

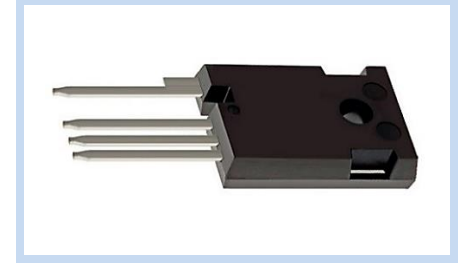
N-Channel Silicon Carbide MOSFET 1200V 69A TO-247-4

MFTC120N69T2474

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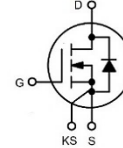
FEATURE

- $R_{DS(ON)} < 45m\Omega$ at $V_{GS}=20V$, $I_D=40A$
- High Blocking Voltage With Low On-Resistance
- High Speed Switching With Low Capacitances
- Fast Intrinsic Diode With Low Reverse Recovery (Qrr)
- Applications: Solar Inverter, High Voltage DC-DC Converter, Switching Mode Power Supplier, Motor Drive, EV Charging



MECHANICAL DATA

- Case: TO-247-4 Package
- Terminals: Solderable per MIL-STD-750, Method 2026

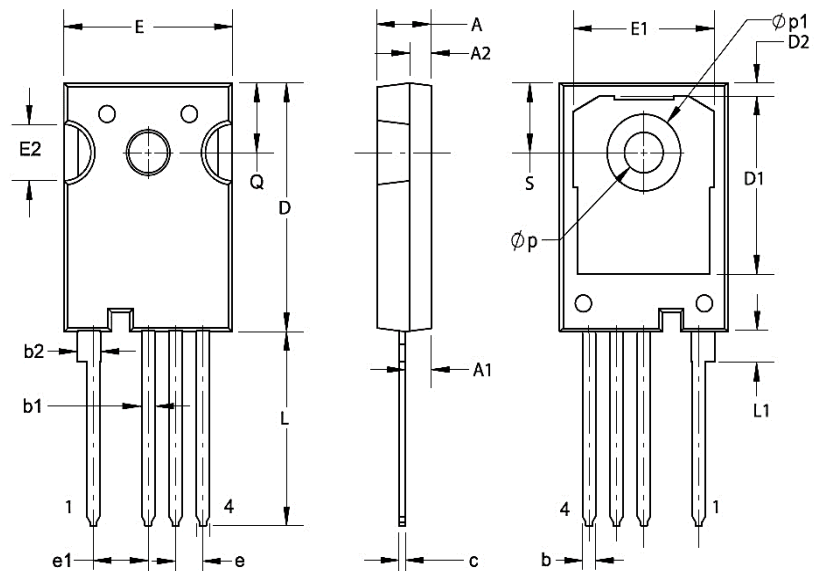


MAXIMUM RATINGS

Parameter		Symbol	Value	Unit
Drain-Source Voltage	$V_{GS}=0V$, $I_D=100\mu A$	V_{DS}	1200	V
Gate-Source Voltage	Dynamic ($f > 1Hz$)	V_{GS}	-10 / +25	V
	Static		-5 / +20	
Drain Current – Continuous	$V_{GS} = 20V$, $T_C=25^\circ C$	I_D	69	A
	$V_{GS} = 20V$, $T_C=100^\circ C$		49	A
Drain Current – Pulsed		I_{DM}	114	A
Power Dissipation		P_D	300	W
Single Pulsed Avalanche Energy	$V_{DD} = 100V$, $V_{GS}=20V$, $L=2mH$	E_{AS}	576	mJ
Single Pulsed Avalanche Current	$V_{DD} = 100V$, $V_{GS}=20V$, $L=2mH$	I_{AS}	24	A
Thermal Resistance, Junction to Case		$R_{\theta JC}$	0.4	$^\circ C / W$
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	$^\circ C$

DIMENSIONS

TO-247-4	Min (mm)	Max (mm)
A	4.83	5.21
A1	2.29	2.54
A2	1.90	2.16
b	1.07	1.33
b1	1.07	1.60
b2	2.34	2.94
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
e		2.54
e1		5.08
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
L	17.31	17.82
L1	3.97	4.37
p	3.51	3.65
p1		7.18
Q	5.49	6.00
S	6.04	6.30



