DACO SEMICONDUCTOR CO., LTD.

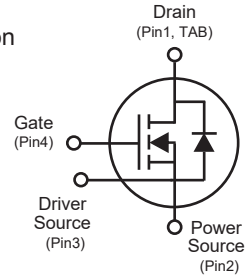
DAC020N065Z1

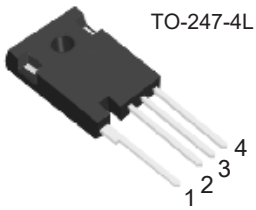
Silicon Carbide Enhancement Mode MOSFET

V_{DSS}	650V
$I_{D(@25℃)}$	107A
$R_{DS(ON)}$	20mΩ

Features

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





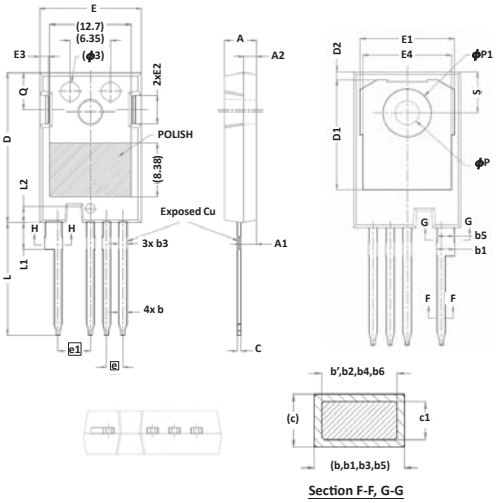
Benefits

- 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

Package Dimensions



Absolute Maximum Ratings

(Tc = 25℃ unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	-5/+20	V
Drain Current-Continuous	@ T_C =25°C @ T_C =110°C	I_D	107 72	A
Pulse Drain Current		$I_{D,pulse}$	305	A
Power Dissipation		P_D	375	W
Avalanche Energy, Single Pulse	V_{DD}=100V I_D=14A	E_{AS}	3.2	J
Storage Temperature Range		T_{STG}	-55 to +175	°C
Operating Junction Temperature Range		T_J	-55 to +175	°C
Thermal Resistance, Junction-to-Case		$R\theta_{JC}$	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	BV_{DSS}	V_{GS}=0V，I_{DS}=0.1mA	650	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS}=0V，V_{DS}=650V	-	<1	100	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	-	2.6	-	V
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=20V，I_{DS}=50A	-	20	26	mΩ
Internal Gate Resistance	$R_{G(int.)}$	f=1MHz，V_{AC}=25mV	-	0.6	-	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=400V V_{GS}=0V V_{AC}=25mV Freq.=1MHz	-	4838	-	pF
Output Capacitance	C_{oss}		-	359	-	
Reverse Transfer Capacitance	C_{rss}		-	47	-	
C_{OSS} Stored Energy	E_{oss}	V_{GS}=0V，V_{DS}=400V Freq.=1MHz，V_{AC}=25mV	-	34	-	μJ
Turn-On Switching Energy	E_{on}	V_{DD}=400V V_{GS}=0V/+20V，I_D =50A $R_{G(ext)}$=2.7Ω	-	61.7*	-	
Turn-Off Switching Energy	E_{off}		-	101*	-	
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	V_{DD}=400V V_{GS}=-4/+20V I_D =35A，R_L=11.4Ω $R_{G(ext)}$=2.7Ω	-	29	-	ns
Rise Time	t_r		-	51	-	
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	
Fall Time	t_f		-	16	-	
Total Gate Charge	Q_g	V_{DS}=400V V_{GS}=-5/+20V I_D =50A	-	287	-	nC
Gate to Source Charge	Q_{gs}		-	80	-	
Gate to Drain Charge	Q_{gd}		-	75	-	
Body Diode Characteristics						
Inverse Diode Forward Voltage	V_{SD}	V_{GS}=0V，I_{SD}=10A	-	2.9	-	V
Continuous Diode Forward Current	I_S	V_{GS}=0V，T_C=25°C	-	61.5	-	A
Reverse Recovery Time	T_{rr}	V_{GS}=0V I_{SD}=30A，V_{DS}=400V, di/dt=300A/μs	-	77	-	ns
Reverse Recovery Charge	Q_{rr}		-	301	-	nC
Peak Reverse Recovery Current	I_{rrm}		-	6.9	-	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˚C

