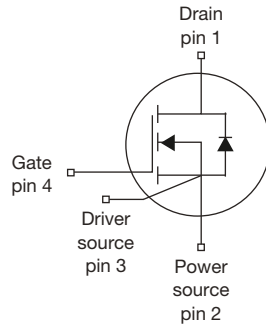


# MaxSiC™ 1200 V N-Channel SiC MOSFET



## 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
- Boost inverter
- DC/DC converter

Marking Code: 120A045FL

PRODUCT SUMMARY	
$V_{DS}$ (V) at $T_J$ max.	1200
$R_{DS(on)}$ typ. ( $m\Omega$ ) at 25 °C	$V_{GS} = 20$ V   45
$Q_g$ typ. (nC)	75.6
$I_D$ (A)	49
$C_{oss}$ typ. (pF)	90
$P_D$ (W)	227
Configuration	Single

ORDERING INFORMATION	
Package	TO-247 4L
Lead (Pb)-free and halogen-free	MXP120A045FL-Y-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	
Continuous drain current	$T_C = 25$ °C	$I_D$	49	A
Continuous drain current	$T_C = 100$ °C	$I_D$	31	
Pulsed drain current <sup>b</sup>		$I_{DM}$	98	
Short-circuit withstand time		$T_{SC}$	3	$\mu$ s
Maximum power dissipation	$T_C = 25$ °C	$P_D$	227	W
	$T_C = 100$ °C	$P_D$	91	W
Operating junction and storage temperature range		$T_J, T_{stg}$	-55 to +150	°C
Soldering recommendations (peak temperature)	For 10 s		260	°C

### Notes

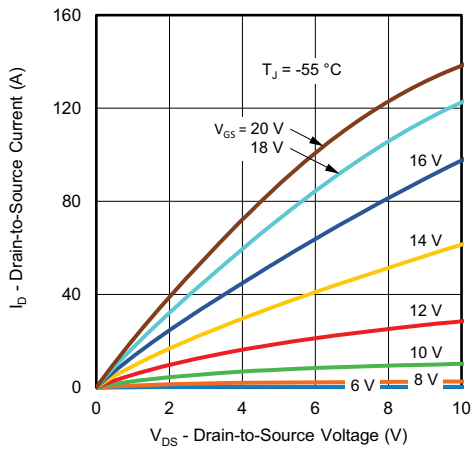
- a.  $T_J = 25$  °C to 150 °C  
 b. Repetitive rating; pulse width limited by maximum junction temperature



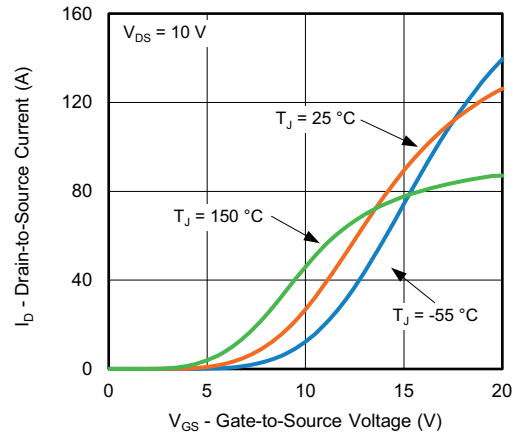
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	-	40	°C/W
Maximum junction-to-case (drain)	$R_{thJC}$	-	0.55	