Pin Layout: 1: Drain(D), 2: Power Source(S), 3: Kelvin Source (KS), 4: Gate(G)

N-Channel Silicon Carbide MOSFET

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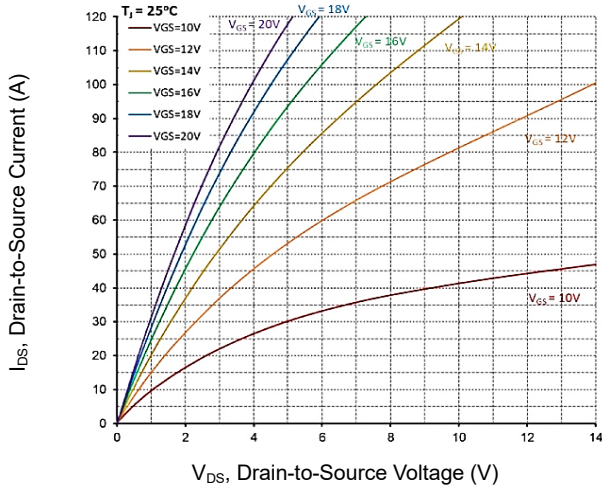
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ELECTRICAL CHARACTERISTICS

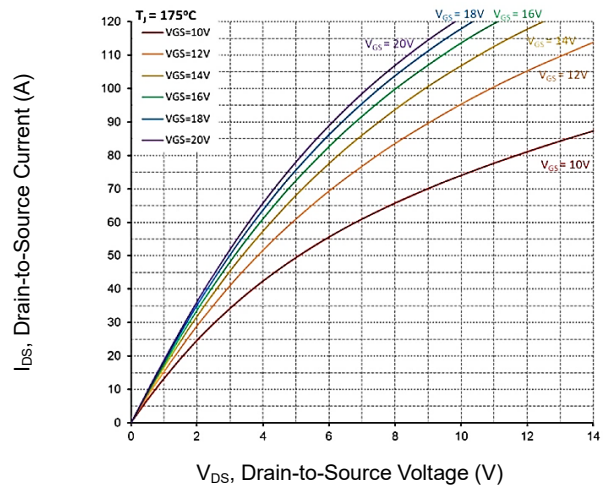
Off Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit	
Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=100\mu A$	BV_{DSS}	1200	--	--	V	
Zero Gate Voltage Drain Current	$V_{DS}=1200V, V_{GS}=0V$	I_{DSS}	--	1	50	μA	
Gate-Body Leakage Current, Forward	$V_{GS}=20V, V_{DS}=0V$	I_{GSSF}	--	1	200	nA	
Gate-Body Leakage Current, Reverse	$V_{GS}=-5V, V_{DS}=0V$	I_{GSSR}	-200	-1	--		
On Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit	
Static Drain-Source On-Resistance	$V_{GS}=20V, I_D=40A$	$R_{DS(ON)}$	--	33	45	m Ω	
	$V_{GS}=20V, I_D=40A, T_J=150^\circ C$		--	50	--		
	$V_{GS}=20V, I_D=40A, T_J=175^\circ C$		--	56	--		
	$V_{GS}=18V, I_D=40A$		--	37	--		
Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=10mA$	$V_{GS(th)}$	1.8	2.6	3.7	V	
	$V_{GS}=V_{DS}, I_D=10mA, T_J=150^\circ C$		--	1.9	--		
	$V_{GS}=V_{DS}, I_D=10mA, T_J=175^\circ C$		--	1.8	--		
Forward Transfer Admittance	$V_{GS}=20V, I_D=40A$	G_{FS}	--	24	--	S	
	$V_{GS}=20V, I_D=40A, T_J=150^\circ C$		--	22	--		
	$V_{GS}=20V, I_D=40A, T_J=175^\circ C$		--	22	--		
Dynamic Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit	
Total Gate Charge	$V_{DS}=800V, I_D=40A, V_{GS}= -5/+20V$	Q_g	--	135	--	nC	
Gate-Source Charge		Q_{gs}	--	36	--		
Gate-Drain Charge		Q_{gd}	--	53	--		
Turn-On Delay Time	$V_{DS}=800V, I_D=40A$ $V_{GS}= -5/+20V, R_{GEN}=2\Omega,$ $L=100\mu H$	$T_{d(on)}$	--	32	--	ns	
Rise Time		T_r	--	18	--		
Turn-Off Delay Time		$T_{d(off)}$	--	41	--		
Fall Time		T_f	--	9	--	μJ	
Turn-On Switching Loss		E_{ON}	--	532	--		
Turn-Off Switching Loss		E_{OFF}	--	24	--		
Input Capacitance		$V_{DS}=1000V, V_{GS}=0V,$ $f=1MHz$	C_{iss}	--	2660	--	pF
Output Capacitance			C_{oss}	--	128	--	
Reverse Transfer Capacitance			C_{rss}	--	9	--	
C_{oss} Stored Energy	E_{oss}		--	84	--	μJ	
Drain-Source Body Diode	Conditions	Symbol	Min	Typ.	Max	Unit	
Drain-Source Diode Forward Voltage	$V_{GS}= -5V, I_{SD}=20A$	V_{DS}	--	4.6	--	V	
	$V_{GS}= -5V, I_{SD}=20A, T_J=150^\circ C$		--	4.1	--		
	$V_{GS}= -5V, I_{SD}=20A, T_J=175^\circ C$		--	4.0	--		
Continuous Diode Forward Current	$V_{GS}= -5V$	I_S	--	--	55	A	
Reverse Recovery Current	$V_R=800V, I_S=40A, V_{GS}= -5V$ $di_{SD}/dt=3400A/\mu s$	I_{rr}	--	31	--	A	
Reverse Recovery Time		T_{rr}	--	19	--	ns	
Reverse Recovery Charge		Q_{rr}	--	330	--	μC	

