

SDM013P04D

-40V P-Channel MOSFETs

Rev A.0

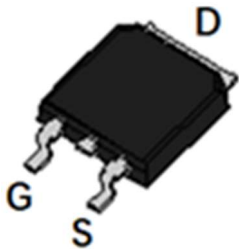
Feature

- ✧ Excellent $R_{DS(ON)}$
- ✧ Low Gate Charge
- ✧ High current Capability
- ✧ Green product (RoHS compliant), lead free
- ✧ 100% UIS Tested

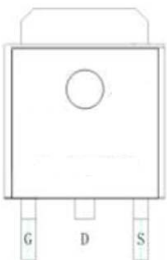
Product Summary

V_{DS}	-40	V
$V_{GS(th_Typ)}$	-1.7	V
$R_{DS(ON_Typ)}$ (at $V_{GS} = -10V$)	10	mΩ
I_D	-40	A

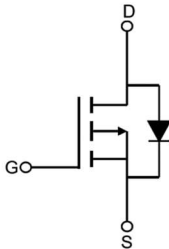
Type	Package	Marking	Outline	Media	Quantity (pcs)
SDM013P04D	TO-252	M013P04	Tape	13" Reel	2500



TO-252(DPAK) top view



Pin Assignment



Schematic Diagram

Absolute Maximum Ratings (Rating at $T_J=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Maximum	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current	I_D	-40	A
		-26	
Pulsed Drain Current ⁽¹⁾	I_{DM}	-160	A
Maximum Body-Diode Continuous Current	I_S	-40	A
Avalanche Energy ⁽²⁾	E_{AS}	144	mJ
Power Dissipation	P_D	41.6	W
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +175	°C

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =-250μA, V _{GS} =0V	-40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-40V, V _{GS} =0V	-	-	-1	μA
I _{GSS}	Gate-Body Leakage Current	V _{DS} =0V, V _{GS} =±20V	-	-	±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D =-250μA	-1.0	-1.7	-2.5	V
R _{DS(ON)} ⁽³⁾	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-20A	-	10	13	mΩ
		V _{GS} =-4.5V, I _D =-10A	-	15	22	
V _{SD}	Diode Forward Voltage	I _S =-30A, V _{GS} =0V	-	-0.8	-1.2	V
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-20V, f=1MHz	-	3801	-	pF
C _{oss}	Output Capacitance		-	331	-	pF
C _{rss}	Reverse Transfer Capacitance		-	291	-	pF
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-10V, V _{DD} =-20V, I _D =-20A	-	69	-	nC
Q _{gs}	Gate Source Charge		-	11	-	nC
Q _{gd}	Gate Drain Charge		-	15	-	nC
t _{D(on)}	Turn-On Delay Time	V _{GS} =-10V,V _{DS} =-20V,R _G =2.4Ω, I _D =-20A	-	11	-	ns
t _r	Turn-On Rise Time		-	83	-	ns
t _{D(off)}	Turn-Off Delay Time		-	95	-	ns
t _f	Turn-Off Fall Time		-	75	-	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-30A, di/dt=100A/μs	-	21	-	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-30A, di/dt=100A/μs	-	15	-	nC

Thermal Resistances

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JC}$	Thermal resistance from junction to Case	-	3.6	°C /W

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=-20\text{V}$, $V_G=-10\text{V}$, $L=0.5\text{mH}$, $R_G=25\Omega$, $I_{AS}=-24\text{A}$.
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