SPECIFICATIONS ( $T_J = 25\text{ °C}$ , 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)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 5\text{ mA}$		-	2.38	- V
		$V_{DS} = V_{GS}, I_D = 5\text{ mA}, T_J = 150\text{ °C}$		-	1.65	- 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 nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 960\text{ V}, V_{GS} = 0\text{ V}$		-	-	10 $\mu$ A
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 20\text{ V}, I_D = 20\text{ A}$		-	45	56 m $\Omega$
		$V_{GS} = 20\text{ V}, I_D = 20\text{ A}, T_J = 150\text{ °C}$		-	75	94 m $\Omega$
		$V_{GS} = 18\text{ V}, I_D = 20\text{ A}$		-	52	65 m $\Omega$
		$V_{GS} = 18\text{ V}, I_D = 20\text{ A}, T_J = 150\text{ °C}$		-	81	101 m $\Omega$
<b>Dynamic</b>						
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 800\text{ V}, f = 1\text{ MHz}$		-	1958	- pF
Output capacitance	$C_{oss}$			-	90	- pF
Reverse transfer capacitance	$C_{rss}$			-	4	- pF
Total gate charge	$Q_g$	$V_{GS} = 18\text{ V}$	$I_D = 20\text{ A}, V_{DS} = 800\text{ V}$	-	75.6	- nC
Gate-source charge	$Q_{gs}$			-	19.5	- nC
Gate-drain charge	$Q_{gd}$			-	26.2	- nC
Gate Resistance	$R_g$	$V_{DS} = 0\text{ V}, f = 1\text{ MHz}$		-	4.9	- $\Omega$
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{GS} = -5\text{ V} \sim 18\text{ V}, I_D = 20\text{ A}, V_{DS} = 800\text{ V}, R_{g(ext)} = 4.4\text{ }\Omega$		-	15	- ns
Rise time	$t_r$			-	21	- ns
Turn-off delay time	$t_{d(off)}$			-	23	- ns
Fall time	$t_f$			-	11	- ns
Turn-on switching energy	$E_{on}$			-	295	- $\mu$ J
Turn-off switching energy	$E_{off}$	-	34	- $\mu$ J		
<b>Reverse Diode Characteristics</b>						
Reverse recovery time	$t_{rr}$	$V_{GS} = -5\text{ V}, I_{SD} = 20\text{ A}, V_R = 800\text{ V}, di/dt = 1000\text{ A}/\mu\text{s}$		-	17	- ns
Reverse recovery charge	$Q_{rr}$			-	65	- nC
Reverse recovery current	$I_{rrm}$			-	6.6	- A

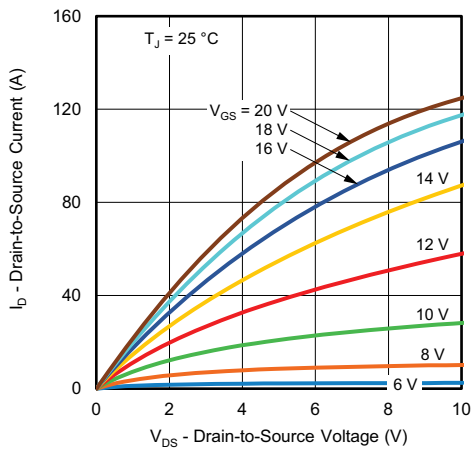
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



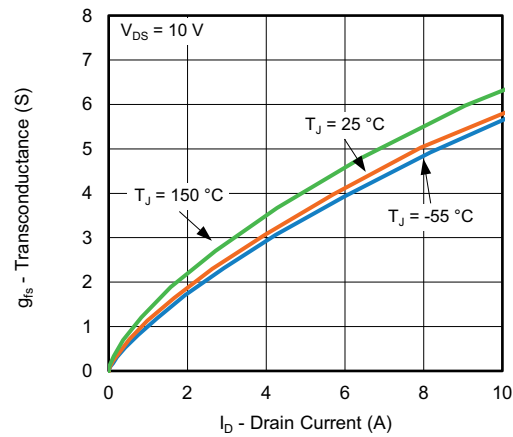
**Fig. 1 - Typical Output Characteristics**