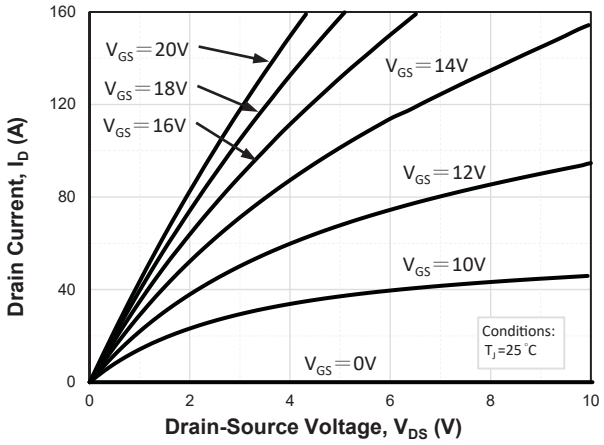


Fig.2 Forward Output Characteristics at T_J=175˚C

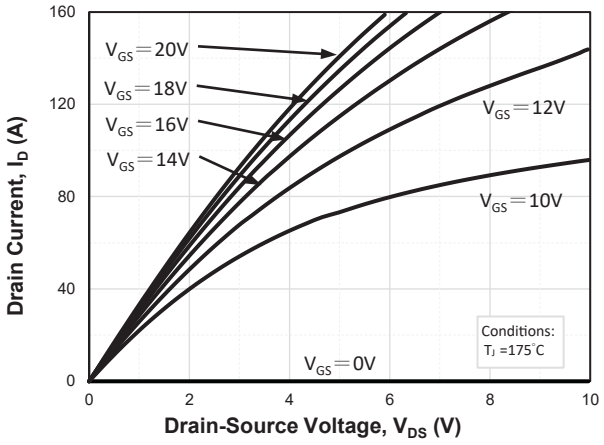


Fig.3 On-Resistance vs. Drain Current for Various T_J

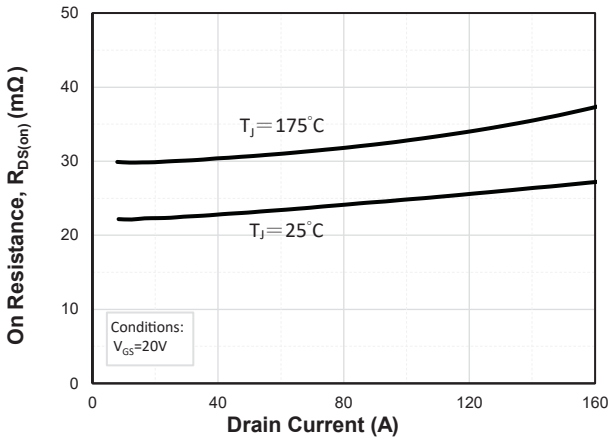


Fig.4 Transfer Characteristics for Various T_J

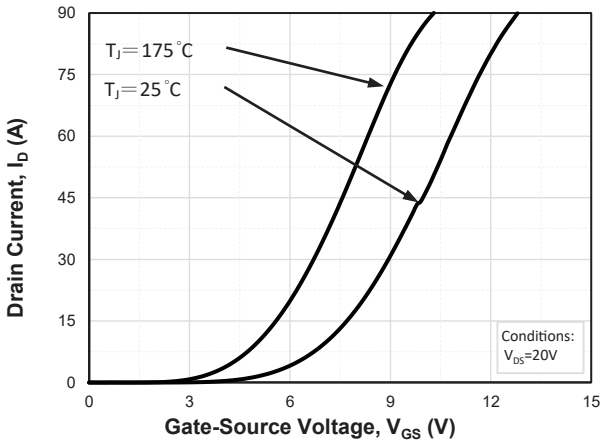


Fig.5 On-Resistance vs. Gate Voltage for Various T_J

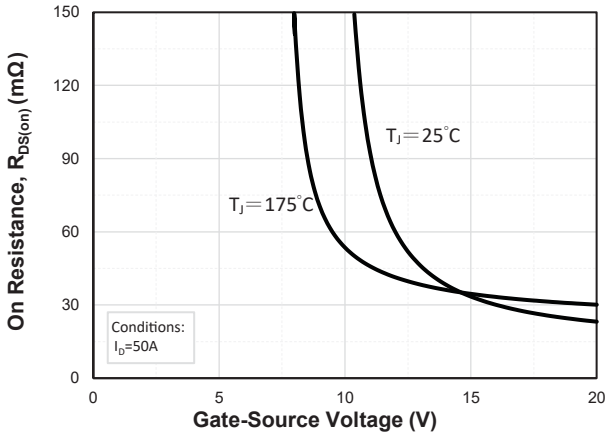
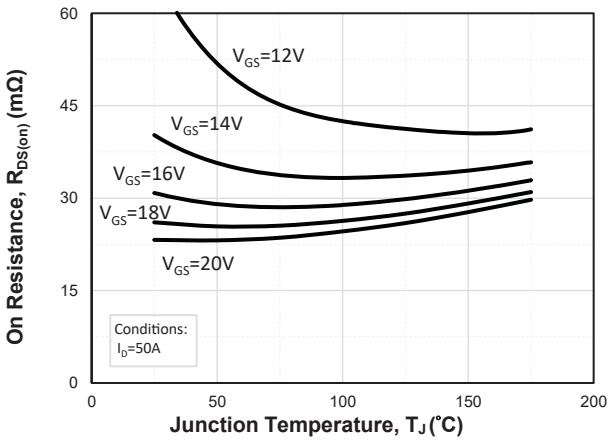


