



Silicon Carbide Enhancement Mode MOSFET

Features

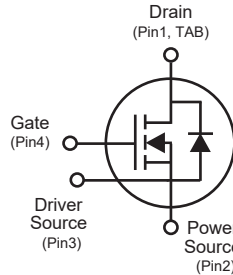
- Low On-Resistance and High Current Capability
- Low Capacitance for High Speed Switching Operation
- Positive Temperature Coefficient Device
- Ultra High Avalanche Ruggedness
- RoHS Compliant and Halogen Free

Benefits

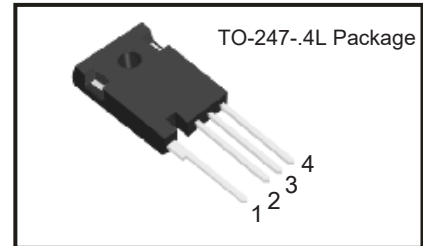
- Higher System Efficiency
- Ease of Paralleling
- Capable of 175°C High T_J Application
- Capable of High Switching Frequency Operating
- Miniaturize and Light Weight System

Applications

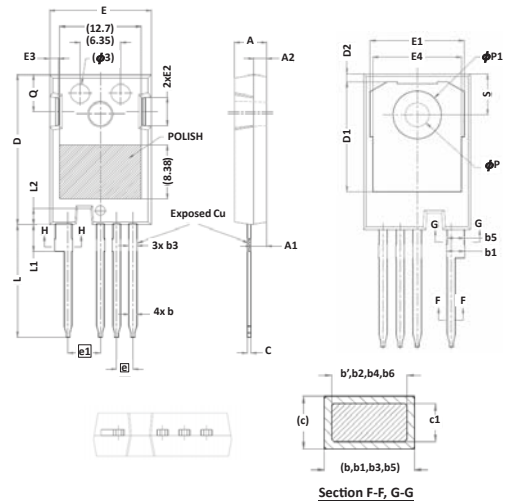
- Switching Mode Power Supply
- DC/DC Converters, UPS, and PFC
- EV Charging Station
- Motor Drives
- Power Inverters
- Solar/Wind Renewable Energy



V _{DSS}	1200V
I _D (@25°C)	86A
R _{DS(ON)}	25mΩ



Package Dimensions



Absolute Maximum Ratings

(T_c = 25°C unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	V _{DS}	1200	V
Gate-Source Voltage	V _{GS}	-5/+20	V
Drain Current-Continuous @ T _c =25°C @ T _c =110°C	I _D	86 58	A
Pulse Drain Current	I _{D,pulse}	327	A
Power Dissipation	P _D	375	W
Avalanche Energy, Single Pulse V _{DD} =100V I _D =14A	E _{AS}	3000	mJ
Storage Temperature Range	T _{STG}	-55 to +175	°C
Operating Junction Temperature Range	T _J	-55 to +175	°C
Thermal Resistance, Junction-to-Case	R _{θJC}	0.4	°C/W
Mounting Torque (M3 or 6-32 screw)	M _d	1.0	N m

Symbol	mm		
	Min.	Typ.	Max.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ϕP	3.51	3.61	3.65
ϕP1	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30