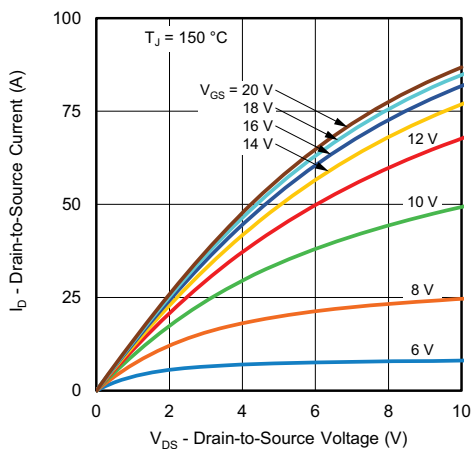
**Fig. 4 - Typical Transfer Characteristics**



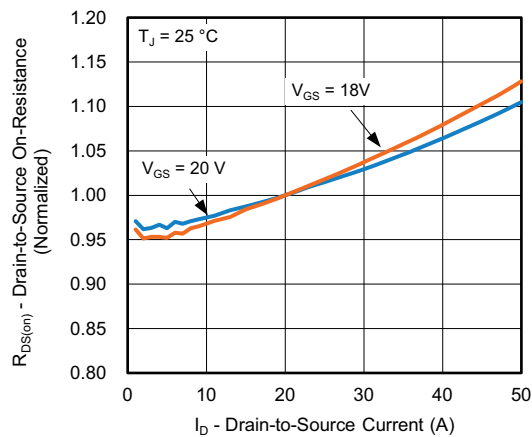
**Fig. 2 - Typical Output Characteristics**



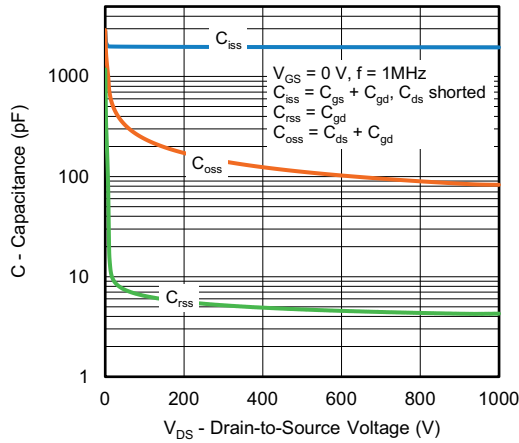
**Fig. 5 - Forward Transconductance vs. Drain Current**



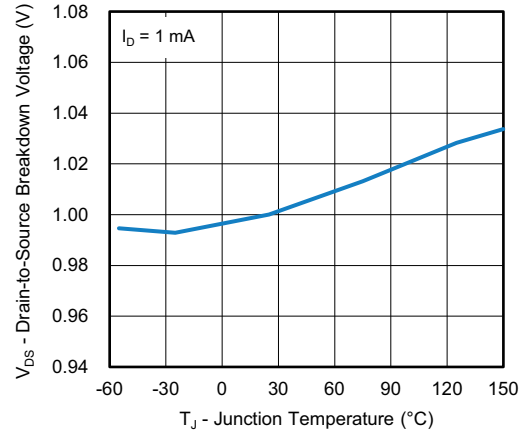
**Fig. 3 - Typical Output Characteristics**



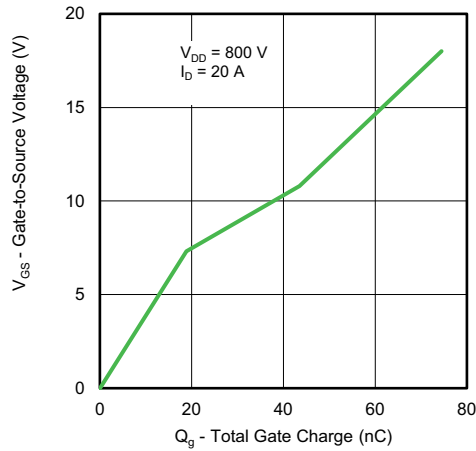
**Fig. 6 - Normalized On-Resistance vs. Drain-to-Source Current**