Fig.6 On-Resistance vs. Temperature for Various Gate Voltage



Typical Device Performance

Fig.7 Normalized On-Resistance vs. Temperature

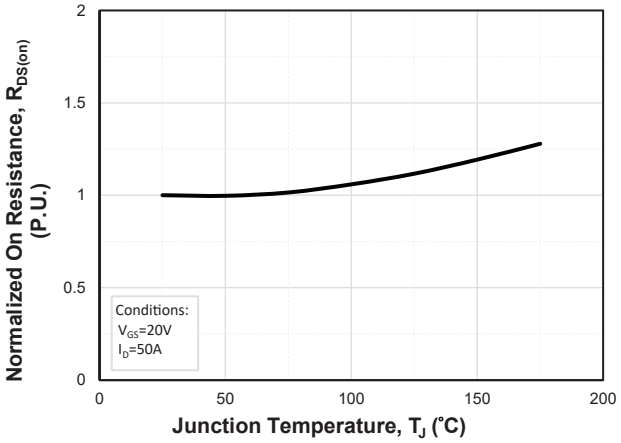


Fig.8 Reverse Output Characteristics at T_J = 25°C

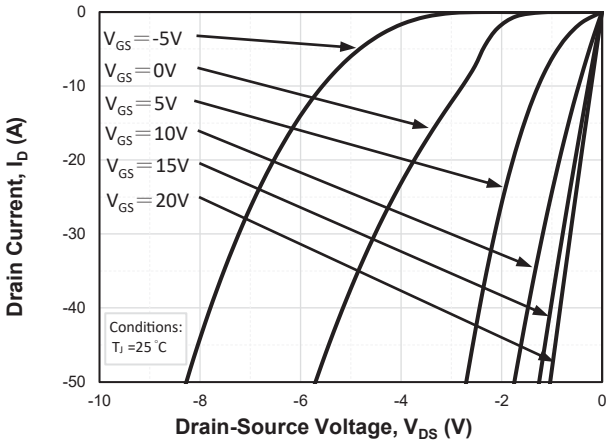


Fig.9 Reverse Output Characteristics at T_J = 175°C

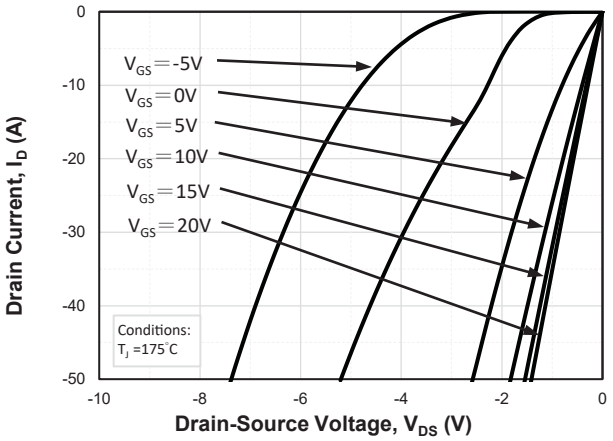


Fig.10 Capacitances vs. Drain to Source Voltage

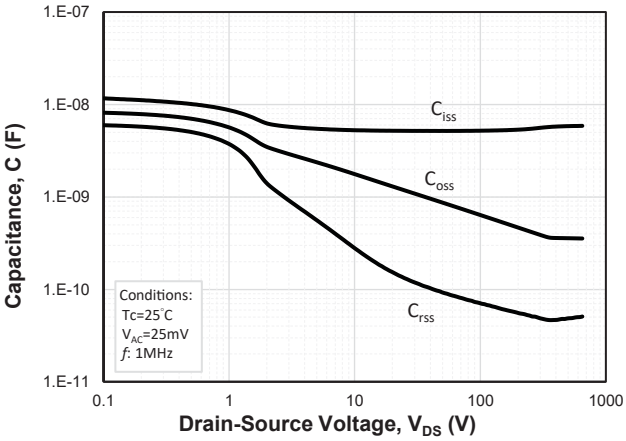


Fig.11 Threshold Voltage vs. Temperature

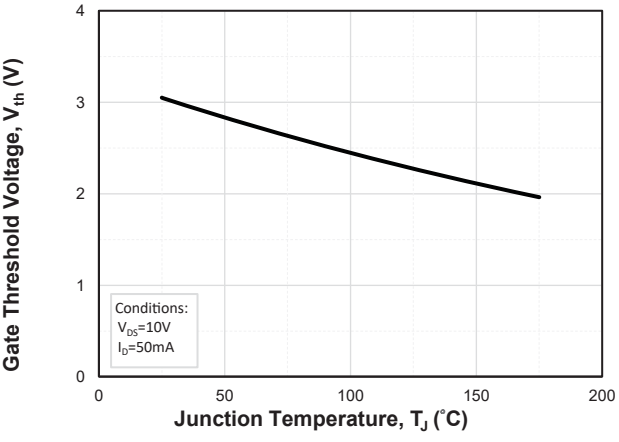
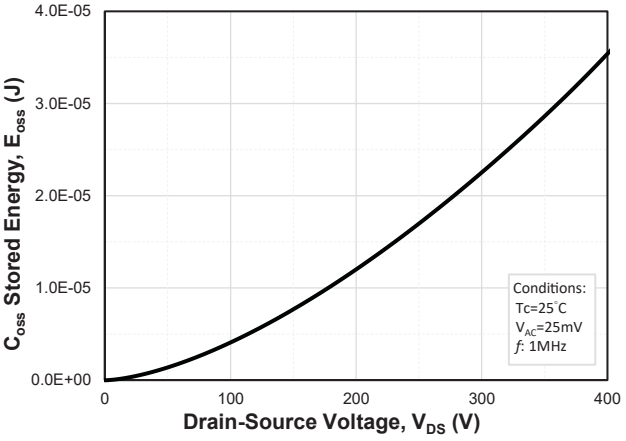


