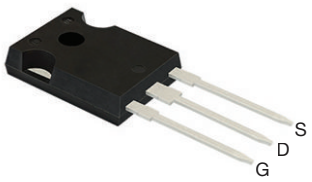
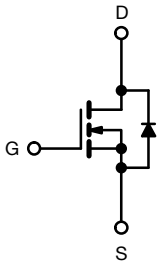
MaxSiC™ 1200 V N-Channel SiC MOSFET

TO-247 3L





N-Channel MOSFET

Marking Code: 120A080FW

FEATURES

- Fast switching speed
- Short circuit withstand time 3 µs
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Charger
- Auxiliary motor drive
- DC/DC converter

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	1200	
$R_{DS(on)}$ typ. (mΩ) at 25 °C	V_{GS} = 20 V	80
Q_g typ. (nC)	47.3	
I_D (A)	29	
C_{oss} typ. (nC)	50	
P_D (W)	139	
Configuration	Single	

ORDERING INFORMATION	
Package	TO-247 3L
Lead (Pb)-free and halogen-free	MXP120A080FW-Y-GE3

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage [a]		V_{DS}	1200	V
Gate-source voltage		V_{GS}	-10 / +22	
Continuous drain current	T_C = 25 °C	I_D	29	A
	T_C = 100 °C	I_D	18	
Pulsed drain current [b]		I_{DM}	86	
Short-circuit withstand time		T_{SC}	3	µs
Maximum power dissipation	T_C = 25 °C	P_D	139	W
	T_C = 100 °C	P_D	55	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C

Notes

a. T_J = 25 °C to 150 °C

b. Repetitive rating; pulse width limited by maximum junction temperature

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum junction-to-ambient	R_{thJA}	-	30.8	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.9	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	1200	-	-	V
Gate-source threshold voltage (N)	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 5 mA	-	2.69	-	V
		V_{DS} = V_{GS}, I_D = 5 mA, T_J = 150 °C	-	1.86	-	V
Gate-source leakage	I_{GSS}	V_{GS} = +22 V, V_{DS} = 0 V	-	-	100	nA
		V_{GS} = -10 V, V_{DS} = 0 V	-	-	-100	
Zero gate voltage drain current	I_{DSS}	V_{DS} = 960 V, V_{GS} = 0 V	-	-	10	µA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS} = 20 V, I_D = 20 A	-	80	100	mΩ
		V_{GS} = 20 V, I_D = 20 A, T_J = 150 °C	-	141	176	
		V_{GS} = 18 V, I_D = 20 A	-	99	124	
		V_{GS} = 18 V, I_D = 20 A, T_J = 150 °C	-	146	183	
Dynamic						
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 800 V, f = 1 MHz	-	1156	-	pF
Output capacitance	C_{oss}		-	50	-	
Reverse transfer capacitance	C_{rss}		-	5	-	
Coss Stored Energy	E_{oss}		-	10	-	µJ
Total gate charge	Q_g	V_{GS} = 18 V; I_D = 10 A, V_{DS} = 800 V	-	47.3	-	nC
Gate-source charge	Q_{gs}		-	14.2	-	
Gate-drain charge	Q_{gd}		-	17.8	-	
Gate Resistance	R_g	V_{DS} = 0 V, f = 1 MHz	-	9.8	-	Ω
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	V_{GS} = -5 V ~ 20 V, I_D = 20 A, V_{DS} = 800 V, $R_{g(ext)}$ = 4.4 Ω	-	19.6	-	ns
Rise time	t_r		-	10.6	-	
Turn-off delay time	$t_{d(off)}$		-	16.6	-	
Fall time	t_f		-	7.9	-	
Turn-on switching energy	E_{on}		-	282	-	µJ
Turn-off switching energy	E_{off}		-	27.9	-	
Reverse Diode Characteristics						
Reverse recovery time	t_{rr}	V_{GS} = -5 V, I_{SD} = 20 A, V_R = 800 V, di/dt = 1000 A/µs	-	37.3	-	ns
Reverse recovery charge	Q_{rr}		-	100	-	nC
Reverse recovery current	I_{rrm}		-	5.4	-	A