Typical Electrical and Thermal Characteristics

Figure 1: Saturation Characteristics

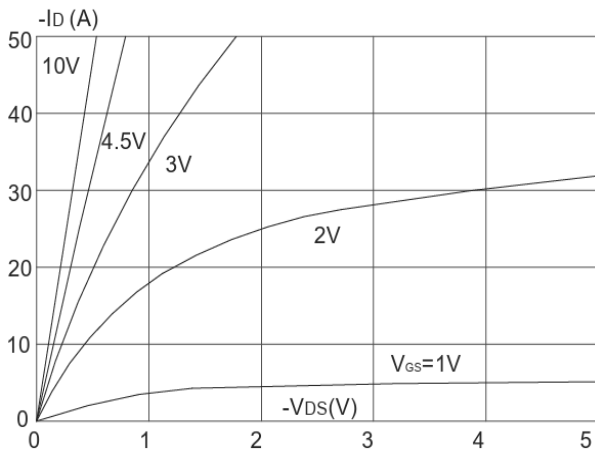


Figure 2: Transfer Characteristics

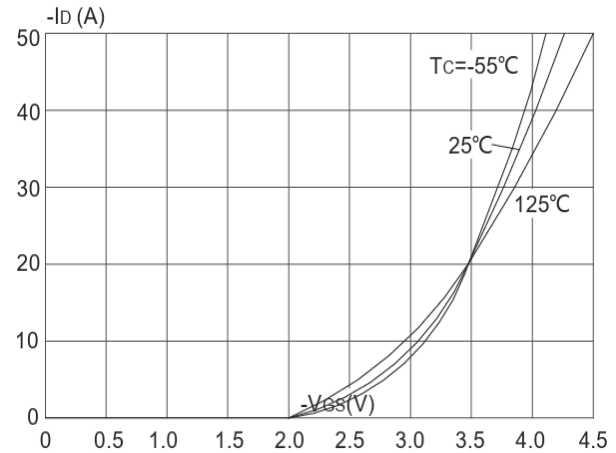
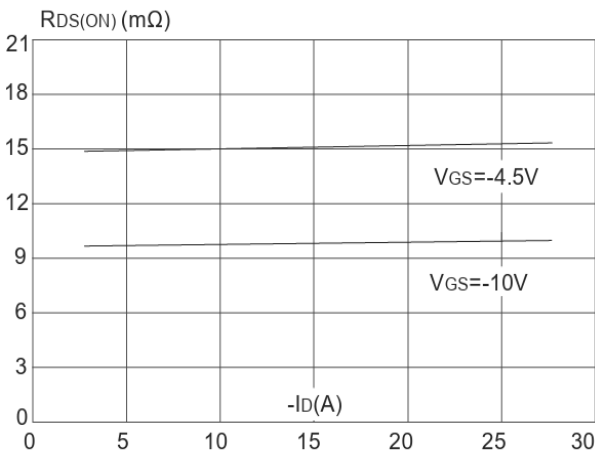
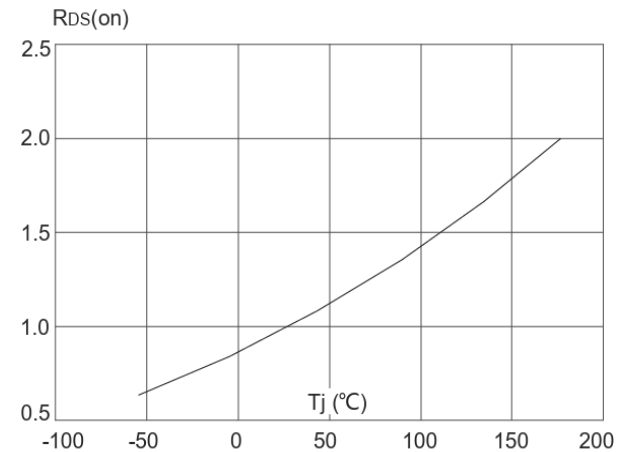
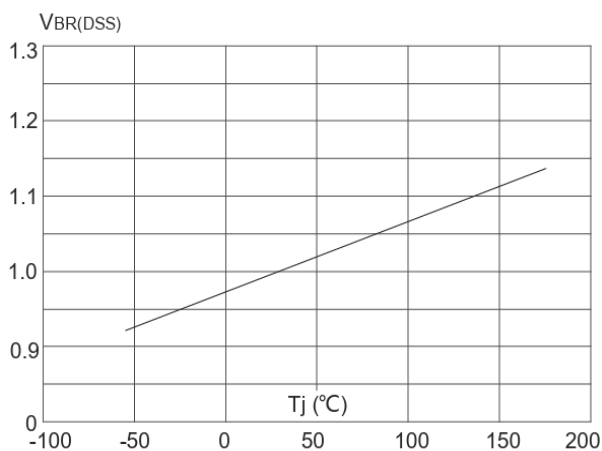
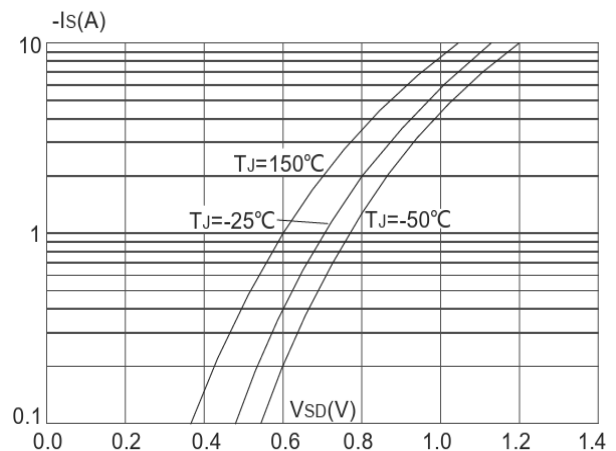
Figure 3: $R_{DS(ON)}$ vs. Drain CurrentFigure 4: $R_{DS(ON)}$ vs. Junction TemperatureFigure 5: $V_{BR(DSS)}$ vs. Junction Temperature

