

30V N-ch Power MOSFET

General Features

- Proprietary New Trench Technology
- Ultra-low Miller Charge
- $R_{DS(ON),typ.}=1.2m\Omega@V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

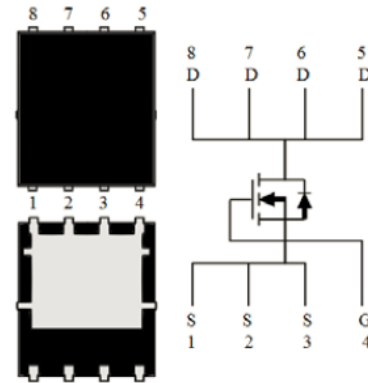
BV_{DSS}	$R_{DS(ON),max.}$	I_D
30V	1.6m Ω	35A

Applications

- High efficiency DC/DC Converters
- Synchronous Rectification
- Motor Drive

Ordering Information

PartNumber	Package	Marking
MXP31P6SG	PDFN(5x6)	MXP31P6SG



Absolute Maximum Ratings

$T_A=25^{\circ}C$ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage ^[1]	30	V
V_{GSS}	Gate-to-Source Voltage	± 20	
I_D	Continuous Drain Current at $T_C=25^{\circ}C$	181	A
	Continuous Drain Current	35	
	Continuous Drain Current at $T_A=100^{\circ}C$	22.2	
I_{DM}	Pulsed Drain Current at $V_{GS}=10V$ ^[2]	140	
E_{AS}	Single Pulse Avalanche Energy ($V_{DD}=15V, V_{GS}=10V, R_G=25\Omega, L=0.1mH$)	91	mJ
P_D	Power Dissipation at $T_C=25^{\circ}C$	104	W
	Power Dissipation	3.9	W
	Derating Factor above 25 $^{\circ}C$	0.031	W/ $^{\circ}C$
T_J & T_{STG}	Operating and Storage Temperature Range	-55 to 150	$^{\circ}C$

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.2	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	32	

Electrical Characteristics

OFF Characteristics

 $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	30			V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current			5	μA	$V_{DS}=30V, V_{GS}=0V$
I_{GSS}	Gate-to-Source Leakage Current			± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$

ON Characteristics

 $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	1.5	2.0	m Ω	$V_{GS}=4.5V, I_D=35A^{[3]}$
		--	1.2	1.6	m Ω	$V_{GS}=10V, I_D=35A^{[3]}$
$V_{GS(TH)}$	Gate Threshold Voltage	1.0	1.8	3.0	V	$V_{DS} = V_{GS}, I_D=250\mu A$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance		3900		pF	$V_{GS}=0V, V_{DS}=15V, f=1.0MHz$
C_{rss}	Reverse Transfer Capacitance		300			
C_{oss}	Output Capacitance		980			
R_G	Gate Series Resistance		1.2		Ω	$f=1.0MHz$
Q_g	Total Gate Charge		59.1		nC	$V_{DD}=15V, I_D=35A, V_{GS}=10V$
Q_g	Total Gate Charge		28.6			$V_{DD}=15V, I_D=35A, V_{GS}=4.5V$
Q_{gs}	Gate-to-Source Charge		13.5			
Q_{gd}	Gate-to-Drain (Miller) Charge		7.6			

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(on)}$	Turn-on Delay Time		25.3		ns	$V_{DD}=15V, I_D=35A, V_{GS}=10V, R_G=10\Omega$
t_{rise}	Rise Time		21.3			
$t_{d(off)}$	Turn-off Delay Time		92.5			
t_{fall}	Fall Time		55.1			

Source-Drain Body Diode Characteristics

 $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage		0.77	1.2	V	$I_S=35A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time		47.2		ns	$V_{GS}=0V, I_F=35A, di/dt=100A/\mu s$
Q_{rr}	Reverse Recovery Charge		49		nC	

Note:

 [1] $T_J=+25^\circ\text{C}$ to $+150^\circ\text{C}$

[2] Repetitive rating, pulse width limited by both maximum junction temperature.