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

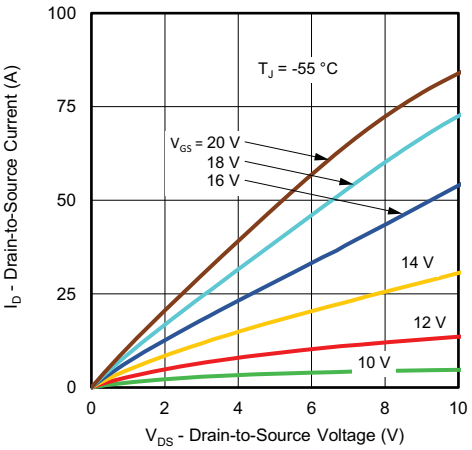


Fig. 1 - Typical Output Characteristics

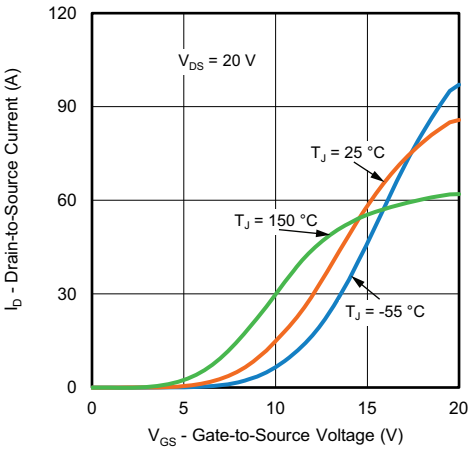


Fig. 4 - Typical Transfer Characteristics

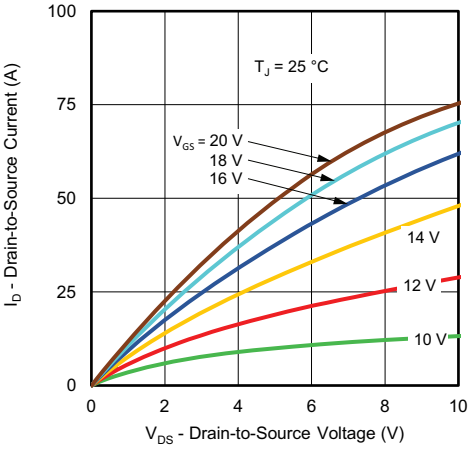


Fig. 2 - Typical Output Characteristics

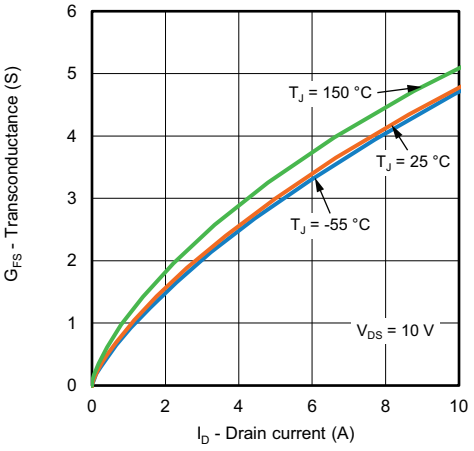


Fig. 5 - Forward Transconductance vs. Drain Current

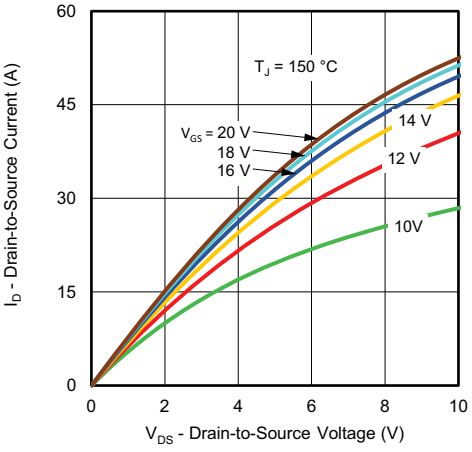