CHARACTERISTIC CURVES

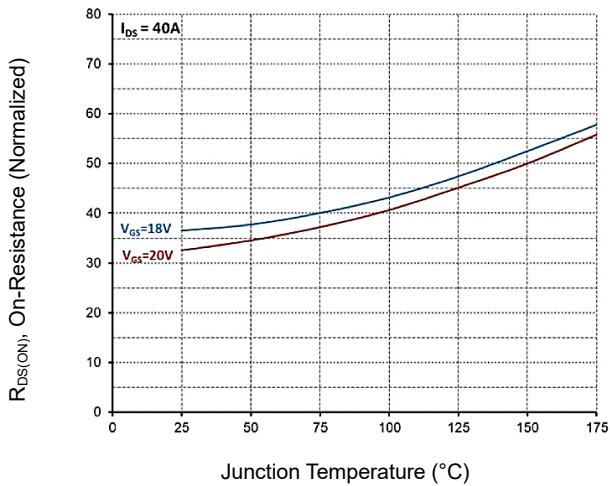
Output Characteristics



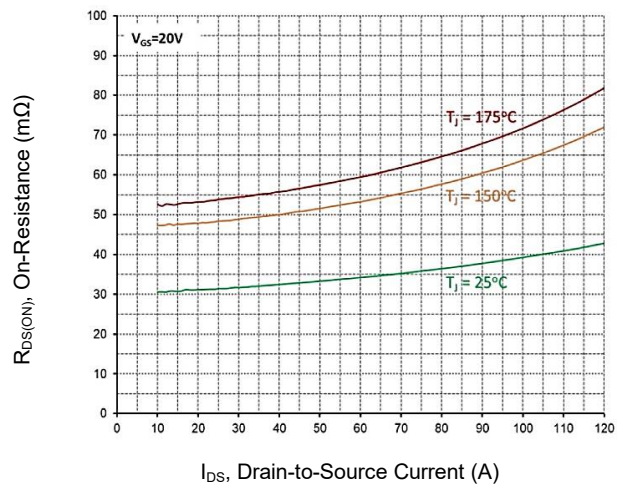
Output Characteristics



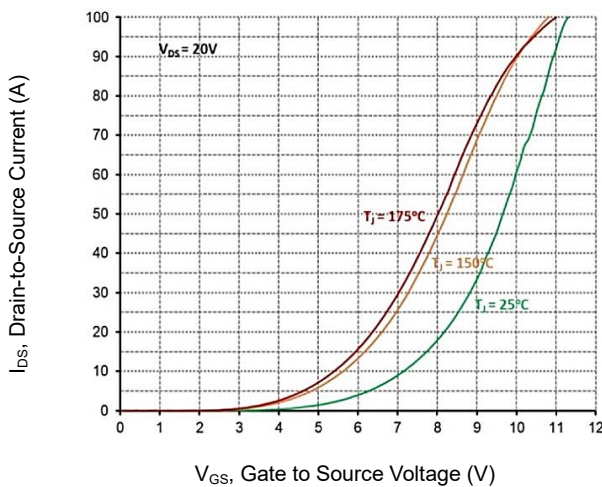
Normalized On-Resistance vs. Junction temperature



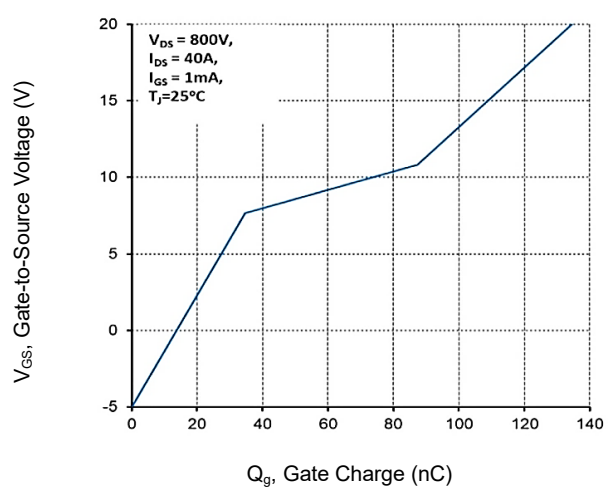
On-Resistance vs. Drain Current