Electrical Characteristics @ T_c =25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OFF Characteristics						
Drain-Source Breakdown Voltage	B _{V_{DSS}}	V _{GS} =0V , I _{DS} =0.1mA	1200	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} =0V , V _{DS} =1200V	-	<1	50	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =20V , V _{DS} =0V	-	-	250	nA
ON Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =10V , I _{DS} =50mA	-	2.35	-	V
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} =20V , I _{DS} =40A	-	25	33	mΩ
Internal Gate Resistance	R _{G(int.)}	f=1MHz , V _{AC} =25mV	-	1.29	-	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =800V V _{GS} =0V	-	4656	-	pF
Output Capacitance	C _{oss}	V _{AC} =25mV	-	188	-	
Reverse Transfer Capacitance	C _{rss}	Freq.=1MHz	-	36	-	
C _{oss} Stored Energy	E _{oss}	V _{GS} =0V , V _{DS} =800V Freq.=1MHz , V _{AC} =25mV	-	78	-	μJ
Turn-On Switching Energy	E _{on}	V _{DD} =800V , V _{GS} =0V/+20V I _D =20A , L=350nH	-	364*	-	
Turn-Off Switching Energy	E _{off}	R _{G(ext)} =2.2Ω FWD=Body Diode of MOSFET	-	208*	-	
Switching Characteristics						
Turn-On Delay Time	t _{d(on)}	V _{DS} =800V	-	31	-	ns
Rise Time	t _r	V _{GS} =-4/+20V	-	55	-	
Turn-Off Delay Time	t _{d(off)}	I _D =40A , R _L =20Ω	-	8	-	
Fall Time	t _f	R _{G(ext)} =2.7Ω	-	12	-	
Total Gate Charge	Q _g	V _{DS} =800V	-	305	-	nC
Gate to Source Charge	Q _{gs}	V _{GS} =-5/+20V	-	91	-	
Gate to Drain Charge	Q _{gd}	I _D =40A	-	88	-	
Body Diode Characteristics						
Inverse Diode Forward Voltage	V _{SD}	V _{GS} =0V , I _{SD} =12A	-	2.65	-	V
Continuous Diode Forward Current	I _S	V _{GS} =0V , T _c =25°C	-	51	-	A
Reverse Recovery Time	T _{rr}	V _{GS} =0V	-	79	-	ns
Reverse Recovery Charge	Q _{rr}	I _{SD} =40A , V _{DS} =400V, di/dt=300A/μs	-	255	-	nC
Peak Reverse Recovery Current	I _{rrm}		-	10.3	-	A

*Based on the results of calculation, note that the energy loss caused by the reverse recovery of free-wheeling diode is not included in Eon.