Fig. 3 - Typical Output Characteristics

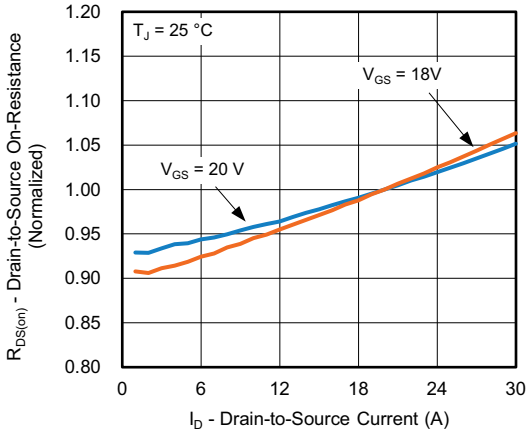


Fig. 6 - Normalized On-Resistance vs. Drain-to-Source Current

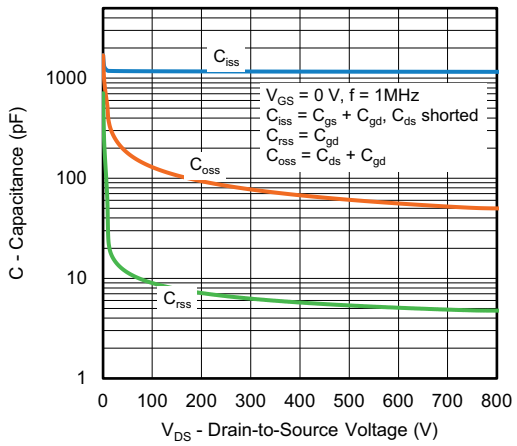


Fig. 7 - Typical Capacitance vs. Drain-to-Source Voltage

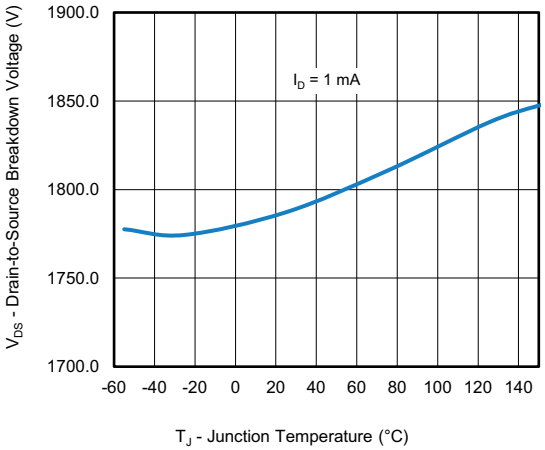


Fig. 10 - Temperature vs. Drain-to-Source Voltage

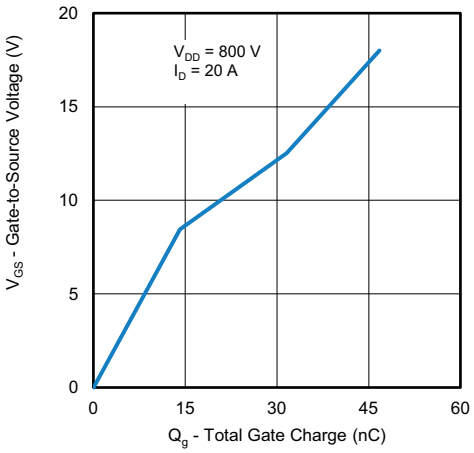


Fig. 8 - Typical Gate Charge vs. Gate-to-Source Voltage