Fig.12 Output Capacitor Stored Energy



Typical Device Performance

Fig.13 Maximum Power Dissipation Derating vs. Case Temperature

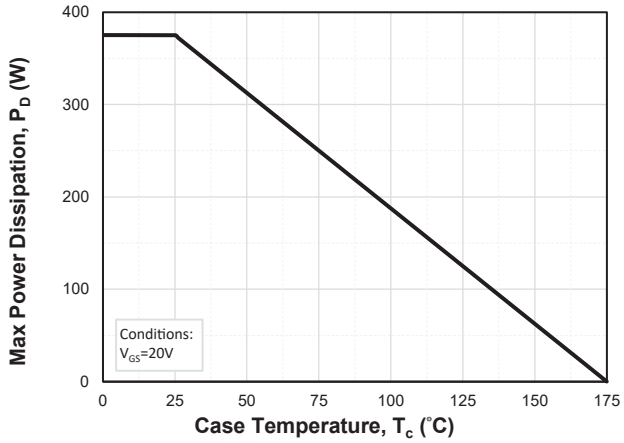


Fig.14 Drain Current Derating vs. Case Temperature

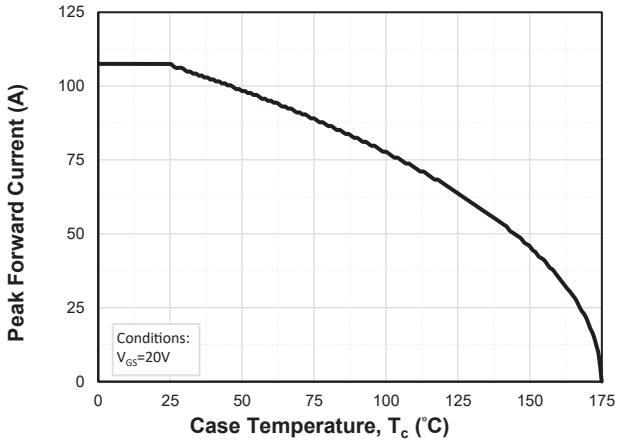


