



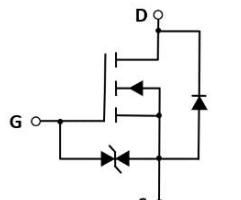
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MN20E013

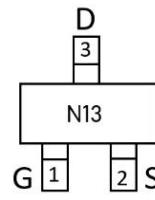
20V N-Channel MOSFET

1. General Description

The MN20E013 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 0.7V. This device is suitable for use as a load switch or in Power switch applications. The mosfet with ESD protected as 2000V.



Schematic Diagram



Pin assignment



SOT-523

2. Specification Features

- $V_{DS} = 20V, I_D = 1.0 A$
- $R_{DS(ON)} < 250m\Omega$ @ $V_{GS} = 4.5 V$ (TYPE: $210m\Omega$)
- $R_{DS(ON)} < 350m\Omega$ @ $V_{GS} = 2.5 V$ (TYPE: $290m\Omega$)
- $R_{DS(ON)} < 800m\Omega$ @ $V_{GS} = 1.8 V$ (TYPE: $520m\Omega$)
- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

3. Application

- PWM applications
- Load switch
- Power management

4. Absolute Maximum Ratings ($T_J = 25^\circ C$)

Characteristics		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	20	V
Gate-Source Voltage		V_{GSS}	± 8	V
Continuous Drain Current (1)	$T_c = 25^\circ C$ (silicon limited)	I_D	1.0	A
	$T_c = 25^\circ C$ (package limited)		0.95	
	$T_c = 100^\circ C$ (silicon limited)		0.72	
Pulsed Drain Current (2)		I_{DM}	6	
Power Dissipation	$T_c = 25^\circ C$	P_D	430	mW
	$T_c = 100^\circ C$		280	
Single Pulse Avalanche Energy (3)		E_{AS}		mJ
Junction and Storage Temperature Range		T_J, T_{STG}	-55~150	°C



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20V N-Channel MOSFET

5. Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal Resistance, Junction-to-Ambient ⁽¹⁾	R _{θJA}	446	°C/W
Thermal Resistance, Junction to Case	R _{θJC}	290	

6. Electrical Characteristics (T_J = 25°C)

Symbol	Characteristics	Test Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	20	22		V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.35	0.7	1	V
I _{DSS}	Drain CutOff Current	V _{DS} =20V, V _{GS} =0V			1	μA
I _{GSS}	Gate Leakage Current	V _{GS} =±8V, V _{DS} =0V			±1	μA
R _{DS(on)}	Drain-Source On-Resistance	V _{GS} =4.5V, I _D =0.6A		210	250	mΩ
		V _{GS} =2.5V, I _D =0.5A		290	350	
		V _{GS} =1.8V, I _D =0.4A		520	800	
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =1.5A		1		S
Dynamic Characteristics						
Q _g	Total Gate Charge	V _{DS} =4.5V, I _D =0.5A, V _{GS} =10V		1.4		nc
Q _{gs}	Gate Source Charge			0.18		
Q _{gd}	Gate Drain Charge			0.28		
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f=1.0MHz		95		pF
C _{rss}	Reverse Transfer Capacitance			12		
C _{oss}	Output Capacitance			21		
t _{D(on)}	Turn-On Delay Time	V _{GS} =4.5V, V _{DS} =10V, R _L =5Ω, R _G =6Ω		24		ns
t _r	Rise Time			86		
t _{D(off)}	Turn-Off Delay Time			750		
t _f	Fall Time			420		
R _g	Gate Resistance	f=1MHz		-		Ω
Drain-Source Body Diode Characteristics						
V _{SD}	Source-Drain Diode Forward Voltage	I _s =0.5A, V _{GS} =0V		0.8	1.2	V
t _{rr}	Body Diode Reverse Recovery Time	I _F =0.5A, dI/dt=100A/μS		-		ns
Q _{rr}	Body Diode Reverse Recovery Charge			-		nc