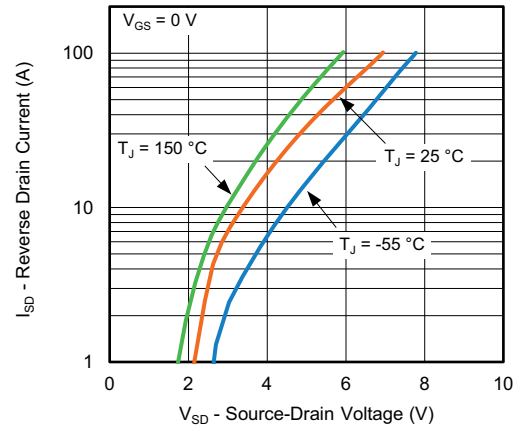
**Fig. 7 - Typical Capacitance vs. Drain-to-Source Voltage**



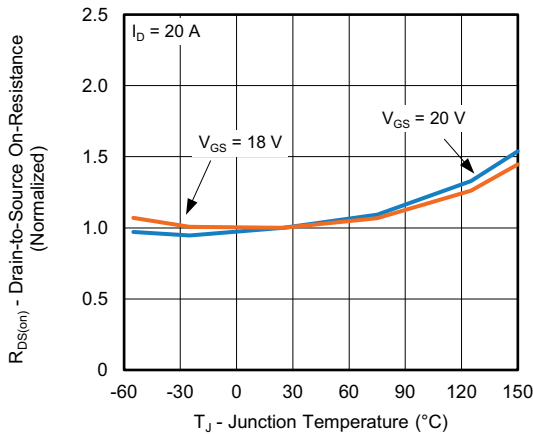
**Fig. 10 - Temperature vs. Drain-to-Source Voltage**



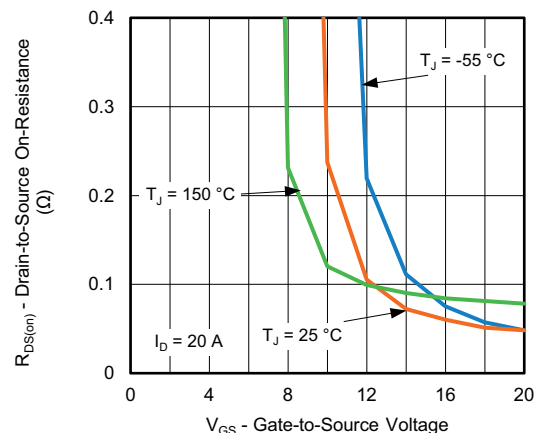
**Fig. 8 - Typical Gate Charge vs. Gate-to-Source Voltage**



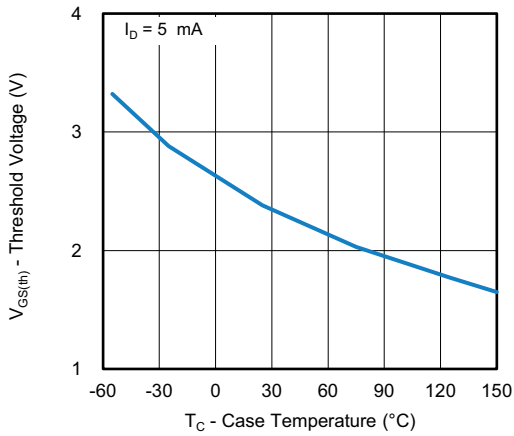
**Fig. 11 - Typical Source-Drain Diode Forward Voltage**



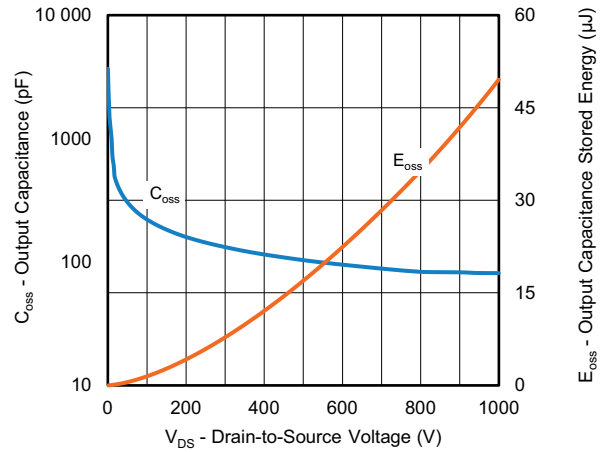
**Fig. 9 - Normalized On-Resistance vs. Temperature**