Transfer Characteristic



Gate-Charge Characteristics



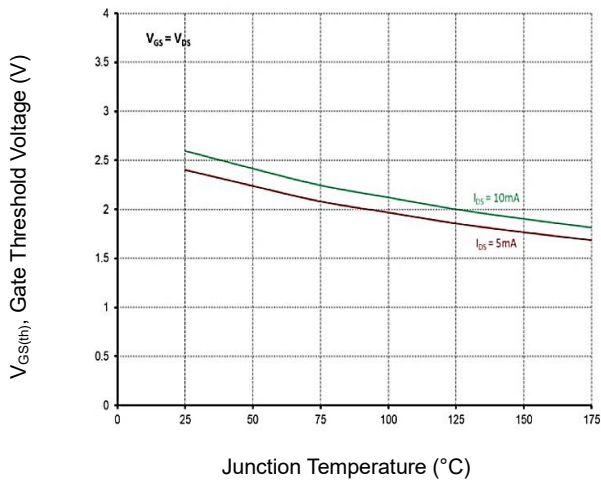
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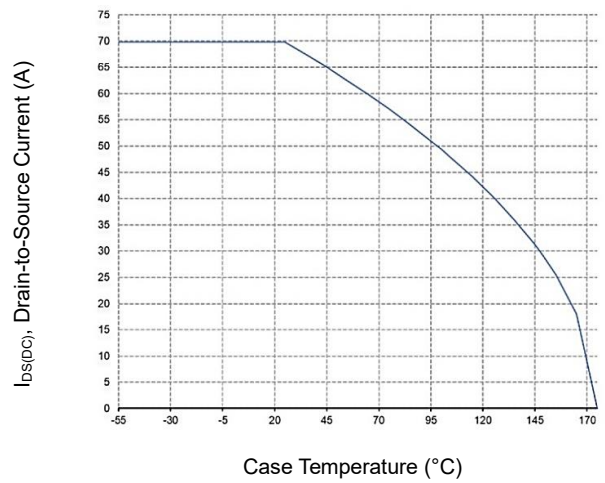
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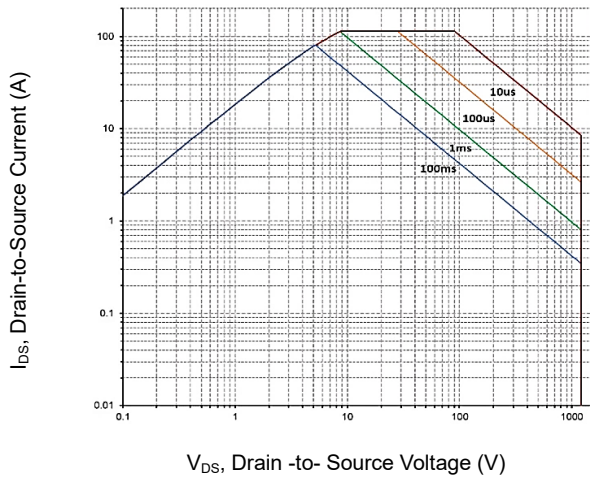
Threshold Voltage vs. Junction temperature



