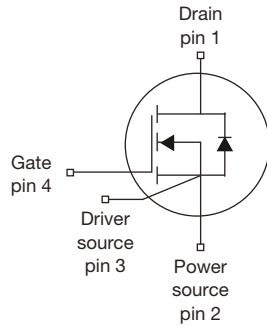


# MaxSiC™ 1200 V N-Channel SiC MOSFET



## FEATURES

- Fast switching speed
- Short circuit withstand time 3  $\mu$ s
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## APPLICATIONS

- Charger
- Auxiliary motor drive
- DC/DC converter

Marking Code: 120A080FL

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

ORDERING INFORMATION	
Package	TO-247 4L
Lead (Pb)-free and halogen-free	MXP120A080FL-GE3

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage <sup>a</sup>		$V_{DS}$	1200	V
Gate-source voltage		$V_{GS}$	-10 / +22	
Recommended operation voltage of gate-source		$V_{GSOP}$	-5 / +20	
Continuous drain current	$T_C = 25$ °C	$I_D$	29	A
	$T_C = 100$ °C	$I_D$	18	
Pulsed drain current <sup>b</sup>		$I_{DM}$	58	
Short-circuit withstand time <sup>c</sup>		$T_{SC}$	3	$\mu$ s
Maximum power dissipation	$T_C = 25$ °C	$P_D$	139	W
	$T_C = 100$ °C	$P_D$	56	
Operating junction and storage temperature range		$T_J, T_{stg}$	-55 to +150	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C

## Notes

- $T_J = 25$  °C to 150 °C
- Repetitive rating; pulse width limited by maximum junction temperature
- Verified by the design / characterization



THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	-	40	°C/W
Maximum junction-to-case (drain)	$R_{thJC}$	-	0.9	

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1200	-	-	V
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 5\text{ mA}$	-	2.69	-	V
		$V_{DS} = V_{GS}, I_D = 5\text{ mA}, T_J = 150\text{ }^\circ\text{C}$	-	1.86	-	V
Gate-source leakage	$I_{GSS}$	$V_{GS} = +22\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	nA
		$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$	-	-	-100	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 960\text{ V}, V_{GS} = 0\text{ V}$	-	-	10	$\mu\text{A}$
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 20\text{ V}, I_D = 20\text{ A}$	-	80	100	m $\Omega$
		$V_{GS} = 20\text{ V}, I_D = 20\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	128	160	
		$V_{GS} = 18\text{ V}, I_D = 20\text{ A}$	-	95	119	
		$V_{GS} = 18\text{ V}, I_D = 20\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	140	175	
<b>Dynamic</b>						
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 800\text{ V}, f = 1\text{ MHz}$	-	1156	-	pF
Output capacitance	$C_{oss}$		-	50	-	
Reverse transfer capacitance	$C_{rss}$		-	5	-	
Coss Stored Energy	$E_{oss}$		-	20	-	
Total gate charge	$Q_g$	$V_{GS} = 18\text{ V}, I_D = 20\text{ A}, V_{DS} = 800\text{ V}$	-	47.3	-	nC
Gate-source charge	$Q_{gs}$		-	14.2	-	
Gate-drain charge	$Q_{gd}$		-	17.8	-	
Gate Resistance	$R_g$		$V_{DS} = 0\text{ V}, f = 1\text{ MHz}$	-	9.8	
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{GS} = -5\text{ V} \sim 18\text{ V}, I_D = 20\text{ A}, V_{DS} = 800\text{ V}, R_{g(ext)} = 4.4\text{ }\Omega$	-	13	-	ns
Rise time	$t_r$		-	19	-	
Turn-off delay time	$t_{d(off)}$		-	15	-	
Fall time	$t_f$		-	8	-	
Turn-on switching energy	$E_{on}$		-	258	-	$\mu\text{J}$
Turn-off switching energy	$E_{off}$		-	24	-	
<b>Body Diode Ratings and Characteristic</b>						
Forward diode voltage	$V_{SD}$	$V_{GS} = -5\text{ V}, I_{SD} = 10\text{ A}, T_J = 25\text{ }^\circ\text{C}$	-	5.1	-	V
Continuous diode forward current	$I_{SD}$	$V_{GS} = -5\text{ V}, T_J = 25\text{ }^\circ\text{C}$	-	-	21	A
Pulsed diode forward current	$I_{SDM}$		-	-	58	
Reverse recovery time	$t_{rr}$	$V_{GS} = -5\text{ V}, I_{SD} = 20\text{ A}, V_R = 800\text{ V}, di/dt = 1000\text{ A}/\mu\text{s}$	-	14	-	ns
Reverse recovery charge	$Q_{rr}$		-	35	-	nC
Reverse recovery current	$I_{rrm}$		-	4.5	-	A