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

7. Typical Electrical and Thermal Characteristics (Curves)

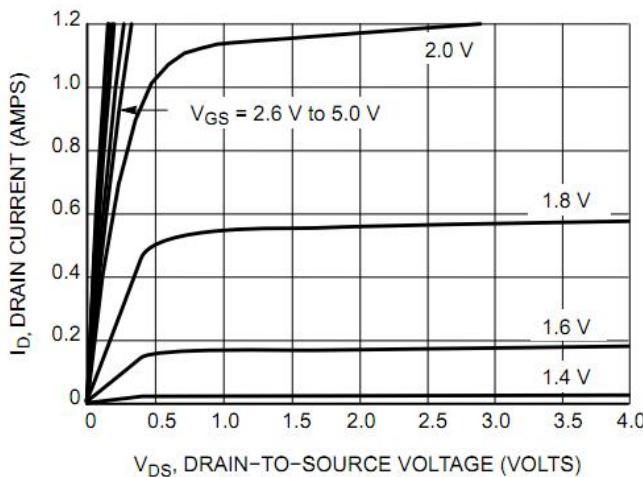


Figure 1. On-Region Characteristics

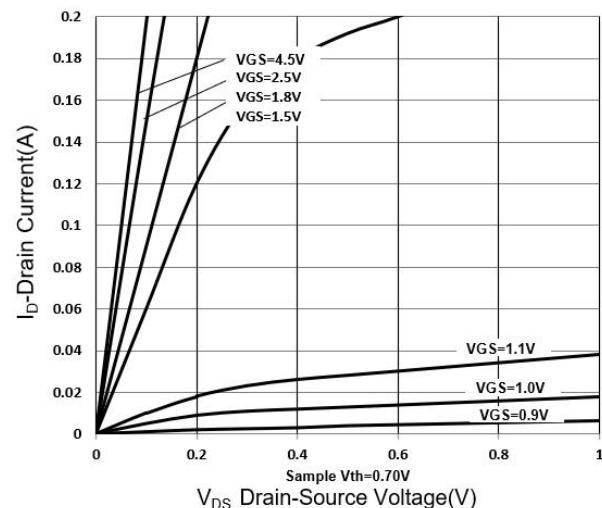


Figure 2. Output Characteristics

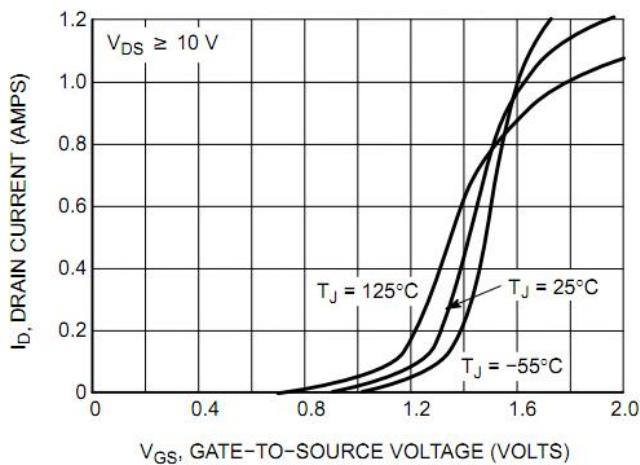


Figure 3. Transfer Characteristics