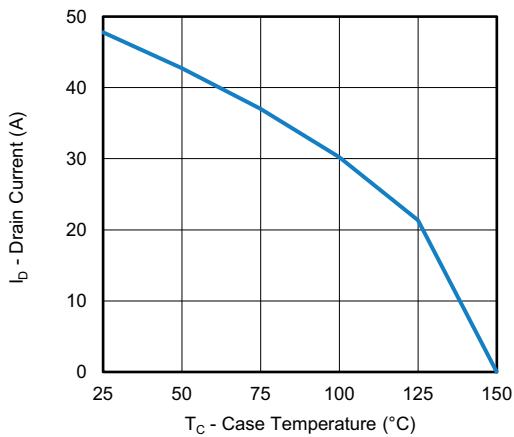
**Fig. 12 - On-Resistance vs. Gate-to-Source Voltage**



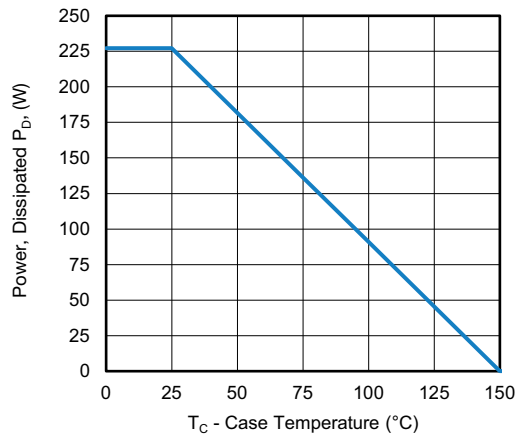
**Fig. 13 - Threshold Voltage vs. Case Temperature**



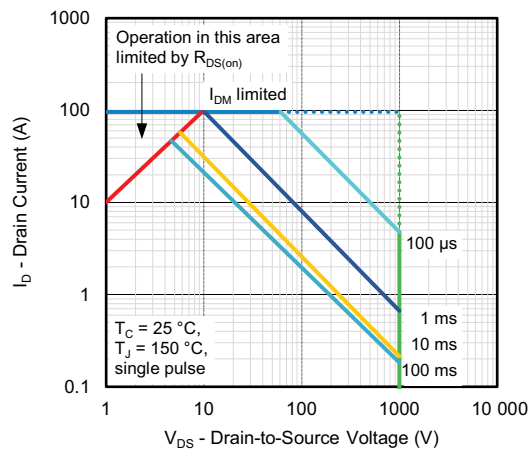
**Fig. 15 - Output Capacitance and its Stored Energy vs. Drain-to-Source Voltage**