Typical Device Performance

Fig.1 Forward Output Characteristics at $T_J=25^\circ\text{C}$

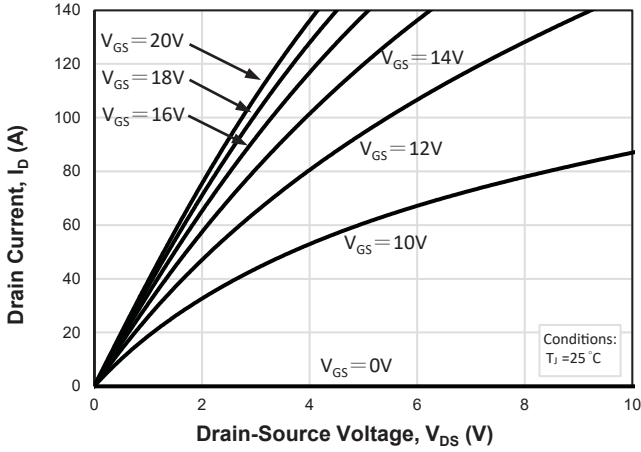


Fig.2 Forward Output Characteristics at $T_J=175^\circ\text{C}$

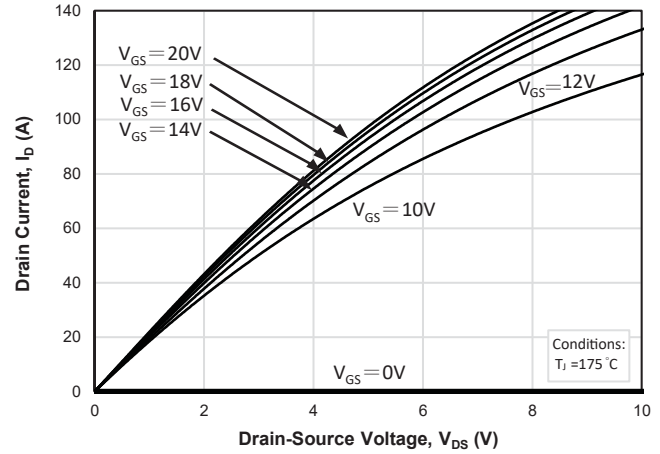


Fig.3 On-Resistance vs. Drain Current for Various T_J

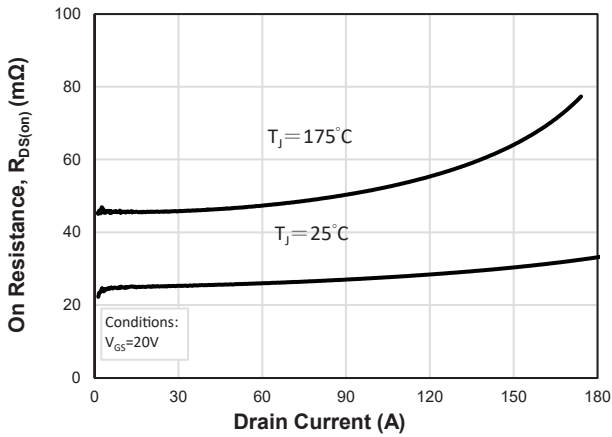


Fig.4 Transfer Characteristics for Various T_J

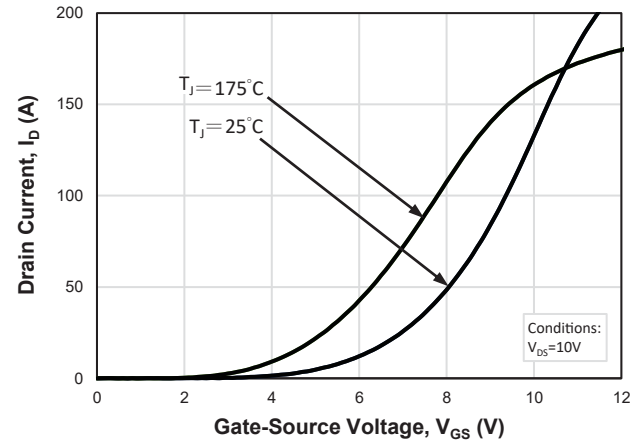


Fig.5 On-Resistance vs. Gate Voltage for Various T_J

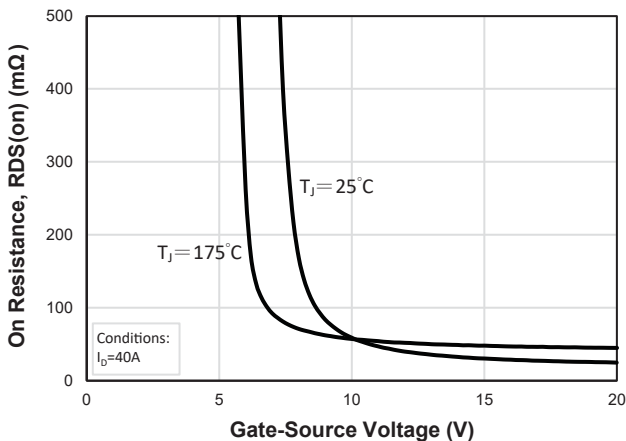
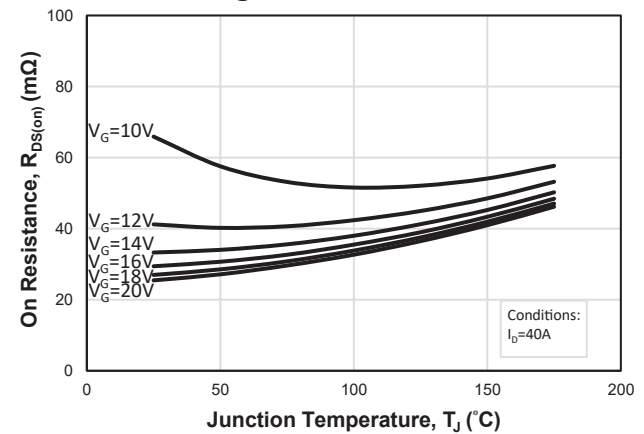