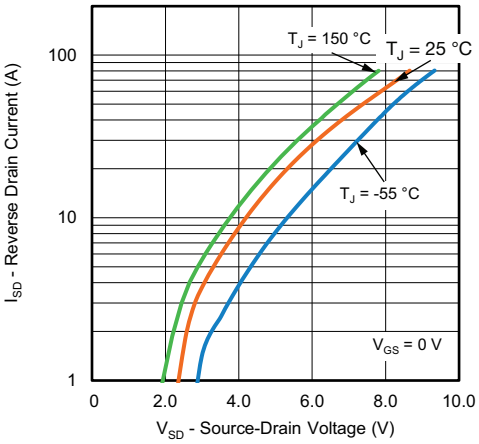


Fig. 11 - Typical Source-Drain Diode Forward Voltage

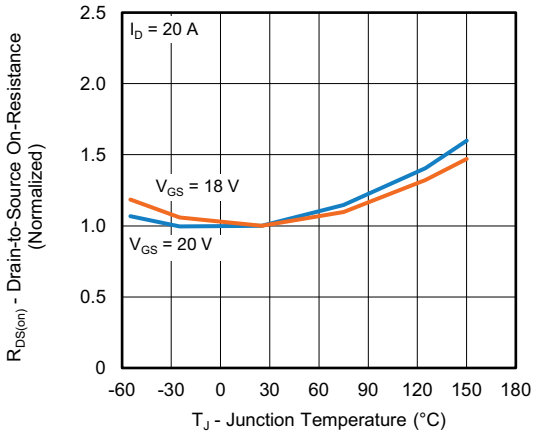


Fig. 9 - Normalized On-Resistance vs. Temperature

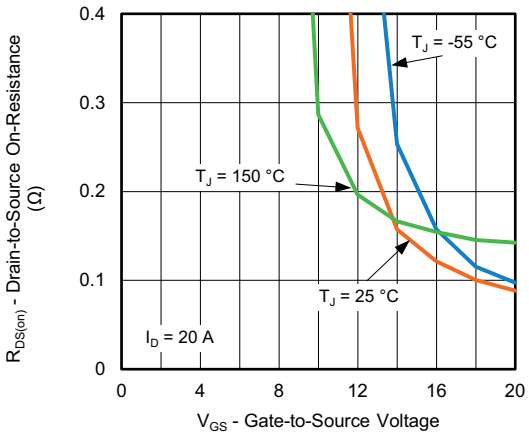


Fig. 12 - On-Resistance vs. Gate-to-Source Voltage

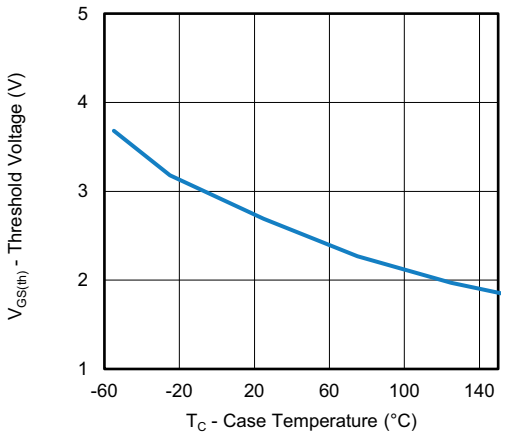


Fig. 13 - Threshold Voltage vs. Case Temperature

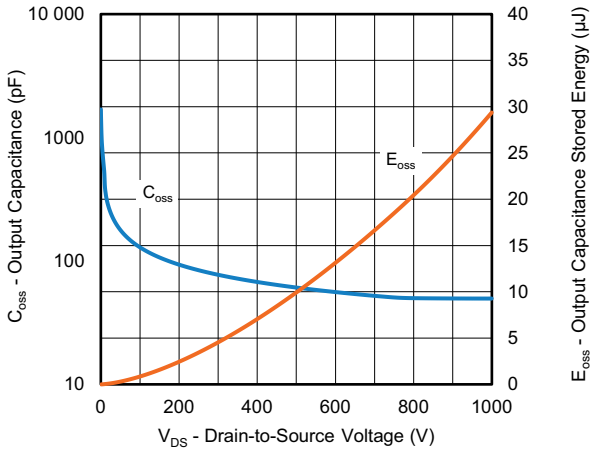


Fig. 15 - Output Capacitances and its Stored Energy vs. Drain-to-Source Voltage

