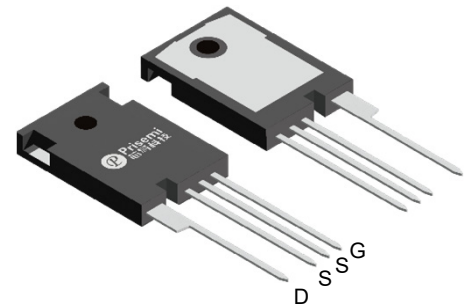


Description

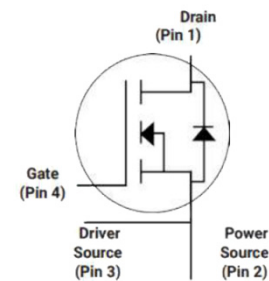
MOSFET Product Summary		
$V_{DS}(V)$	$R_{DS(on)}(m\Omega)$	$I_D(A)$
650	45@ $V_{GS} = 15V$	51


TO-247-4L
Feature

- High Blocking Voltage with Low On-Resistance
- High Frequency Operation
- Low on-resistance
- Fast intrinsic diode with low reverse recovery
- 100% avalanche tested

Applications

- Solar Inverters
- Switch Mode Power Supplies
- UPS
- Battery Chargers


Schematic diagram
Absolute maximum rating@25°C

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DSmax}	650	V
Gate-Source Voltage (dynamic), $T_{surge} < 100ns$	V_{GSmax}	-8/+19	V
Gate-Source Voltage (static)	V_{GSop}	-4/+15	V
Continuous Drain Current @ $V_{GS}=15V$	I_D	$T_C=25^\circ C$	51
		$T_C=100^\circ C$	36
Pulsed Drain Current	$I_{D(pulse)}$	120	A
Avalanche Energy @ $V_{DD}=100V, V_{GS}=15V, L=1mH$	E_{AS}	313	mJ
Avalanche Peak Current @ $V_{DD}=100V, V_{GS}=15V, L=1mH$	I_{AV}	25	A
Power Dissipation	P_D	200	W
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to +175	°C

Thermal Resistance

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	-	0.61	0.75	°C/W

Electrical characteristics per line@25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Statistic Characteristics							
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 100\mu A$	650	-	-	V	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 5mA$	$T_J = 25^\circ C$	1.8	2.7	3.6	V
			$T_J = 150^\circ C$	-	2.0	-	
			$T_J = 175^\circ C$	-	1.9	-	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650V, V_{GS} = 0V$	0.0	1.0	50	μA	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = 15V, V_{DS} = 0V$	0.0	1.0	200	nA	
		$V_{GS} = -4V, V_{DS} = 0V$	-200	-1.0	0.0		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 15V, I_D = 20A$	$T_J = 25^\circ C$	-	45	60	m Ω
			$T_J = 150^\circ C$	-	50	-	
			$T_J = 175^\circ C$	-	55	-	
		$V_{GS} = 13V, I_D = 20A$	-	57	-		
Transconductance	g_{fs}	$V_{DS} = 20V, I_D = 20A$	$T_J = 25^\circ C$	-	15	-	S
			$T_J = 150^\circ C$	-	14	-	
			$T_J = 175^\circ C$	-	14	-	
Dynamic Characteristics							
Input Capacitance	C_{iss}	$V_{DS} = 400V, V_{GS} = 0V, f = 1MHz$	-	1650	-	pF	
Output Capacitance	C_{oss}		-	142	-		
Reverse Transfer Capacitance	C_{rss}		-	8.0	-		
C_{oss} Stored Energy	E_{oss}		-	14	-		μJ
Total Gate Charge	Q_g	$V_{DS} = 400V, I_D = 20A, V_{GS} = -4V/+15V$	-	79	-	nC	
Gate-Source Charge	Q_{gs}		-	22	-		
Gate-Drain Charge	Q_{gd}		-	31	-		
Internal Gate Input Resistance	$R_{G(int)}$	$f = 1MHz, I_D = 0A$	-	3.0	-	Ω	
Turn-On Switching Energy	E_{on}	$V_{DS} = 400V, I_D = 20A, V_{GS} = -4V/+15V, R_{G(ext)} = 2\Omega, L = 100\mu H$	-	91	-	μJ	
Turn-Off Switching Energy	E_{off}		-	13	-		
Turn-on Delay Time	$t_{d(on)}$	$V_{DS} = 400V, I_D = 20A, V_{GS} = -4V/+15V, R_{G(ext)} = 2\Omega, L = 100\mu H$	-	13	-	ns	
Turn-on Rise Time	t_r		-	17	-		
Turn-Off Delay Time	$t_{d(off)}$		-	24	-		
Turn-Off Fall Time	t_f		-	8.0	-		
Reverse Diode Characteristics							
Diode Forward Voltage	V_{SD}	$V_{GS} = -4V, I_{SD} = 10A$	$T_J = 25^\circ C$	-	4.1	-	V
			$T_J = 150^\circ C$	-	3.7	-	
			$T_J = 175^\circ C$	-	3.6	-	
		$V_{GS} = -4V, I_{SD} = 20A$	$T_J = 25^\circ C$	-	4.7	-	
			$T_J = 150^\circ C$	-	4.2	-	
			$T_J = 175^\circ C$	-	4.1	-	
Continuous Diode Forward Current	I_S	$V_{GS} = -4V$	-	-	36	A	
Reverse Recovery Time	t_{rr}	$V_{GS} = -4V, I_{SD} = 20A, V_R = 400V, dif/dt = 3300A/\mu s$	-	13	-	ns	
Reverse Recovery Charge	Q_{rr}		-	155	-	nC	
Peak Reverse Recovery Current	I_{rrm}		-	22	-	A	