Fig.6 On-Resistance vs. Temperature for Various Gate Voltage





Typical Device Performance

Fig.7 Normalized On-Resistance vs. Temperature

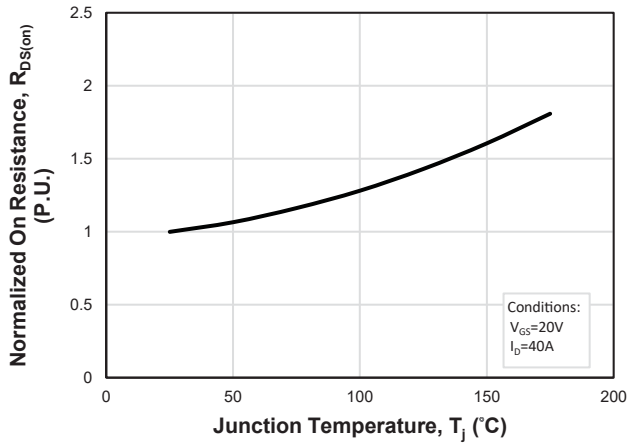


Fig.8 Reverse Output Characteristics at T_J = 25°C

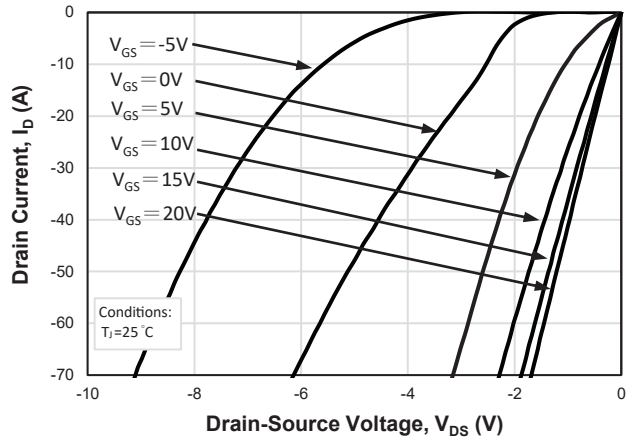


Fig.9 Reverse Output Characteristics at T_J = 175°C

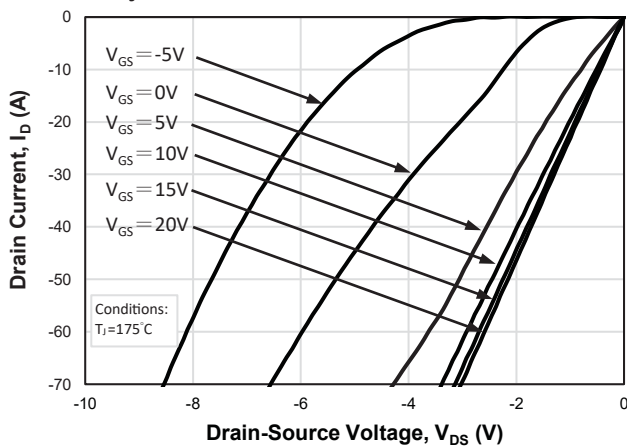


Fig.10 Capacitances vs. Drain to Source Voltage

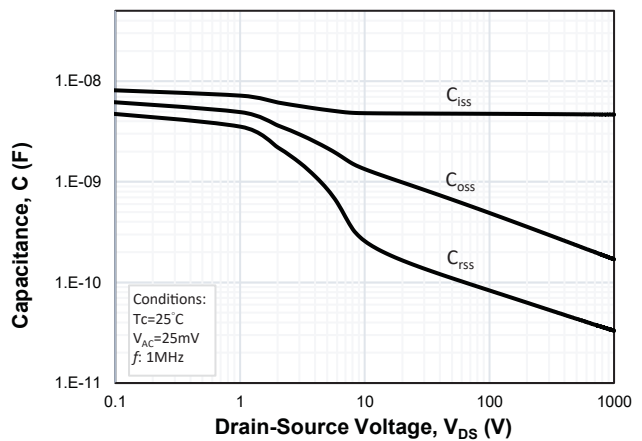


Fig.11 Threshold Voltage vs. Temperature

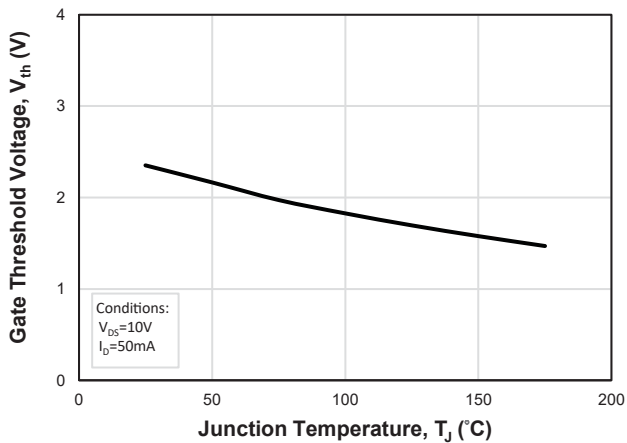
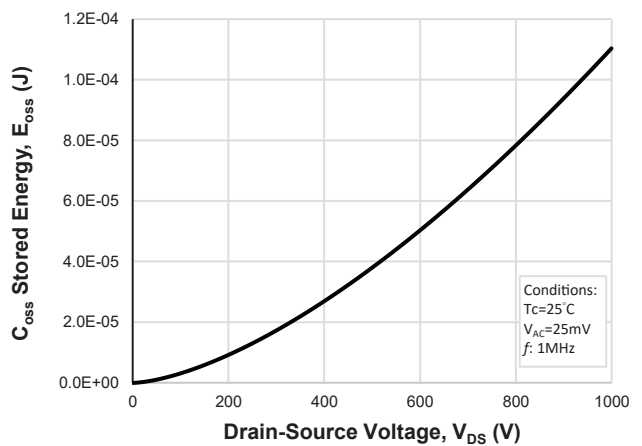


