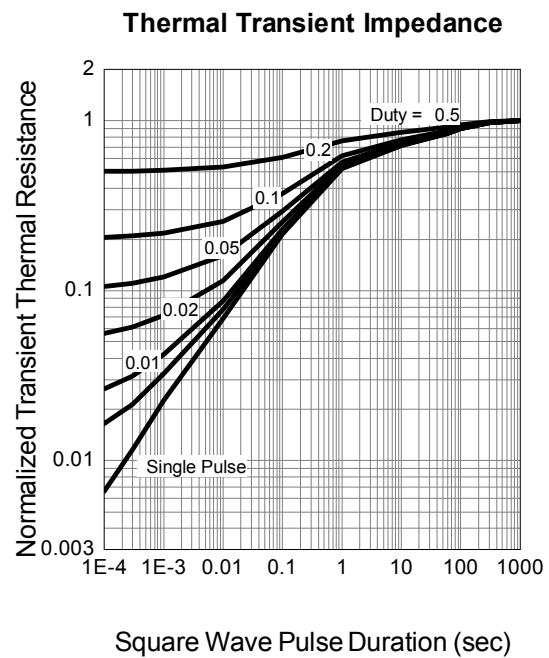
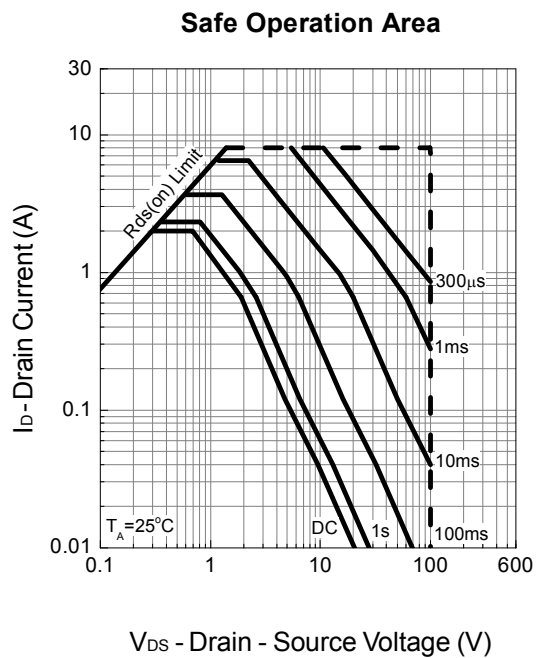
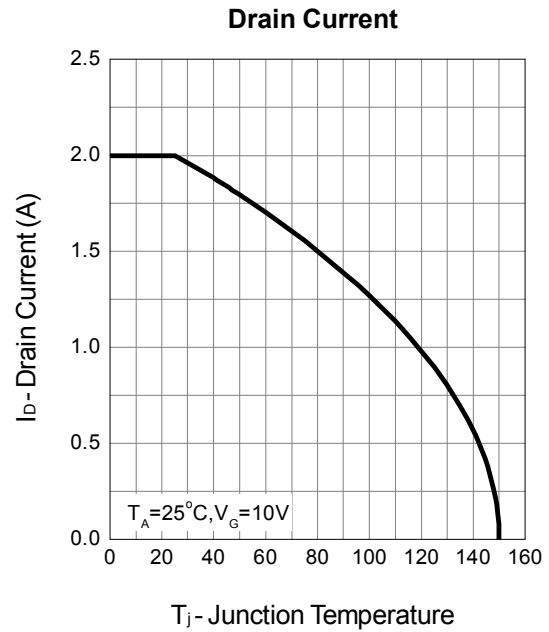
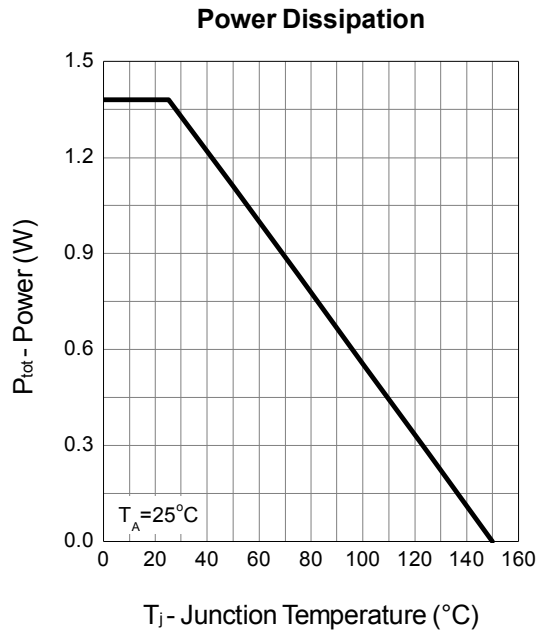
Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	100	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =80V, V _{GS} =0V T _J =85°C	-	-	1 30	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1	2	3	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±10	μA
R _{DS(ON)} ^d	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =2A V _{GS} =4.5V, I _{DS} =1.5A	-	130 135	156 176	mΩ
Diode Characteristics						
V _{SD} ^d	Diode Forward Voltage	I _{SD} =1A, V _{GS} =0V	-	0.8	1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} =2A, dI _{SD} /dt=100A/μs	-	24	-	ns
Q _{rr}	Reverse Recovery Charge		-	31	-	nC
Dynamic Characteristics ^e						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	-	2.5	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, Frequency=1.0MHz	-	440	570	pF
C _{Oss}	Output Capacitance		-	30	-	
C _{rss}	Reverse Transfer Capacitance		-	16	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =30V, R _L =30Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	9	17	ns
t _r	Turn-on Rise Time		-	7	13	
t _{d(OFF)}	Turn-off Delay Time		-	18	33	
t _f	Turn-off Fall Time		-	4	8	
Gate Charge Characteristics ^e						
Q _g	Total Gate Charge	V _{DS} =30V, V _{GS} =4.5V, I _{DS} =2A	-	4.8	-	nC
Q _g	Total Gate Charge	V _{DS} =30V, V _{GS} =10V, I _{DS} =2A	-	10	14	
Q _{gs}	Gate-Source Charge		-	1.8	-	
Q _{gd}	Gate-Drain Charge		-	1.9	-	