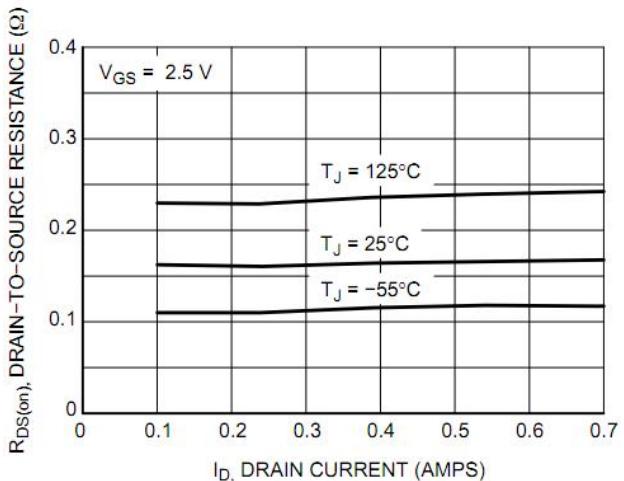


Figure 4. On-Resistance vs. Drain Current and Temperature

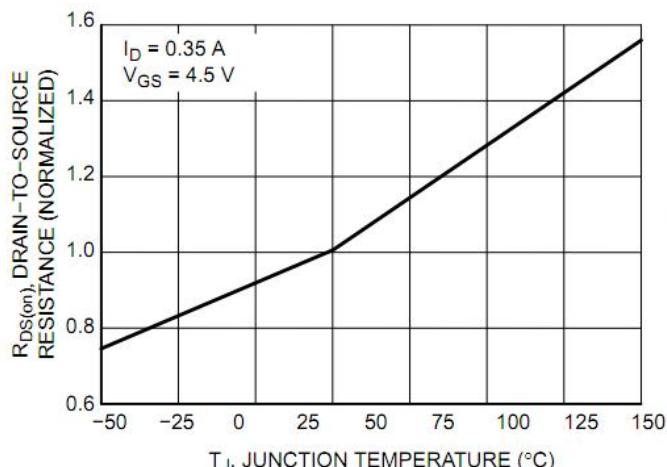


Figure 5. On-Resistance Variation with Temperature

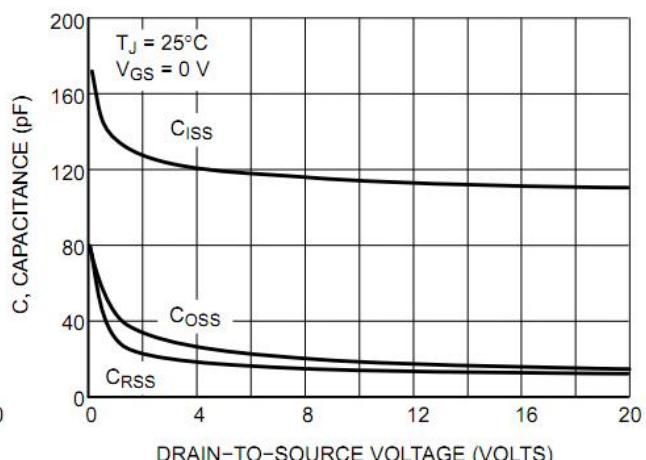


Figure 6. Capacitance Variation



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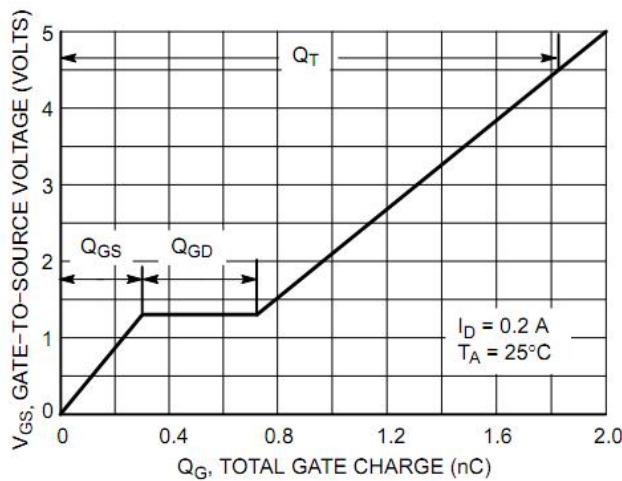