Fig.12 Output Capacitor Stored Energy





Typical Device Performance

Fig.13 Maximum Power Dissipation Derating vs. Case Temperature

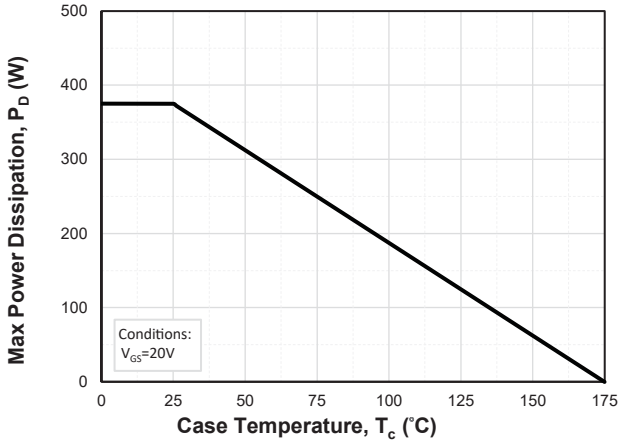


Fig.14 Drain Current Derating vs. Case Temperature

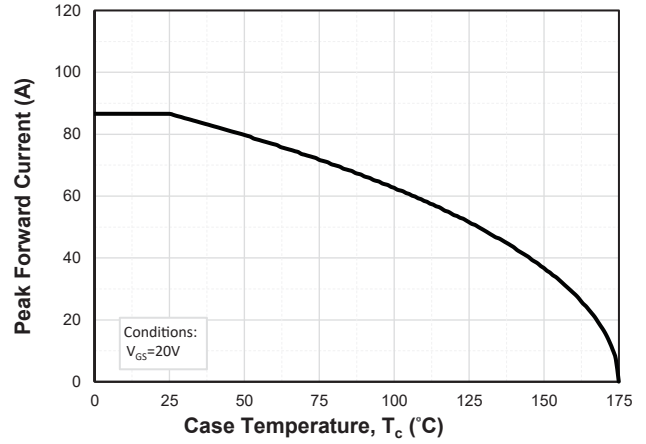


Fig.15 Safe Operating Area

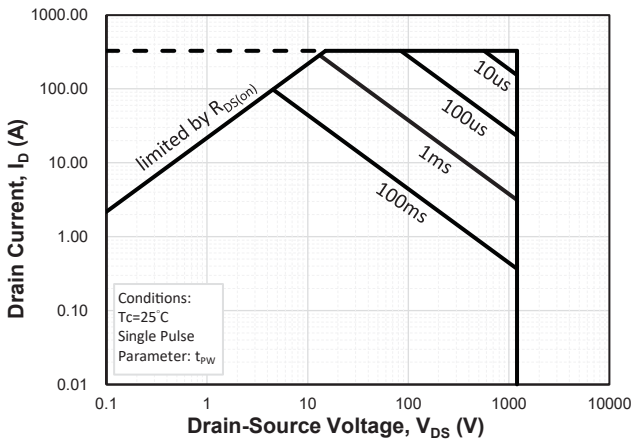