Note d : Pulse test ; pulse width≤300μs, duty cycle≤2%.

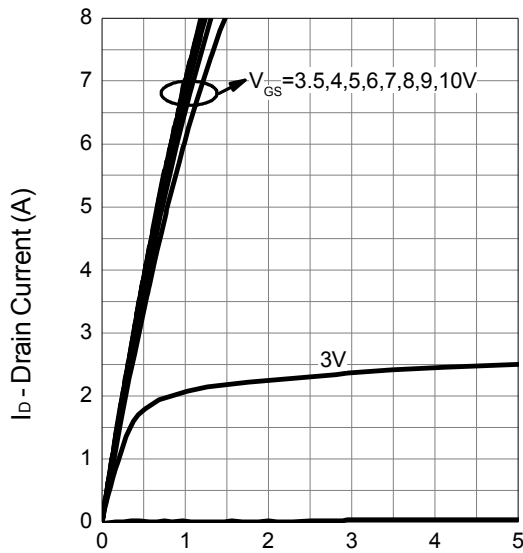
Note e : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics



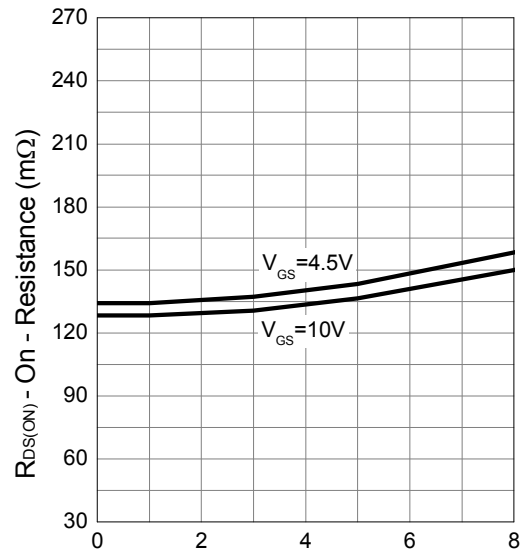
Typical Operating Characteristics (Cont.)

Output Characteristics



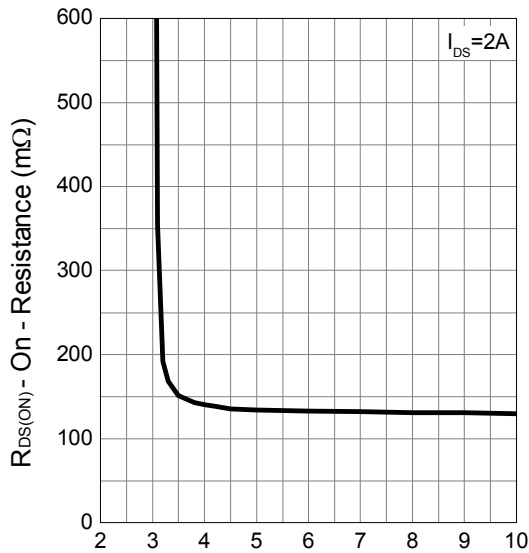
V_{DS} - Drain - Source Voltage (V)