Typical Characteristics

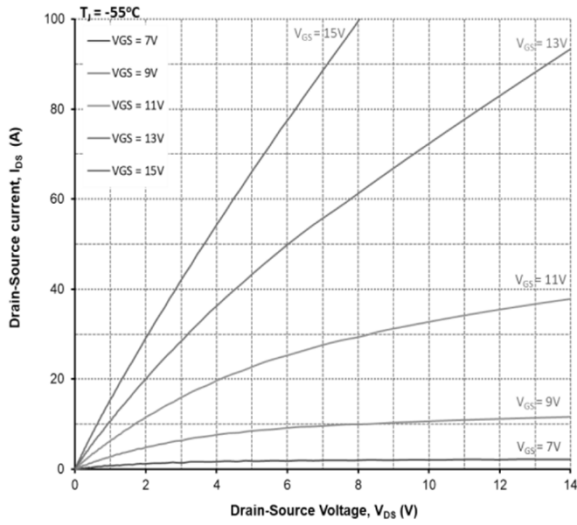


Figure 1. Output Characteristics, $T_J = -55^\circ\text{C}$

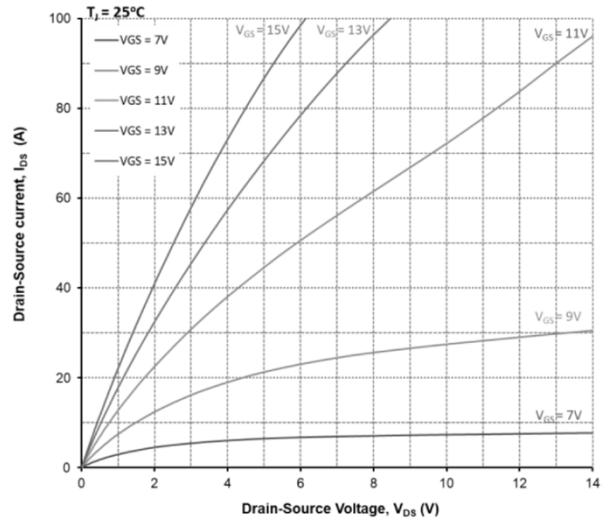


Figure 2. Output Characteristics, $T_J = 25^\circ\text{C}$

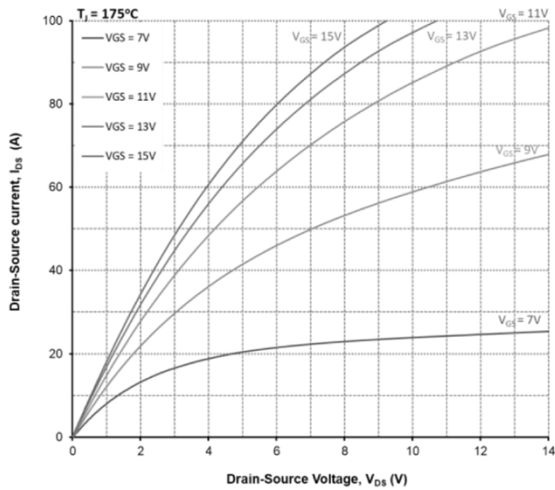


Figure 3. Output Characteristics, $T_J = 175^\circ\text{C}$

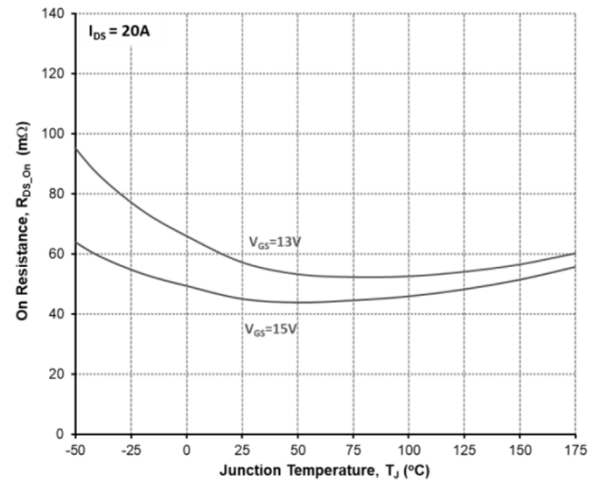