Fig.15 Safe Operating Area

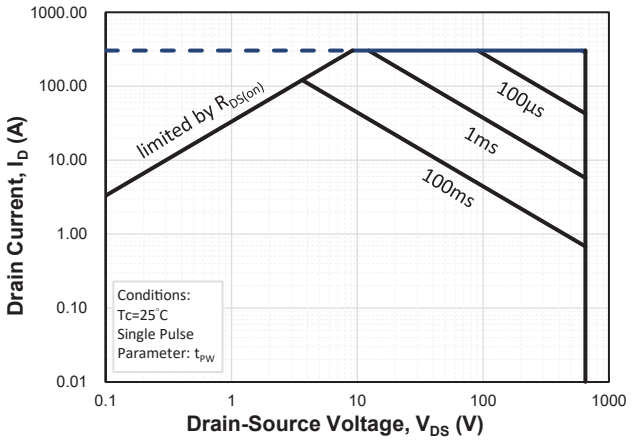


Fig.16 Gate Charge Characteristics

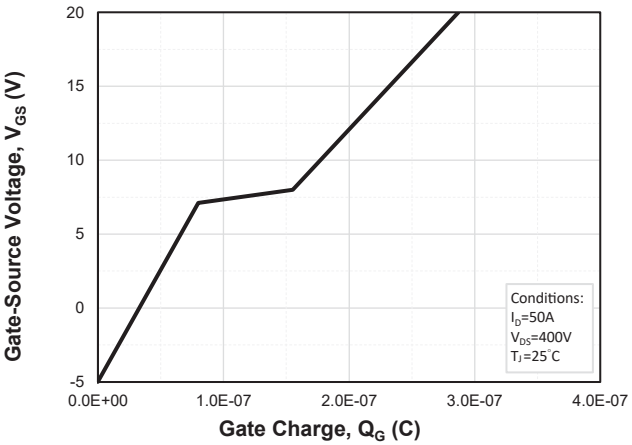


Fig.17 Clamped Inductive Switching Energy vs. Drain Current

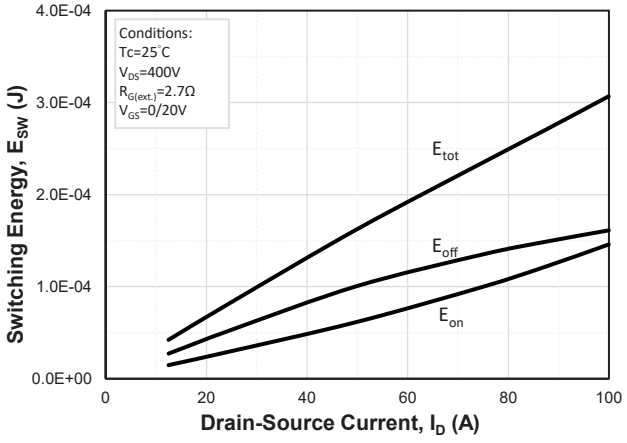
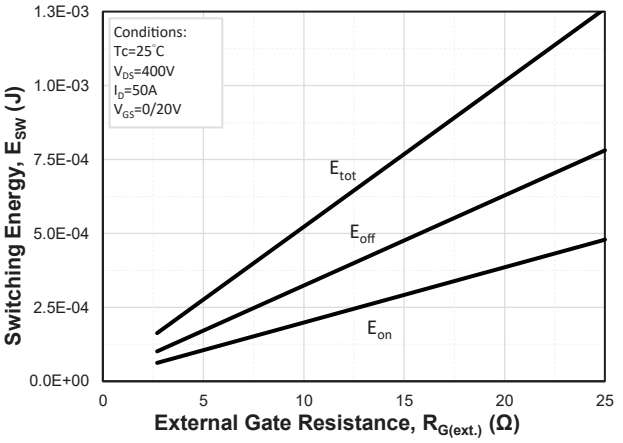