Drain-Source On Resistance



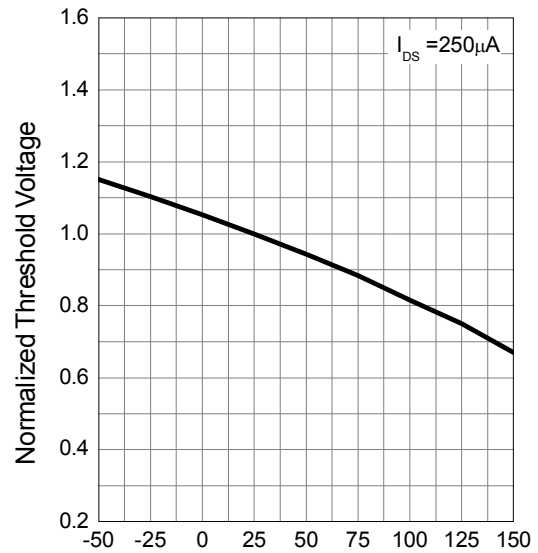
I_D - Drain Current (A)

Gate-Source On Resistance



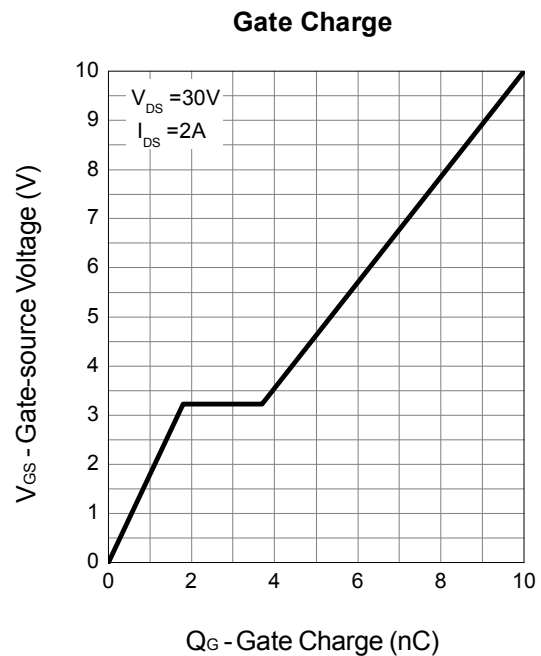
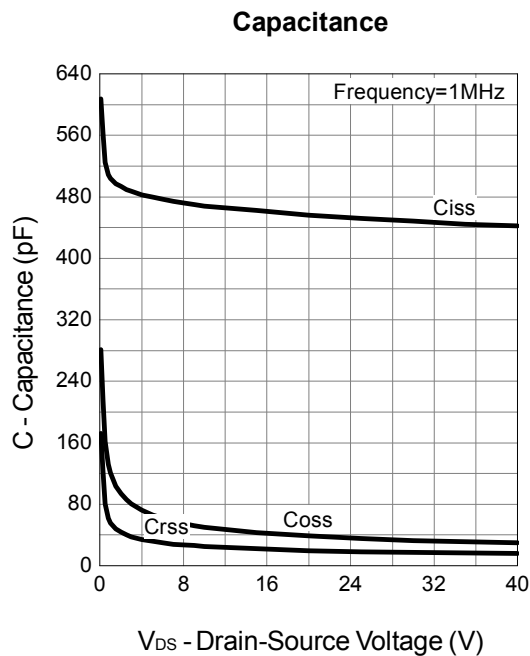
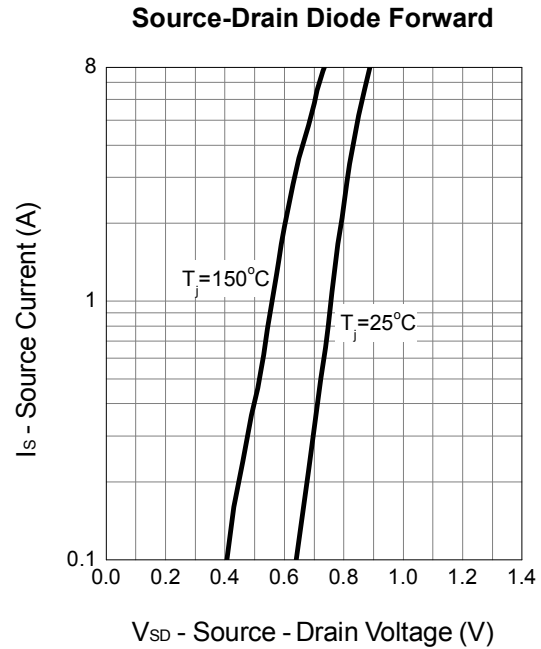
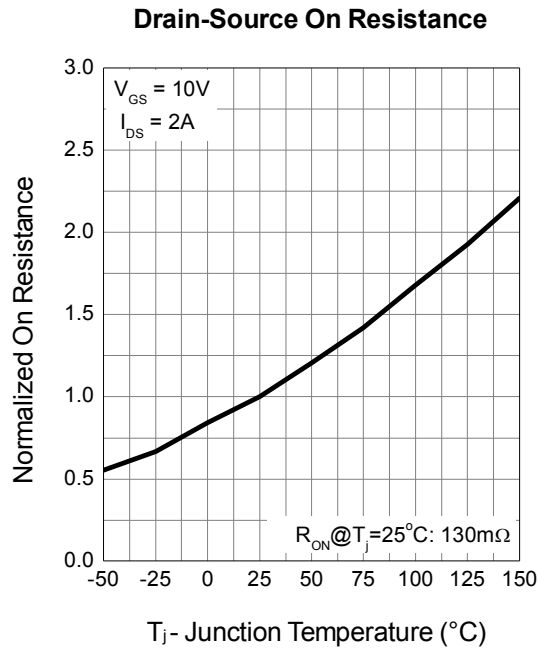
V_{GS} - Gate - Source Voltage (V)