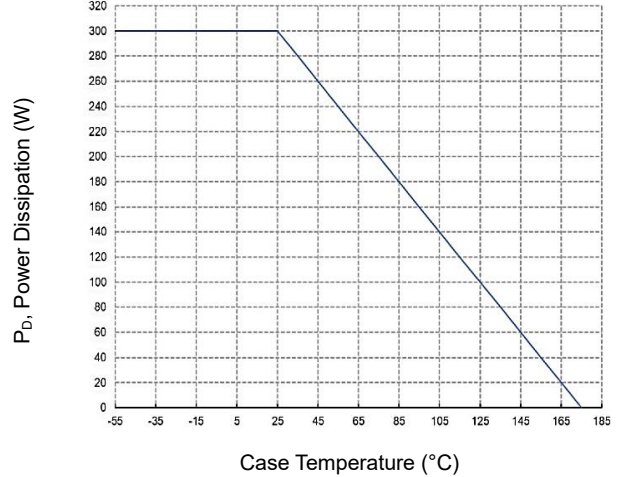
Continuous Drain Current vs. Case Temperature



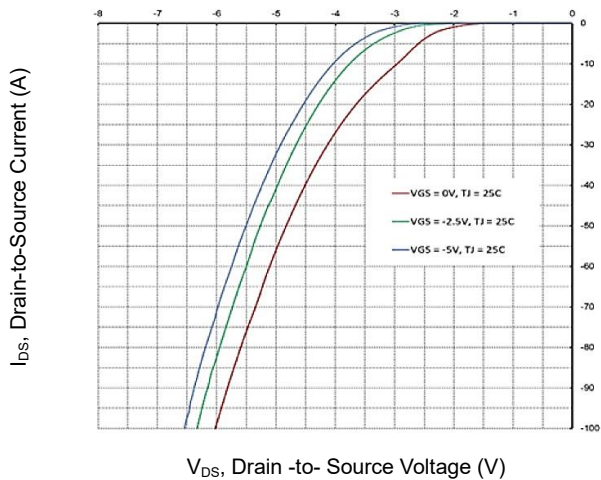
Safe Operating Area



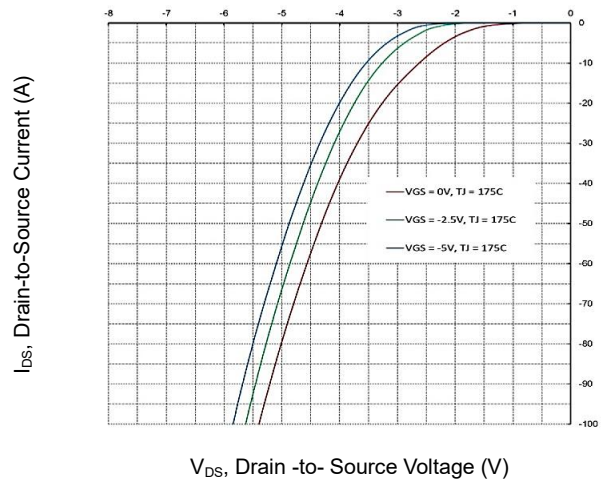
Maximum Power Dissipation Derating



Body Diode Characteristics



Body Diode Characteristics