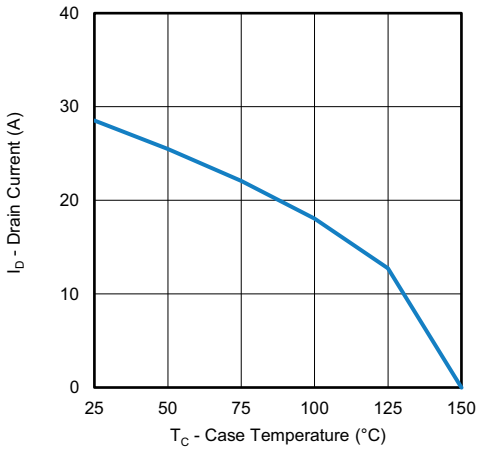


Fig. 14 - Drain Current vs. Case Temperature

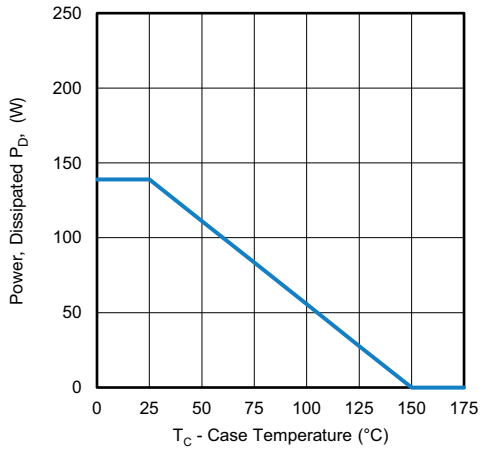


Fig. 16 - Power, Dissipated P_D vs. Case Temperature

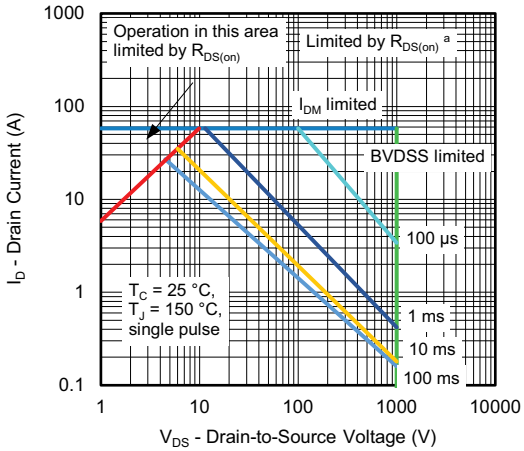


Fig. 17 - Safe Operating Area

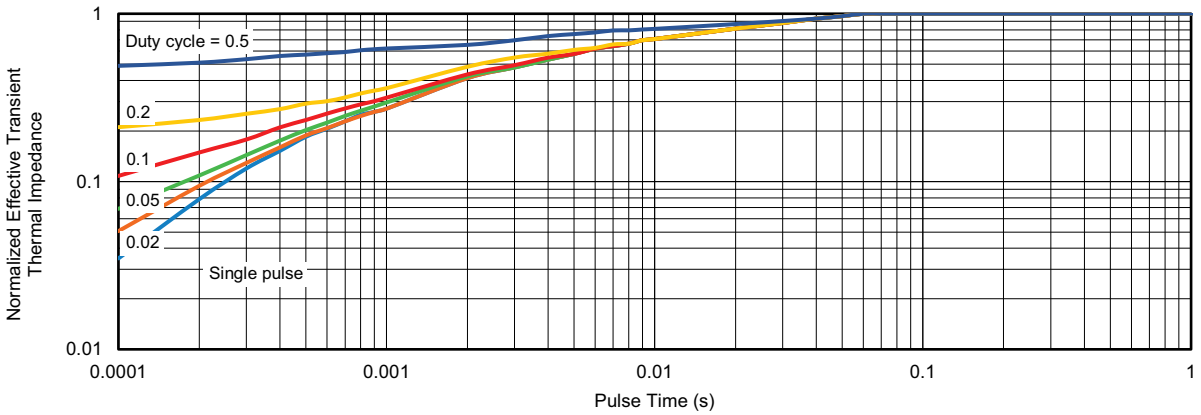


Fig. 18 - Normalized Effective Transient Thermal Impedance

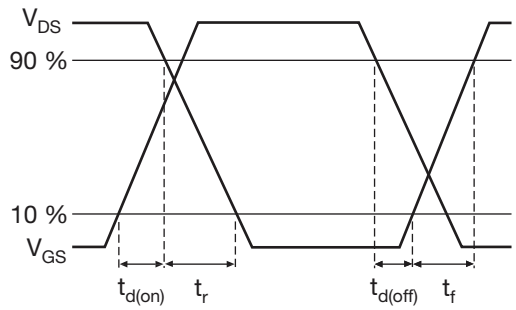