Fig.16 Gate Charge Characteristics

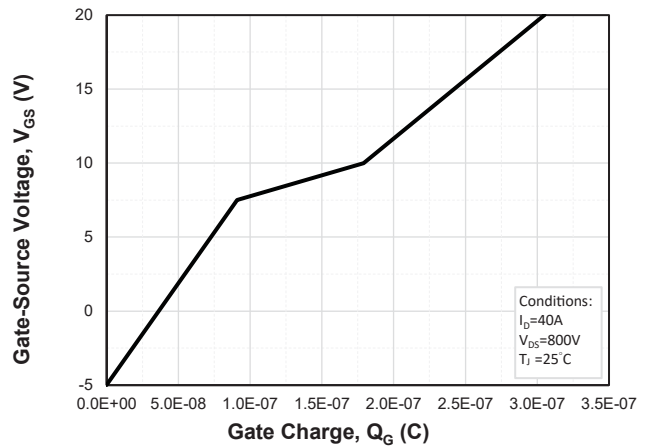


Fig.17 Clamped Inductive Switching Energy vs. Drain Current

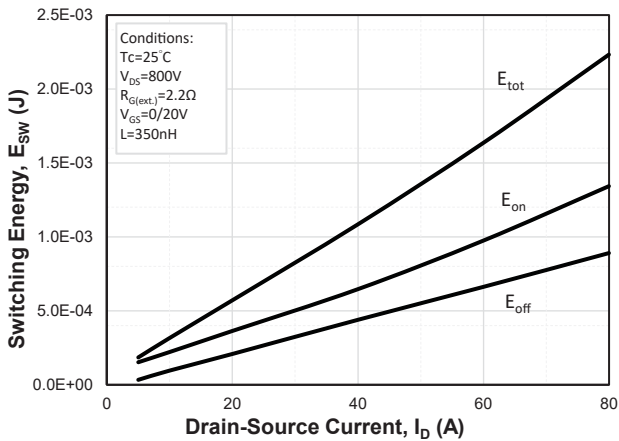
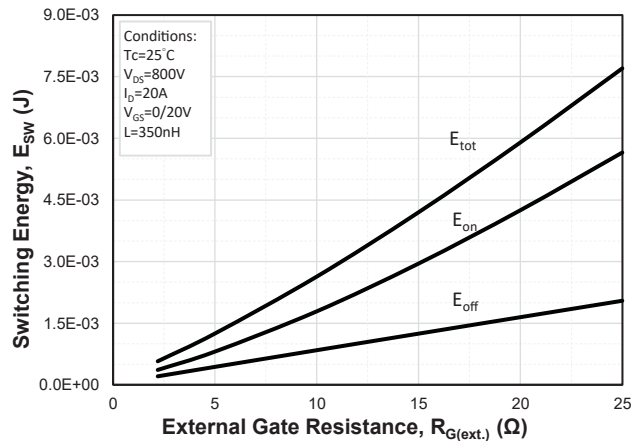


Fig.18 Clamped Inductive Switching Energy vs. External Gate Resistor (R_G(ext.))