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

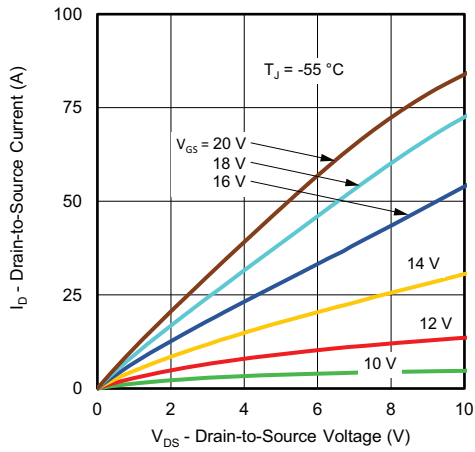


Fig. 1 - Typical Output Characteristics

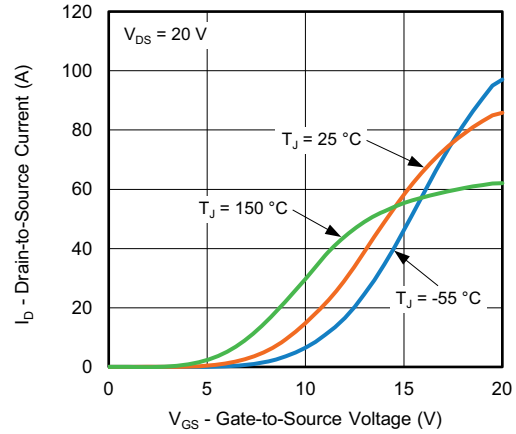


Fig. 4 - Typical Transfer Characteristics

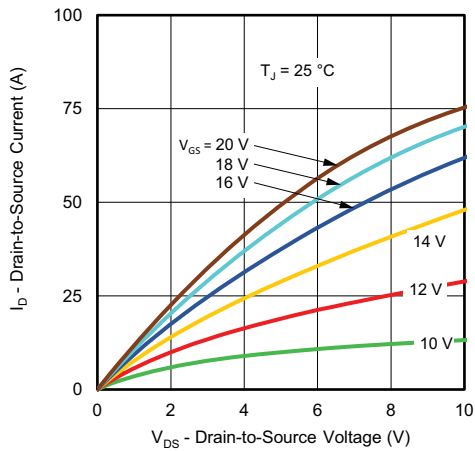


Fig. 2 - Typical Output Characteristics

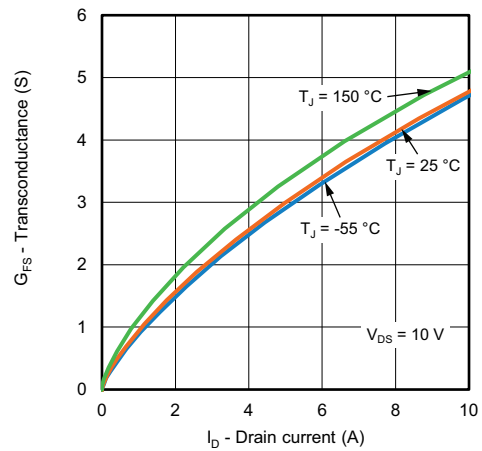


Fig. 5 - Forward Transconductance vs. Drain Current