Figure 6: Body-Diode Characteristics



Typical Electrical and Thermal Characteristics

Figure 7: Gate-Charge characteristics

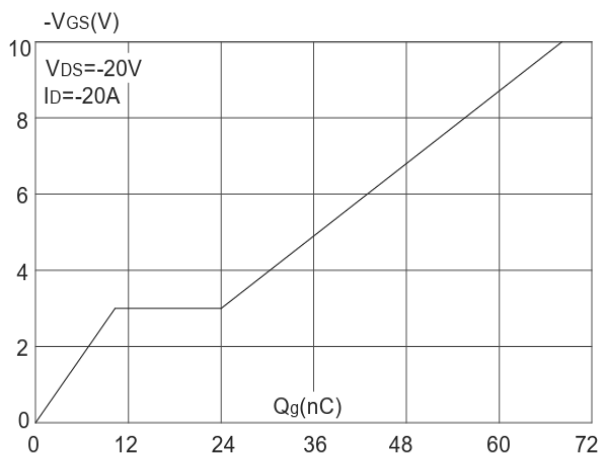


Figure 8: Capacitance characteristics

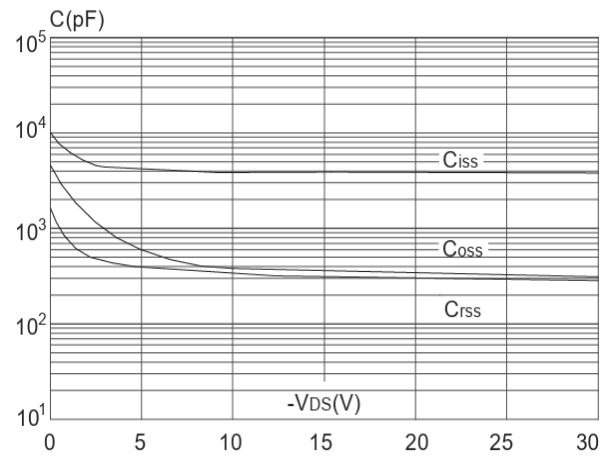


Figure 9: Maximum Safe Operating Area

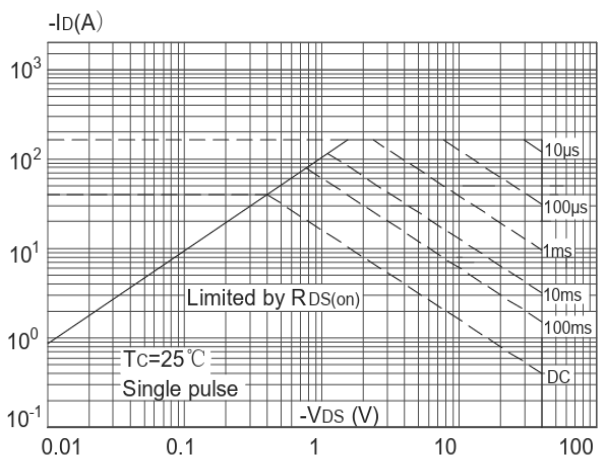


Figure 10: Current De-rating

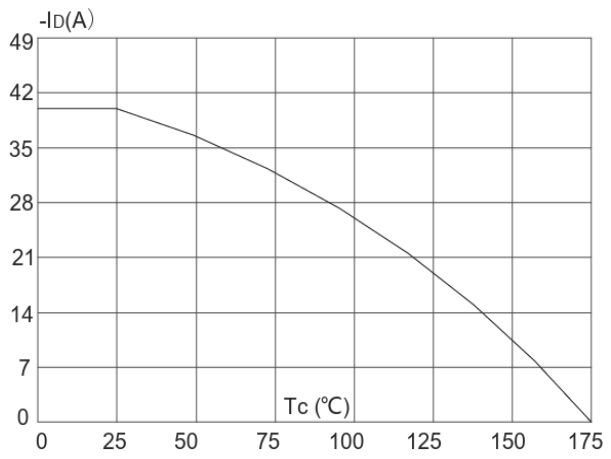
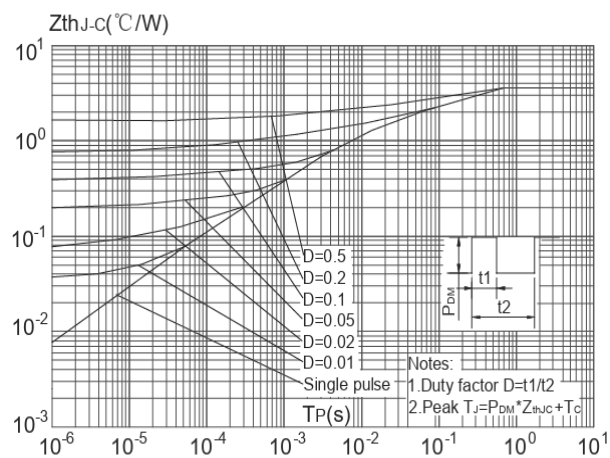