Figure 4. On-Resistance vs. Temperature

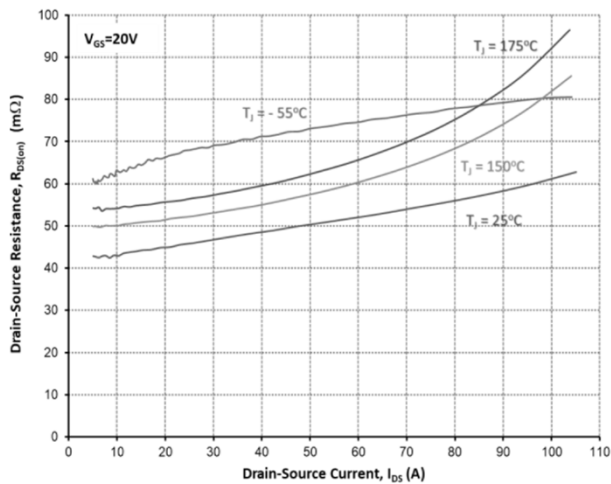


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

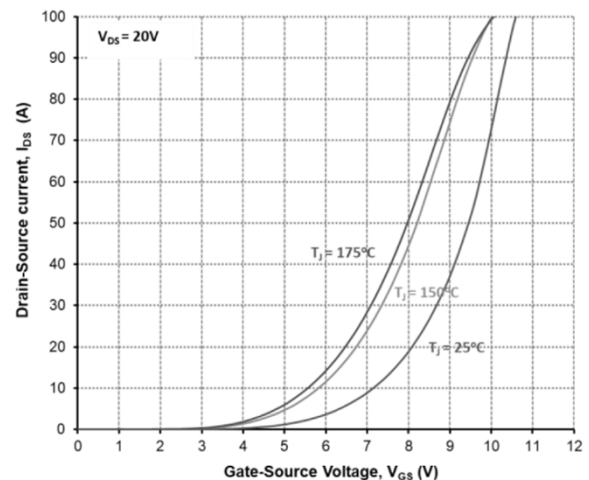


Figure 6. Transfer Characteristic For Various Junction Temperatures

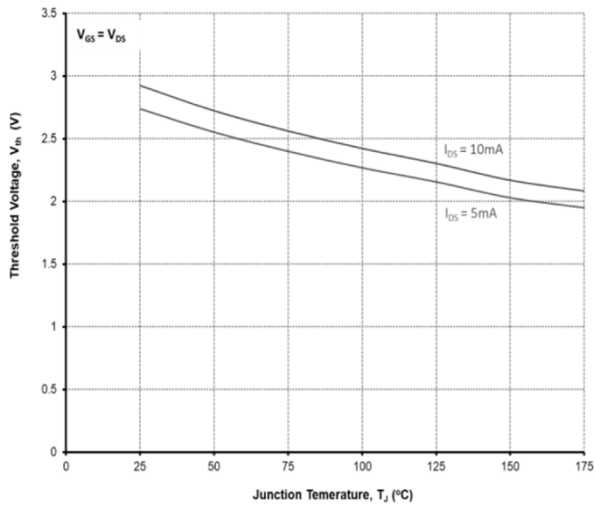


Figure 7. Threshold Voltage vs. Temperature

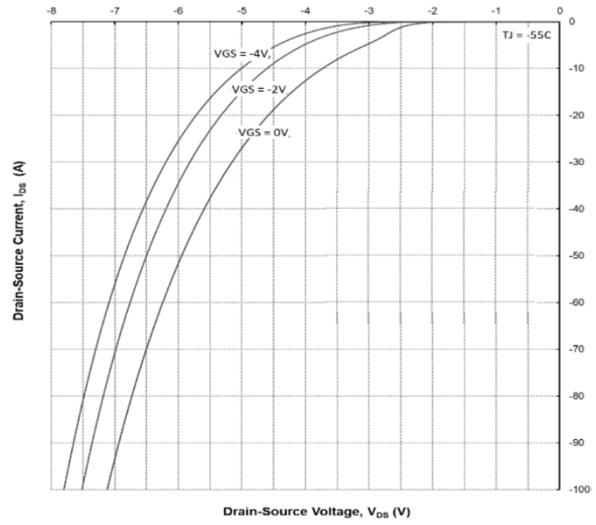