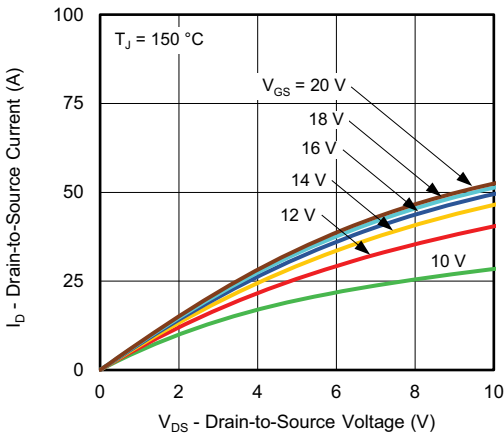


Fig. 3 - Typical Output Characteristics

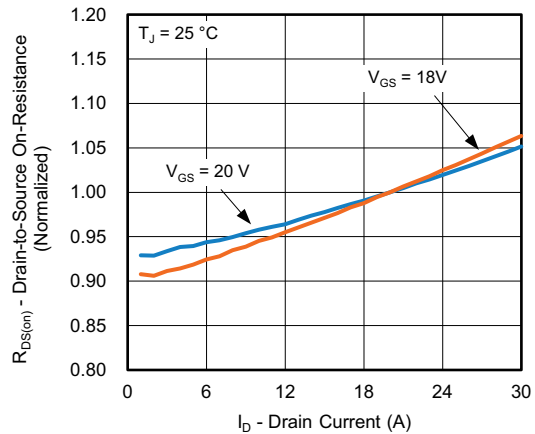


Fig. 6 - Normalized On-Resistance vs. Drain Current

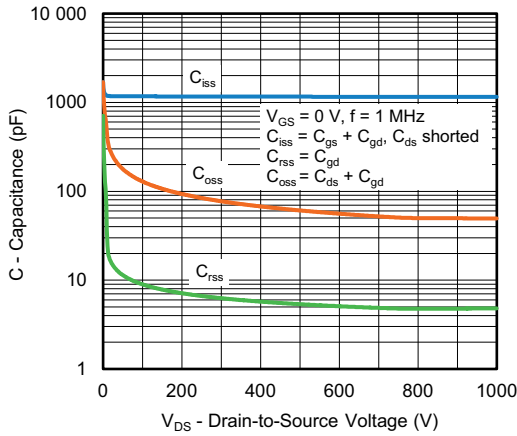


Fig. 7 - Typical Capacitance vs. Drain-to-Source Voltage

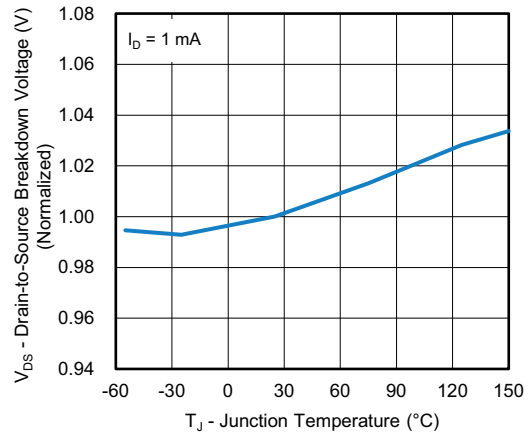


Fig. 10 - Drain-to-Source Voltage vs. Temperature