Typical Device Performance

Fig.19 Schematic of Resistive Switching

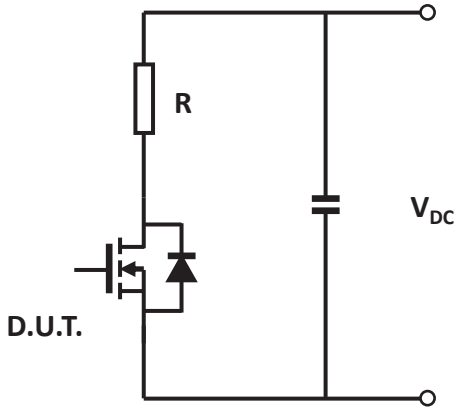


Fig.20 Switching Times Definition

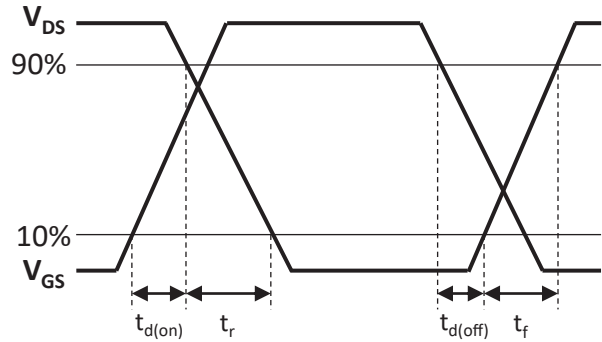
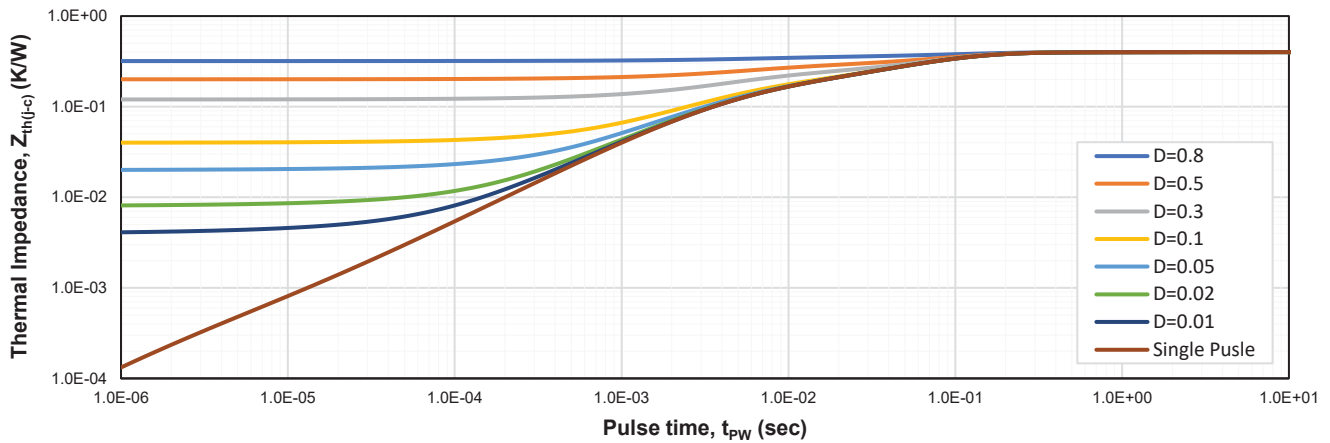


Fig.21 Transient Junction to Case Thermal Impedance





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