Figure 8. Body Diode Characteristics @ -55°C

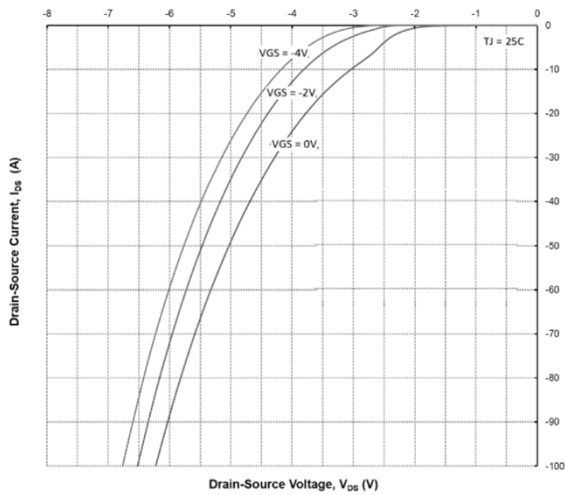


Figure 9. Body Diode Characteristics @ 25°C

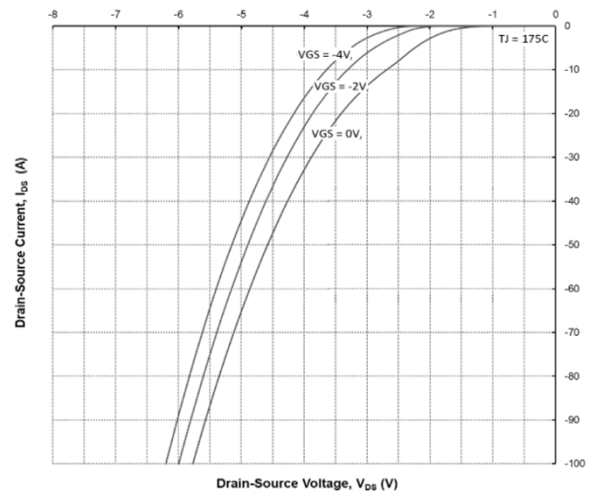


Figure 10. Body Diode Characteristics @ 175°C

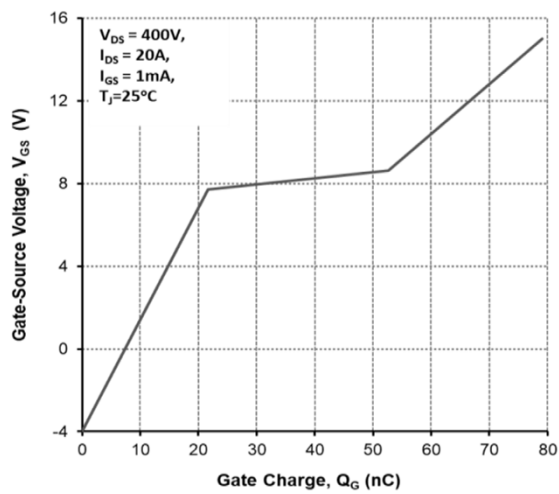


Figure 11. Gate Charge Characteristics

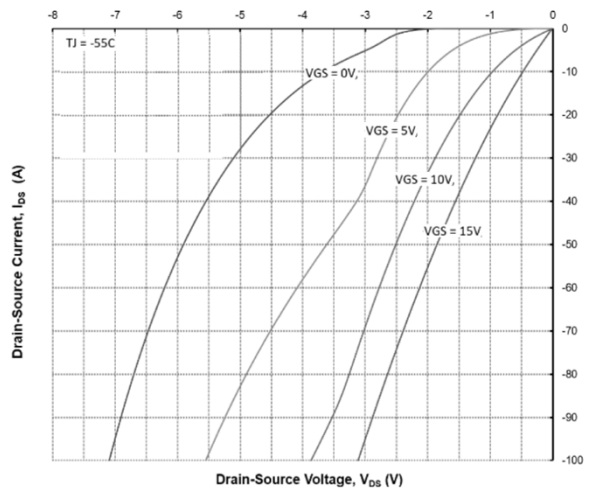


Figure 12. 3rd Quadrant Characteristics @ -55°C