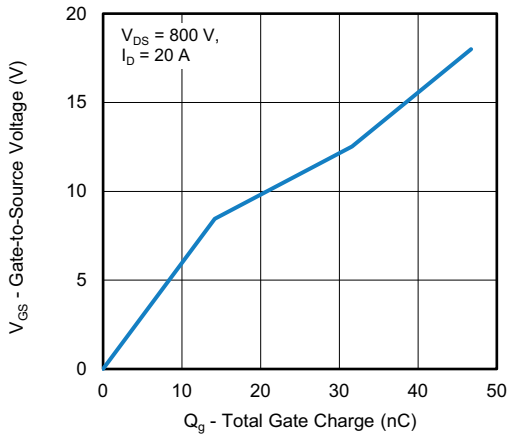


Fig. 8 - Typical Gate Charge vs. Gate-to-Source Voltage

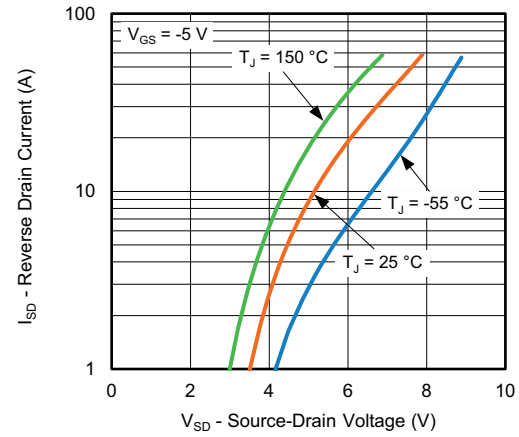


Fig. 11 - Typical Source-Drain Diode Forward Voltage

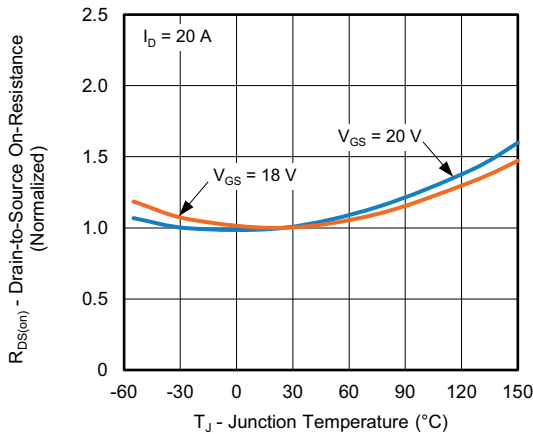


Fig. 9 - Normalized On-Resistance vs. Temperature

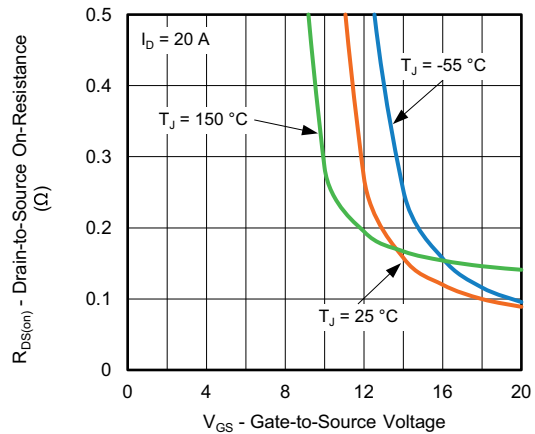
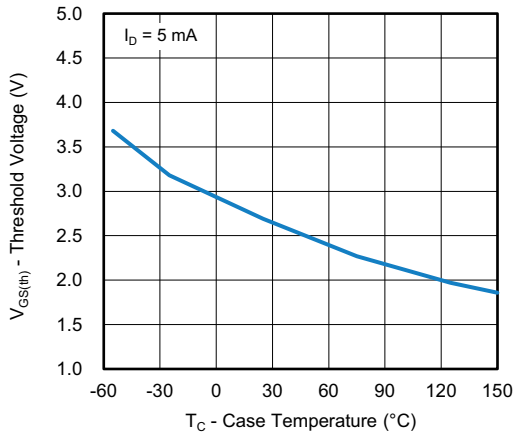
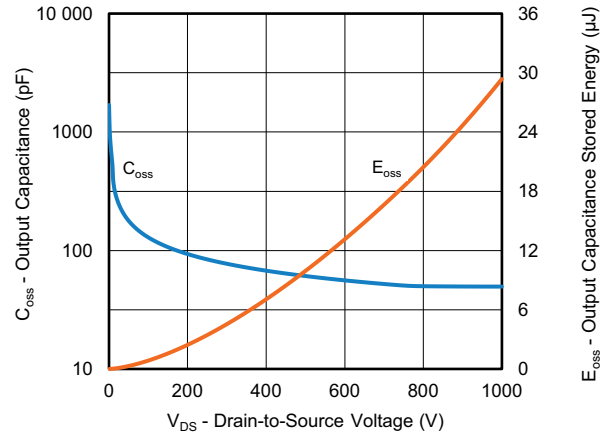