Gate Threshold Voltage

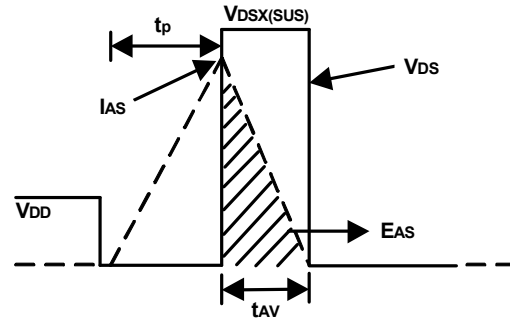
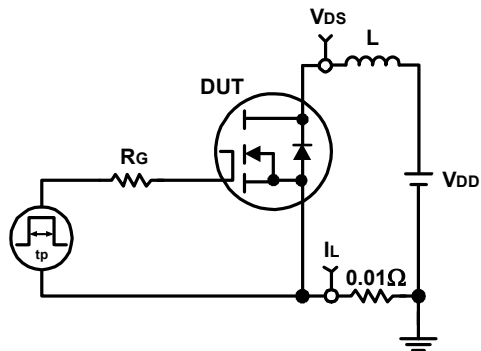


T_J - Junction Temperature ($^{\circ}C$)

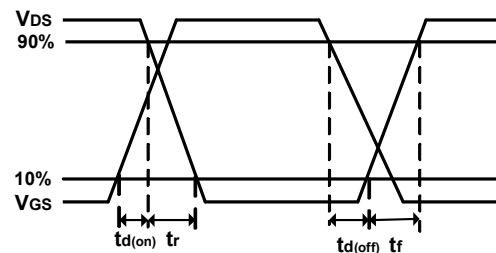
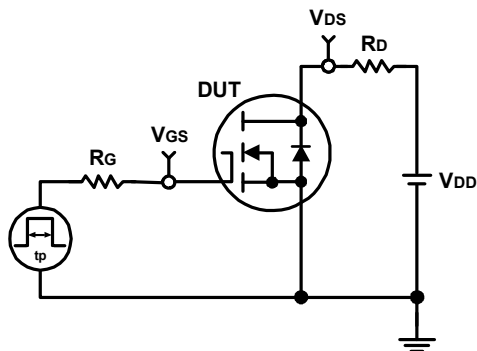
Typical Operating Characteristics (Cont.)



Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



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The figure illustrates the thermal profile of a solder joint, showing temperature versus time. The main graph includes the following details:

- Y-axis:** Temperature (°C), with markers for T_p , T_L , T_{smax} , T_{smin} , and 25.
- X-axis:** Time (s), with markers for t_s , t , and t_p .
- Key Regions and Parameters:**
 - Preheat Area:** The region between T_{smin} and T_{smax} .
 - Max. Ramp Up Rate = 3°C/s** and **Max. Ramp Down Rate = 6°C/s** are indicated for the heating and cooling phases, respectively.
 - t_s :** Time from 25°C to T_{smin} .
 - t :** Time from T_L to the peak.
 - t_p :** Peak dwell time at T_p .
 - $T_c - 5^\circ\text{C}$:** Temperature 5°C below the peak.

Two inset graphs at the top show the temperature profile relative to the supplier's and user's T_p and T_c limits:

- Left Inset:** Supplier $T_p \geq T_c$. The peak is at T_p , and the dwell time is t_p .
- Right Inset:** User $T_p \leq T_c$. The peak is at T_p , and the dwell time is t_p .

Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax}) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_p)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	1000 Hrs, 80% of VDS max @ T_{jmax}
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ T_{jmax}
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

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