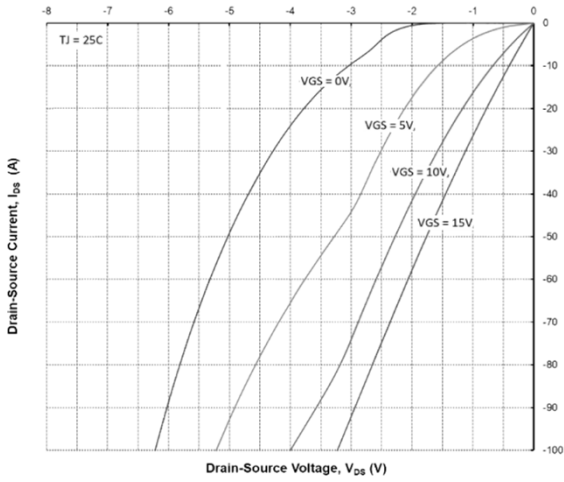


Figure 13. 3rd Quadrant Characteristics @ 25°C

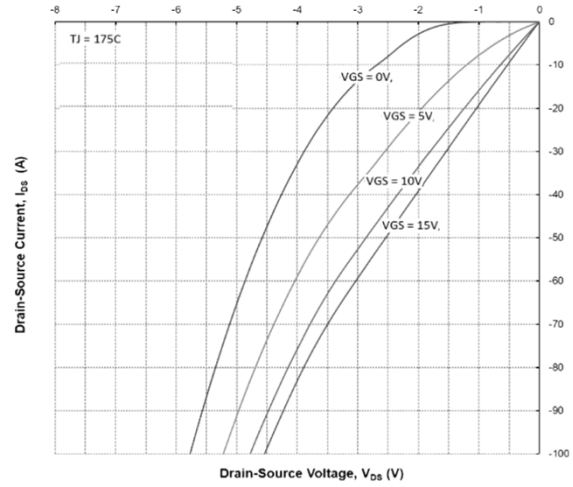


Figure 14. 3rd Quadrant Characteristics @ 175°C

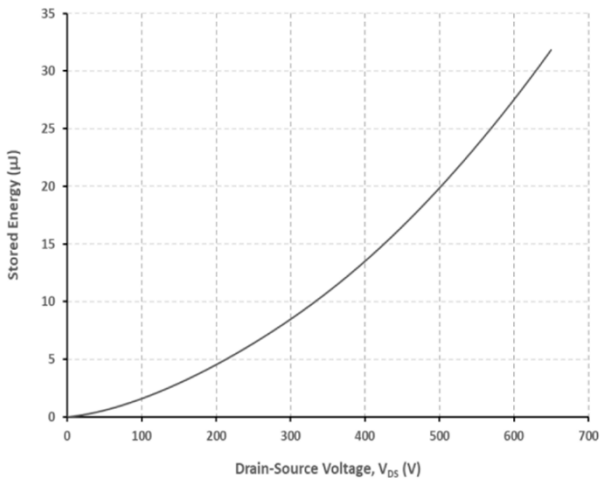


Figure 15. Output Capacitor Stored Energy

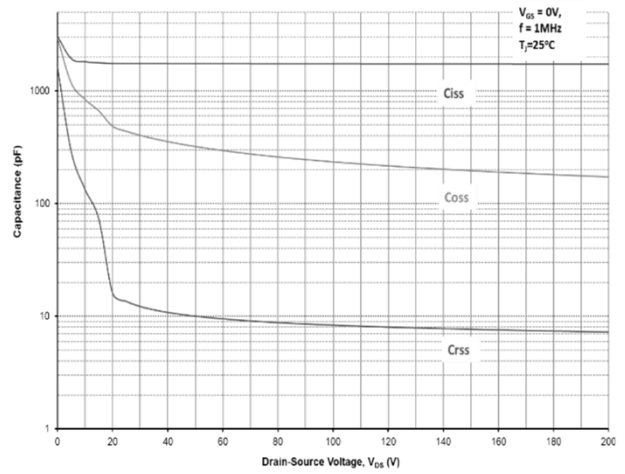


Figure 16. Capacitances vs. Drain-Source Voltage (0-200V)