Figure 11: Normalized Maximum Transient Thermal Impedance



Test Circuit

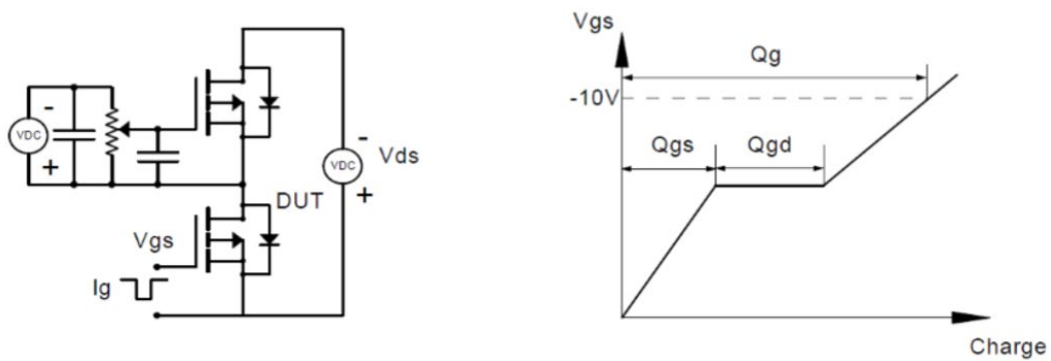


Figure1: Gate Charge Test Circuit & Waveforms

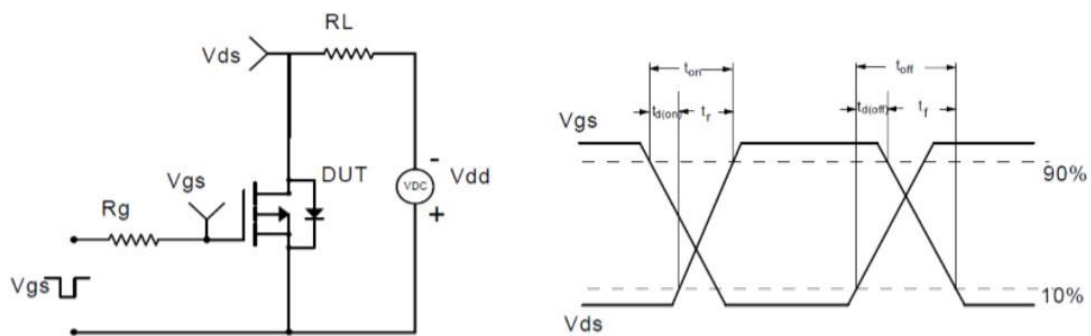


Figure2: Resistive Switching Test Circuit & Waveforms

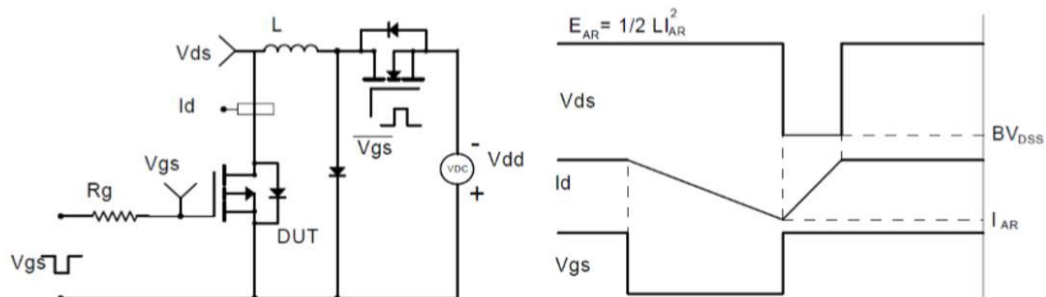