Fig.18 Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)



Typical Device Performance

Fig.19 Schematic of Resistive Switching

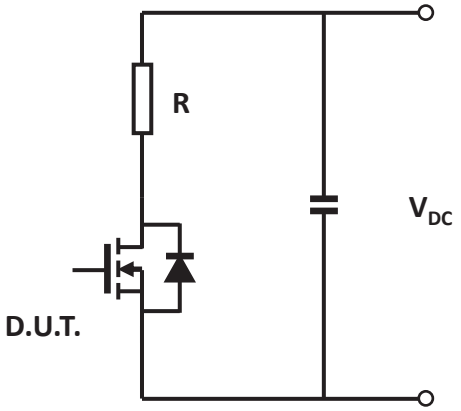


Fig.20 Switching Times Definition

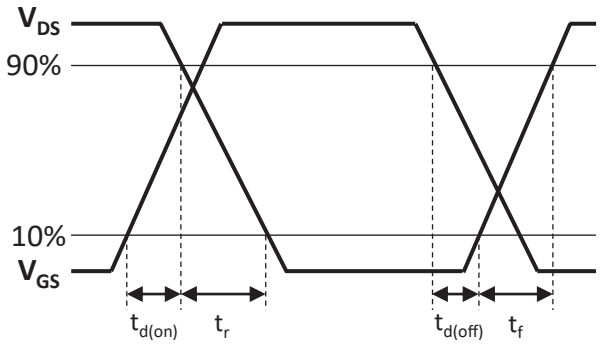
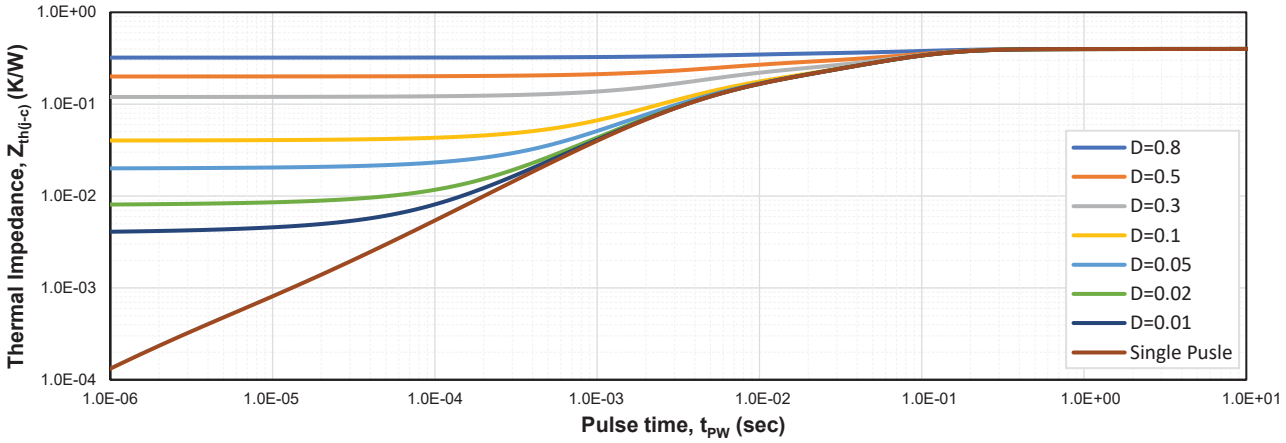


Fig.21 Transient Junction to Case Thermal Impedance



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