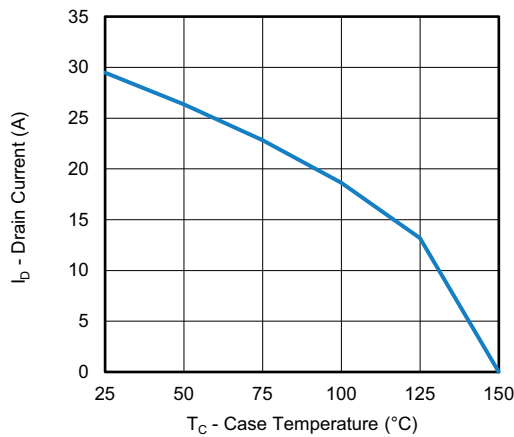
Fig. 12 - On-Resistance vs. Gate-to-Source Voltage



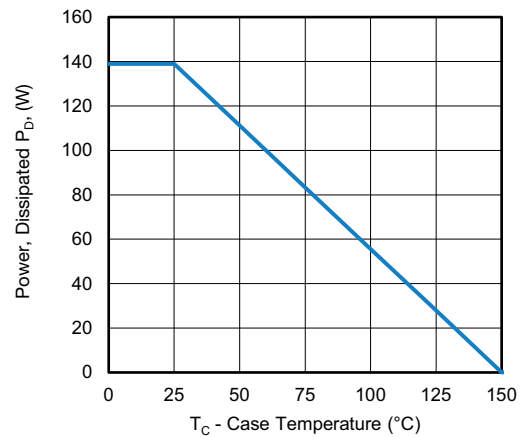
**Fig. 13 - Threshold Voltage vs. Case Temperature**



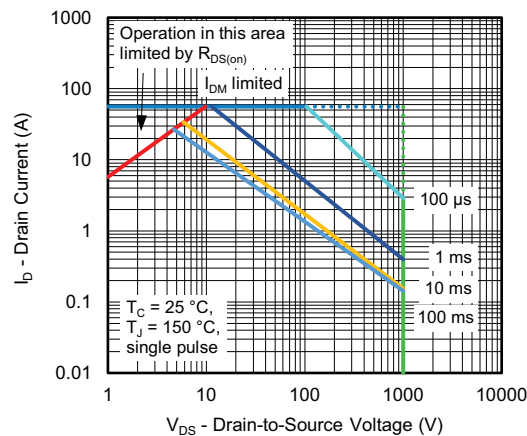
**Fig. 15 - Output Capacitances and its Stored Energy vs. Drain-to-Source Voltage**