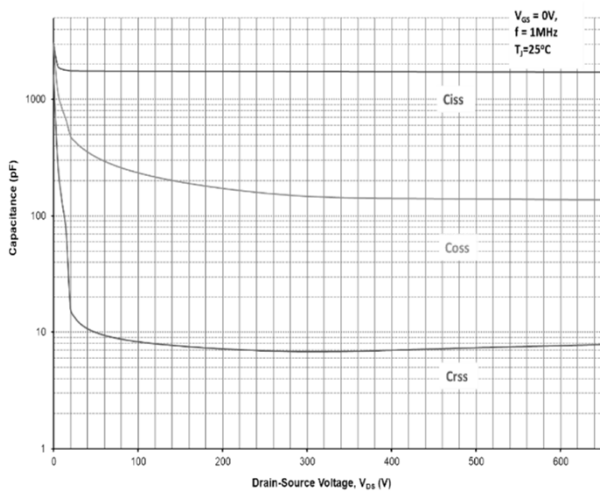


Figure 17. Capacitances vs. Drain-Source Voltage (0-650V)

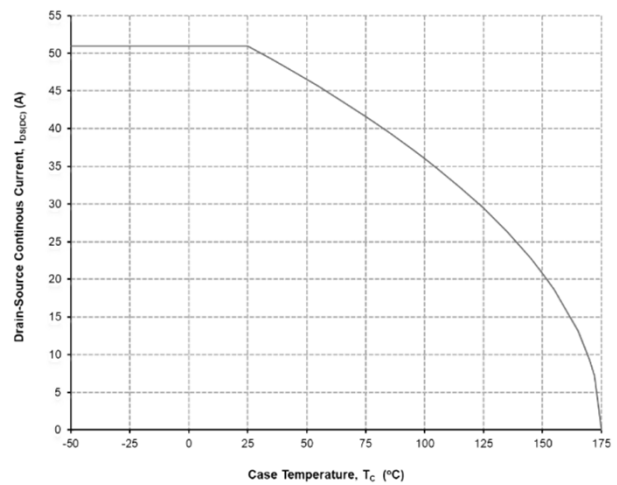


Figure 18. Continuous Drain Current Derating vs. Case Temperature

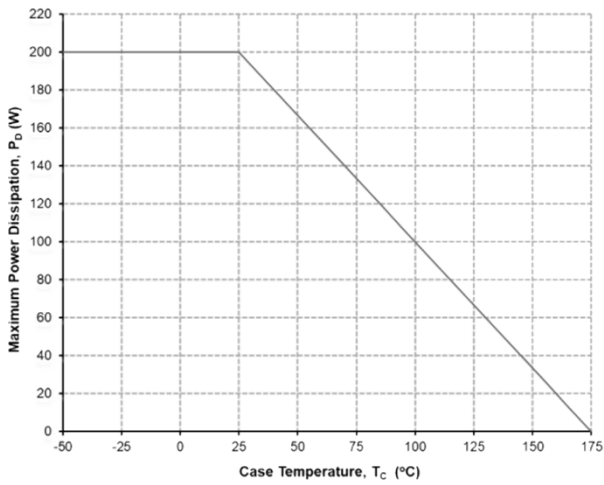


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

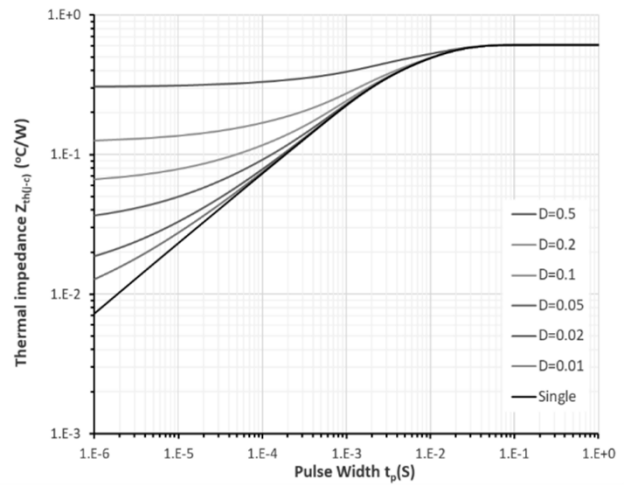


Figure 20. Transient Thermal Impedance (Junction to Case)