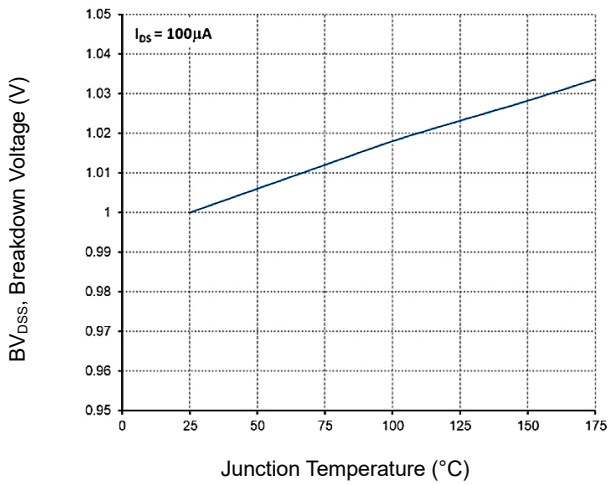
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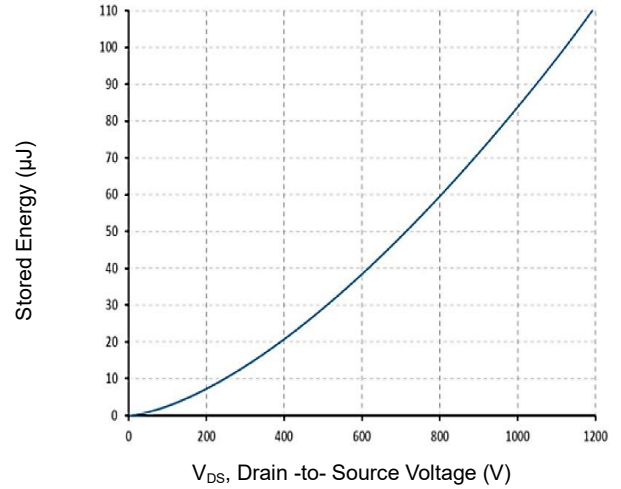
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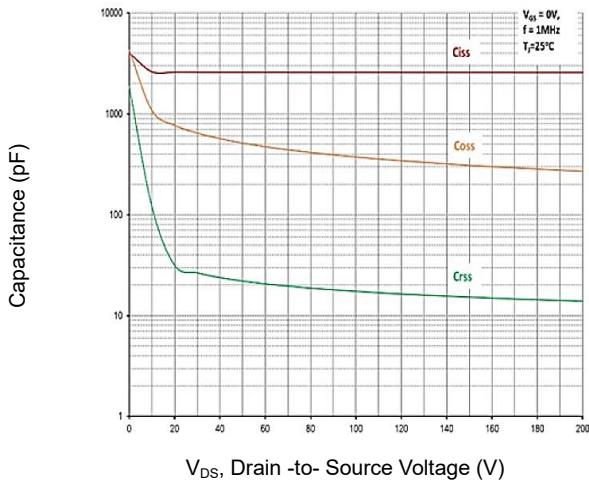
Breakdown Voltage vs Junction Temperature