Fig. 19 - Waveforms of Switching Time

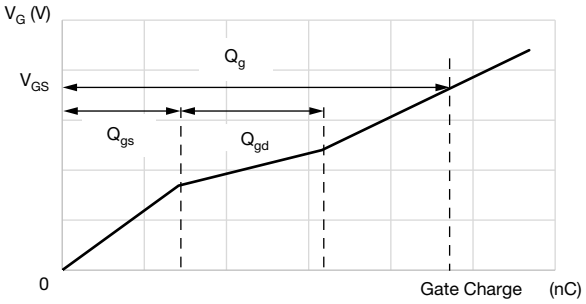


Fig. 22 - Waveforms for Gate Charge

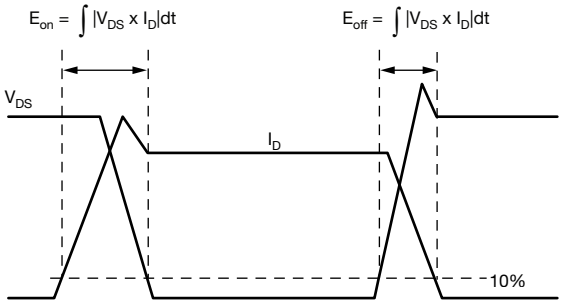


Fig. 20 - Waveforms for Switching Energy

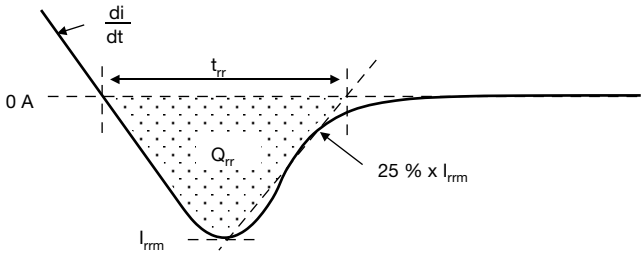


Fig. 23 - Waveforms for Reverse Recovery

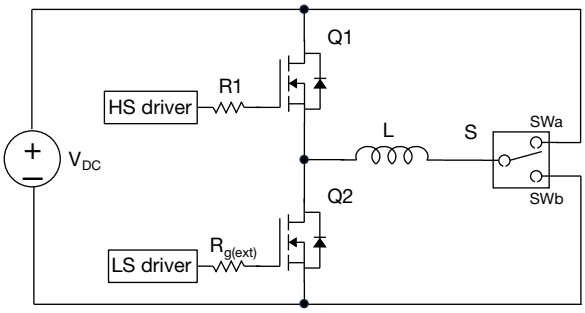


Fig. 21 - Switching and Reverse Diode Characteristics Measurement Circuit

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