Figure 7. Gate-to-Source Voltage vs. Total Gate Charge

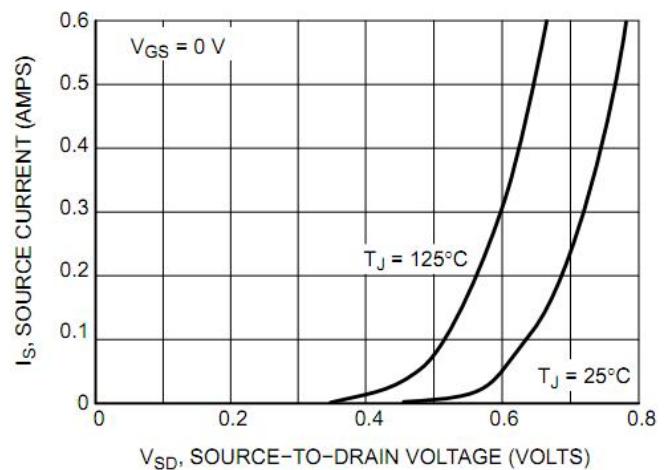


Figure 8. Diode Forward Voltage vs. Current

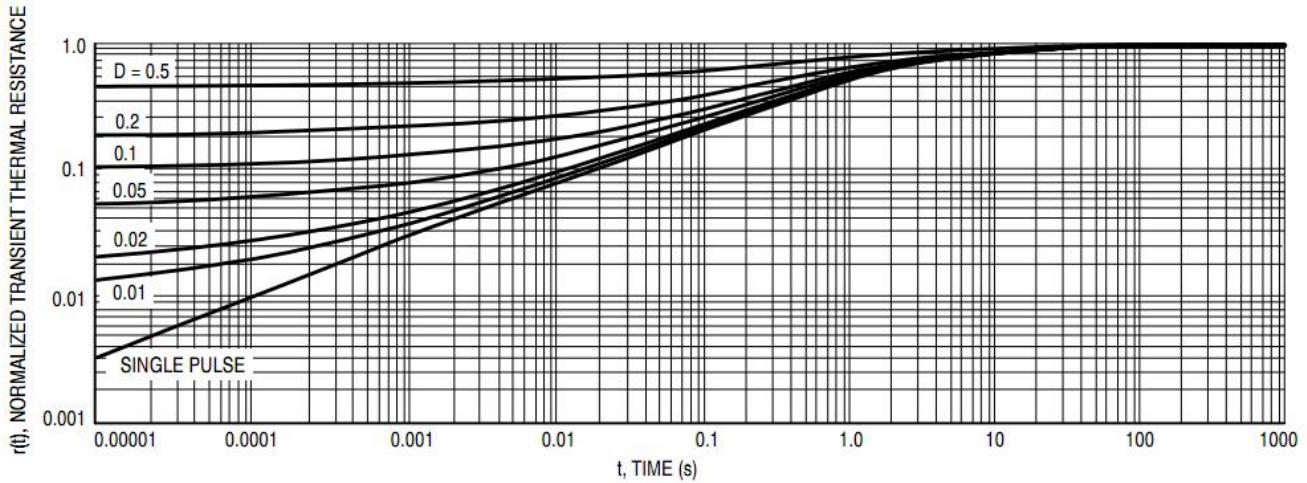


Figure 9. Normalized Thermal Response



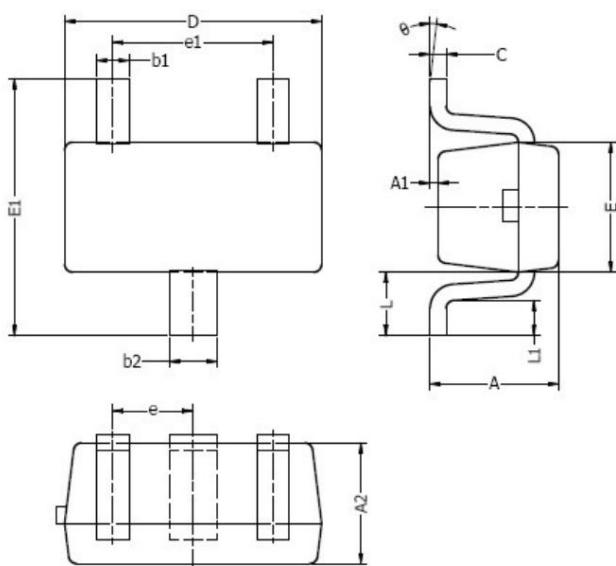
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8. Package Outline Dimensions

Device Marking	Device	Package	Reel size	Tape width	Quantity
N13	MN20E013	SOT-523	7inch	8mm	4000/4500



SOT-523 POD		
Symbol	Min (mm)	Max (mm)
A	0.70	0.90
A1	0.00	0.10
A2	0.70	0.80
b1	0.15	0.25
b2	0.25	0.35
c	0.10	0.20
D	1.50	1.70
E	0.70	0.90
E1	1.45	1.75
e	0.50Typ	
e1	0.90	1.10
L	0.40Ref	
L1	0.10	0.30
θ	0°	8°



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