**Fig. 14 - Drain Current vs. Case Temperature**



**Fig. 16 - Power, Dissipated P<sub>D</sub> vs. Case Temperature**



**Fig. 17 - Safe Operating Area**

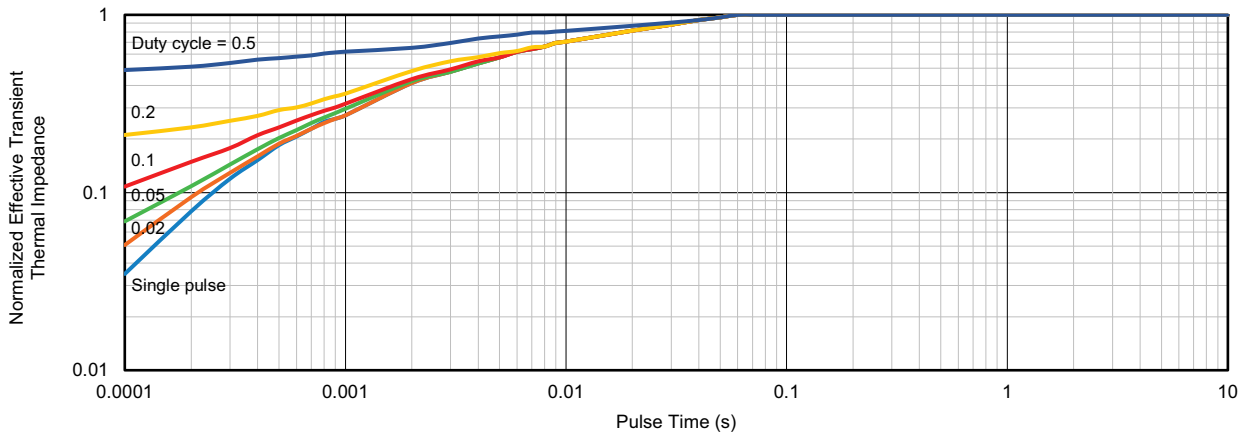


Fig. 18 - Normalized Effective Transient Thermal Impedance

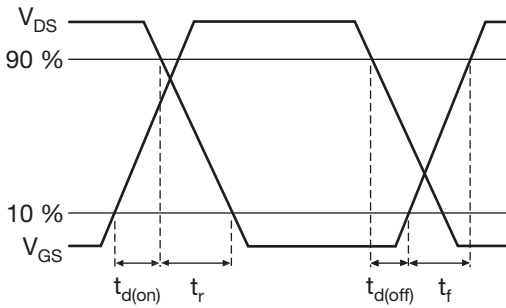


Fig. 19 - Waveforms of Switching Time

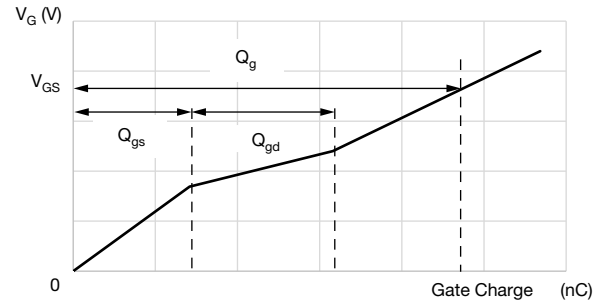


Fig. 22 - Waveforms for Gate Charge

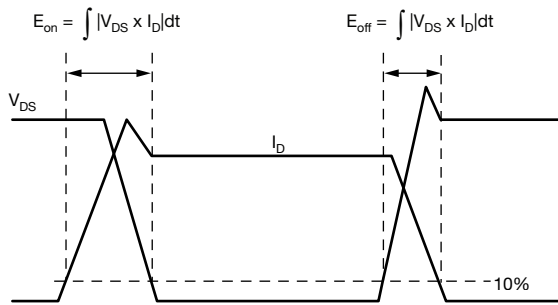


Fig. 20 - Waveforms for Switching Energy

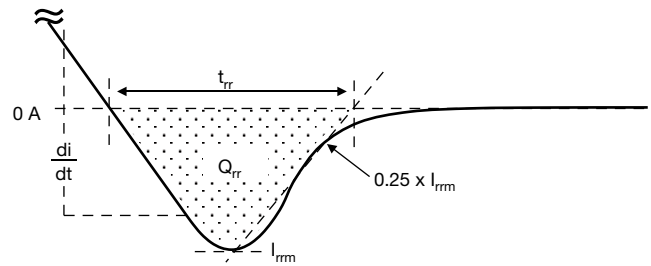


Fig. 23 - Waveforms for Reverse Recovery

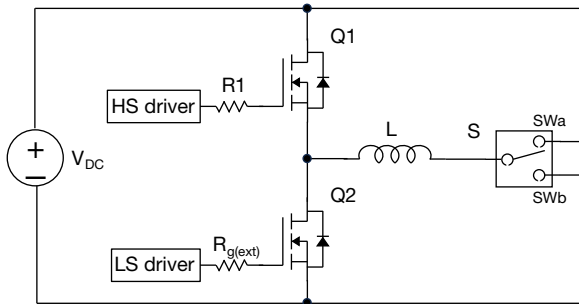


Fig. 21 - Switching and Reverse Diode Characteristics Measurement Circuit

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