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



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



**Fig. 17 - Safe Operating Area**

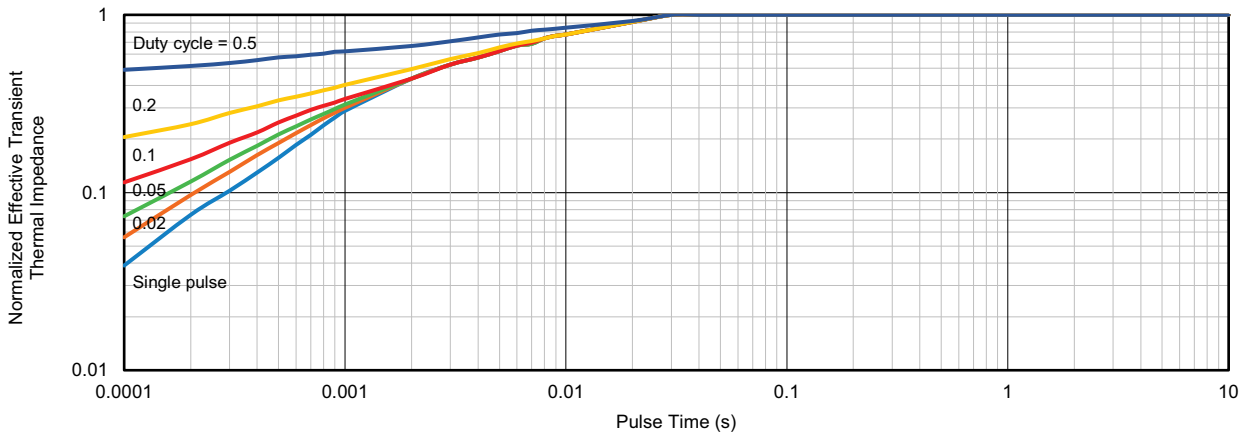
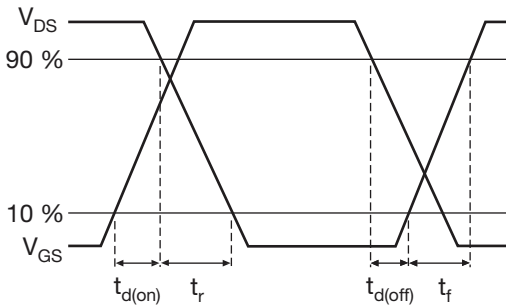
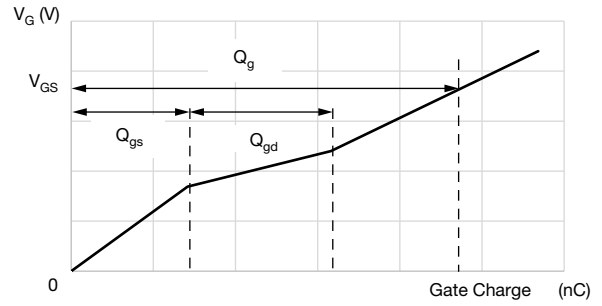


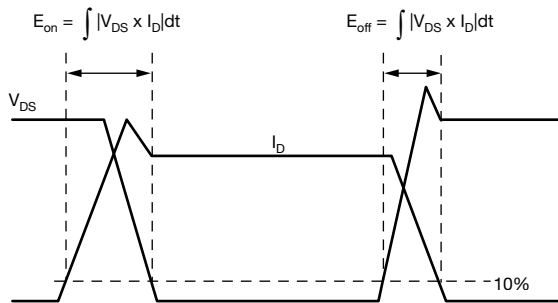
Fig. 18 - Normalized Effective Transient Thermal Impedance



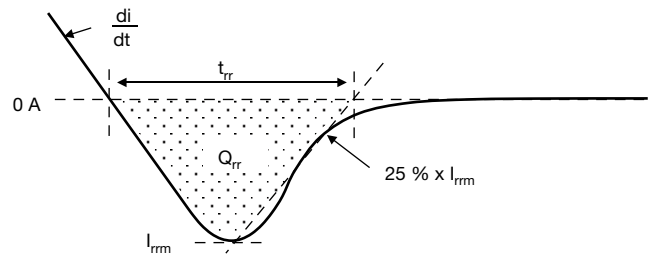
**Fig. 19 - Waveforms of Switching Time**



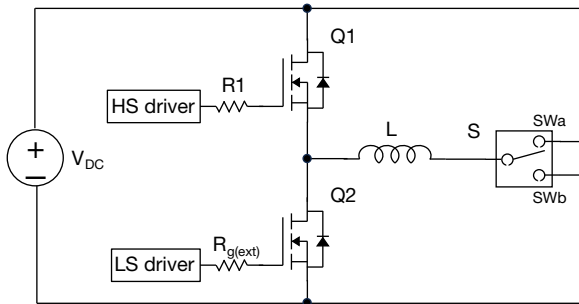
**Fig. 22 - Waveforms for Gate Charge**



**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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