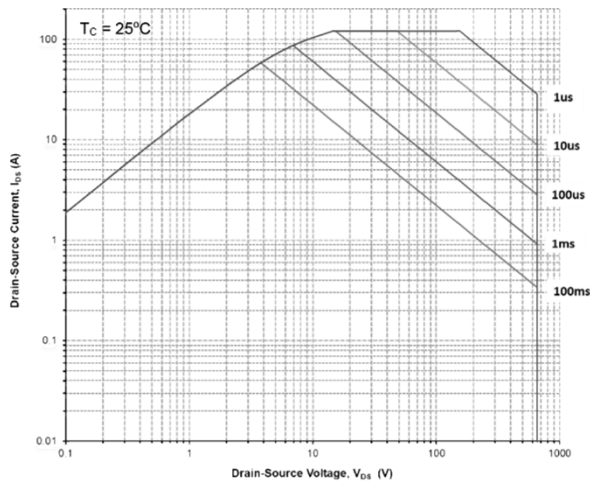


Figure 21. Safe Operating Area

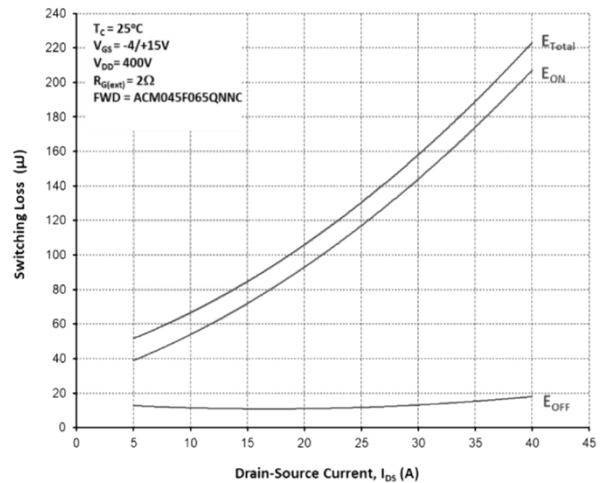


Figure 22. Switching energy vs Drain current

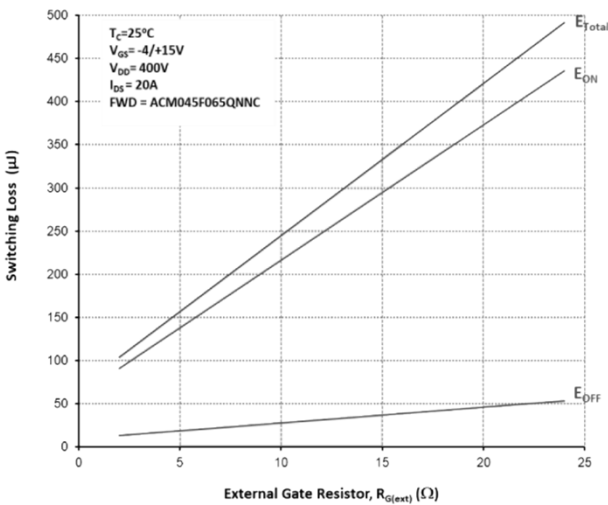


Figure 23. Switching energy vs External Gate Resistor