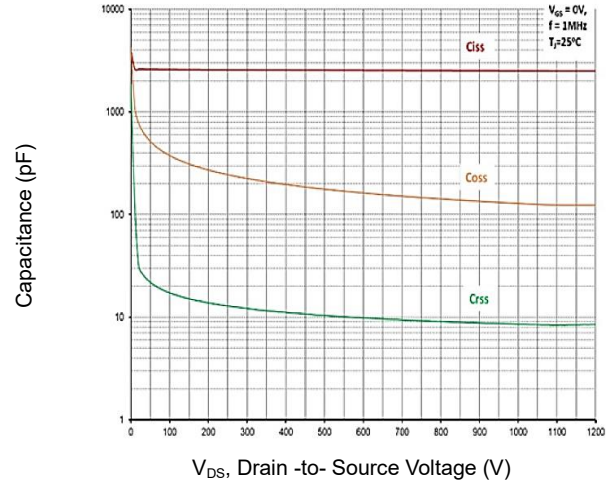
Output Capacitor Stored Energy



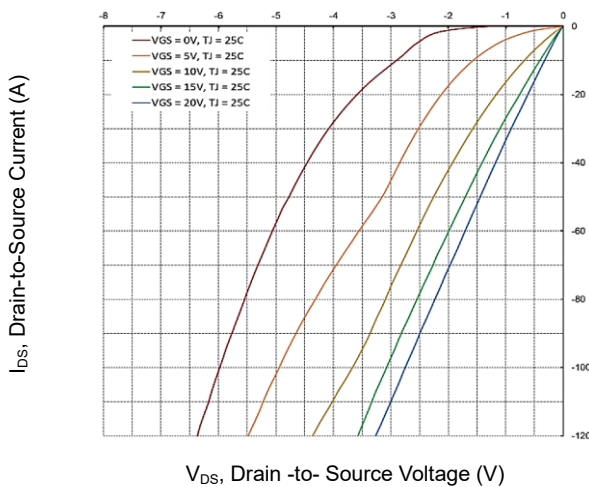
Capacitance vs. Drain-Source Voltage



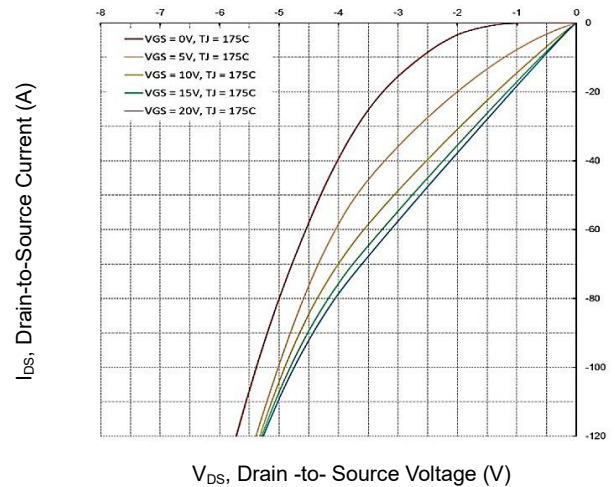
Capacitance vs. Drain-Source Voltage



3rd Quadrant Characteristics

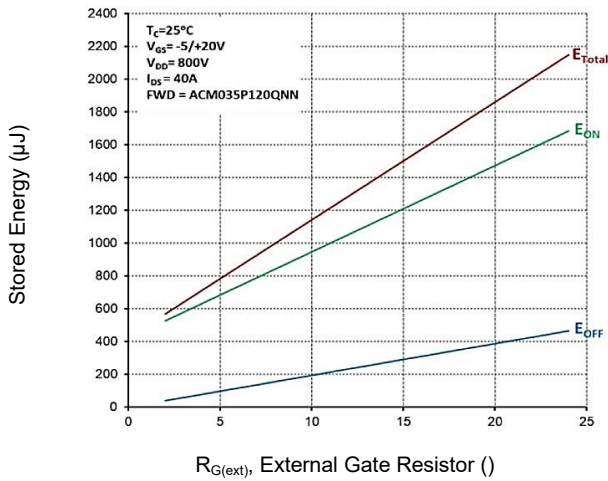


3rd Quadrant Characteristics

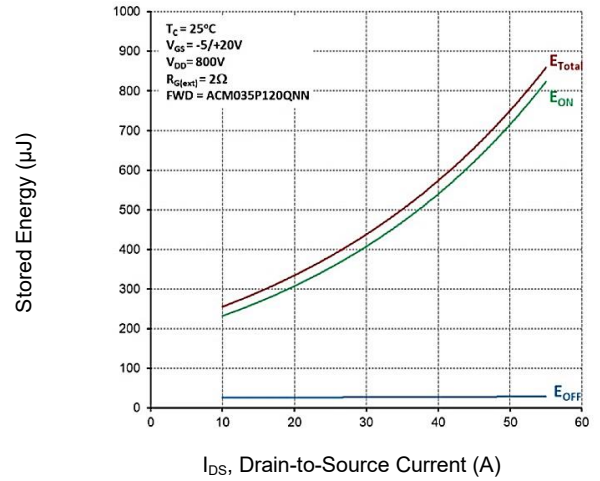


CHARACTERISTIC CURVES

Switching Energy vs. External Gate Resistor



Switching Energy vs. Drain Current



Transient Thermal Impedance