Figure3: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

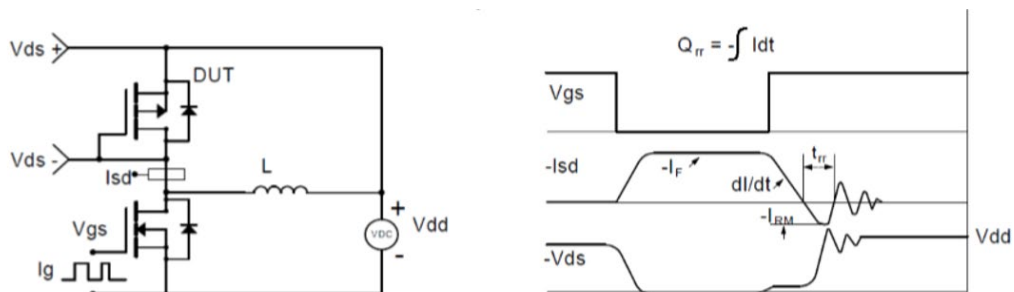
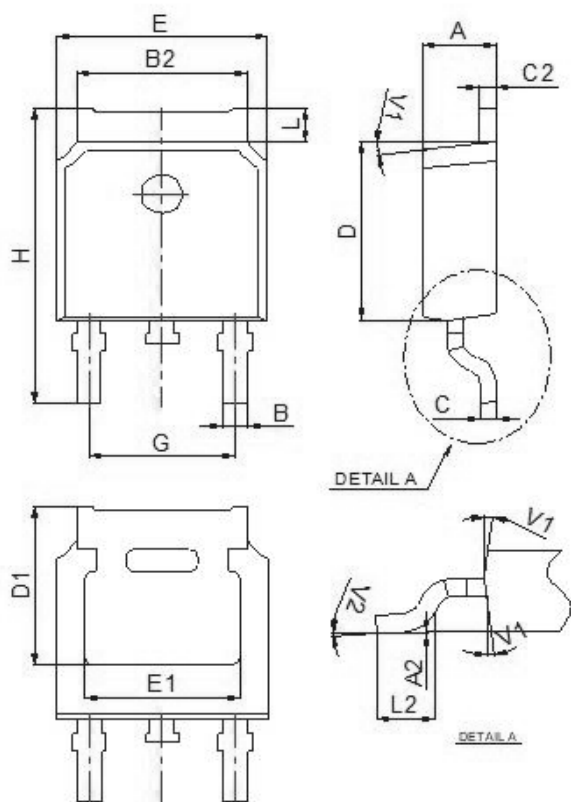


Figure4: Diode Recovery Test Circuit & Waveforms

TO-252 Package Information



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°