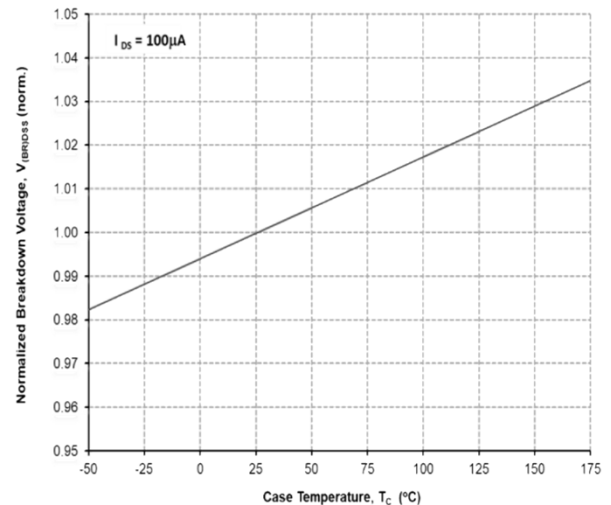
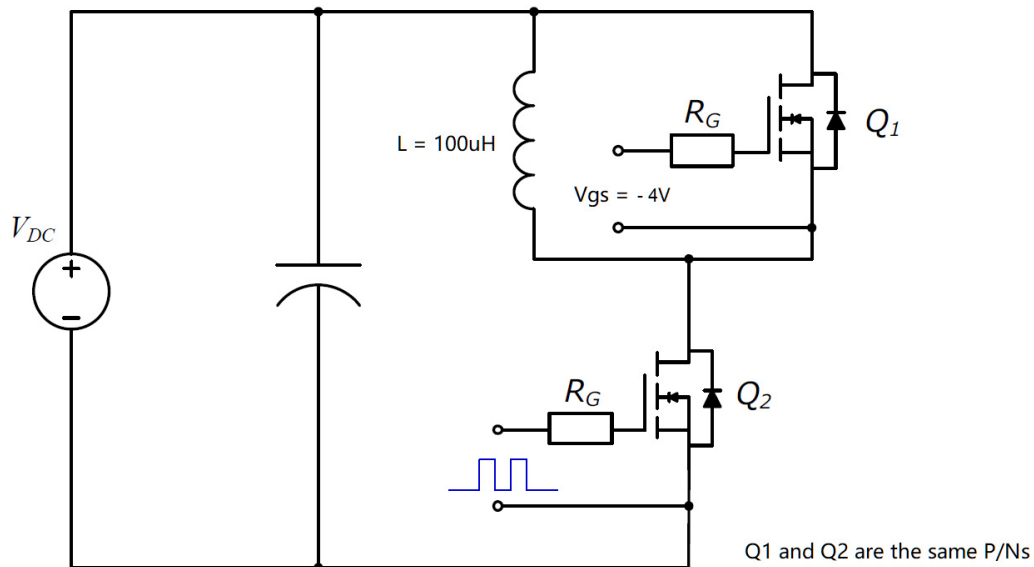
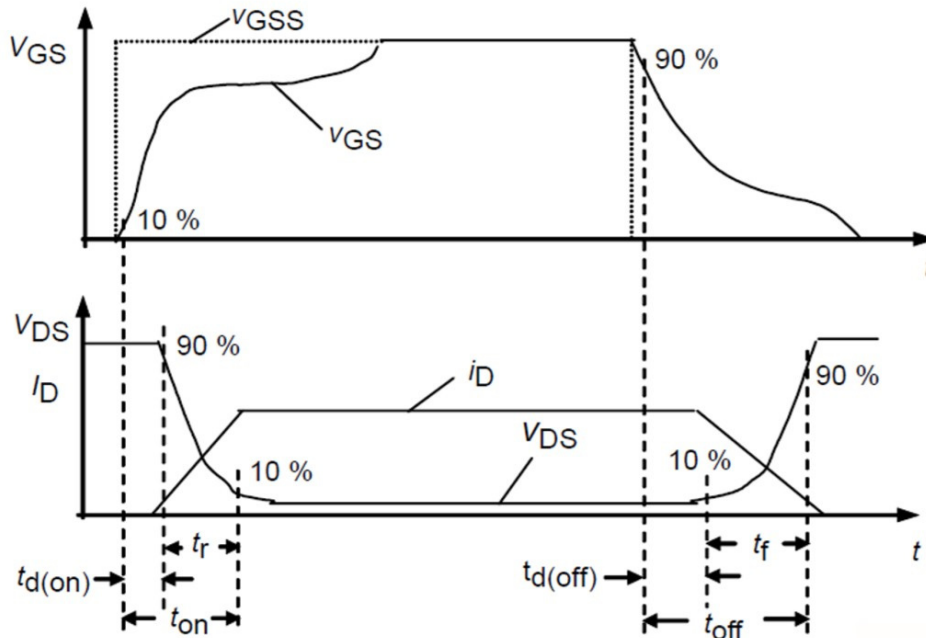



Figure 18. Normalized breakdown voltage vs Temperature

Switching Times Definition and Test Circuit




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