 [3] Pulse width $\leq 380\mu s$; duty cycle $\leq 2\%$.

Typical Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

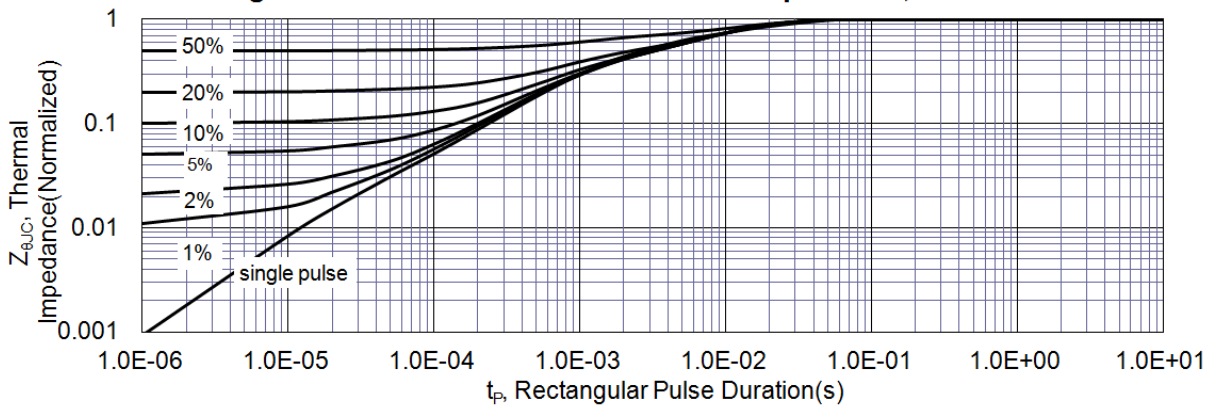


Figure 2A. Maximum Power Dissipation vs. Case Temperature

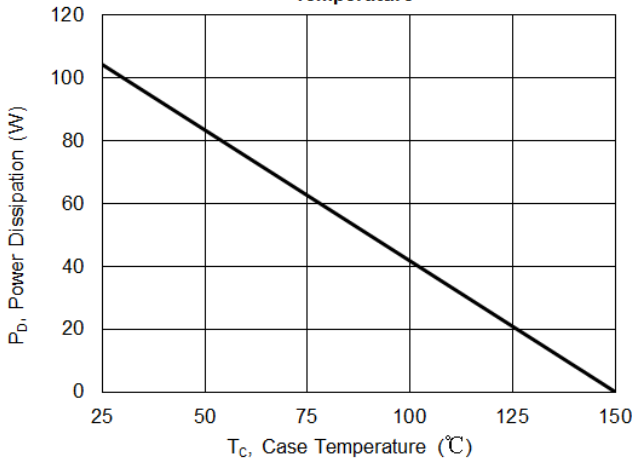


Figure 2. Maximum Power Dissipation vs. Ambient Temperature

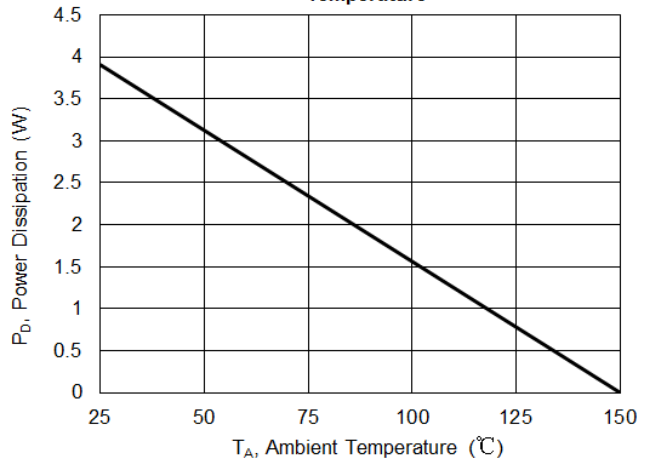


Figure 3A. Maximum Continuous Drain Current vs Case Temperature

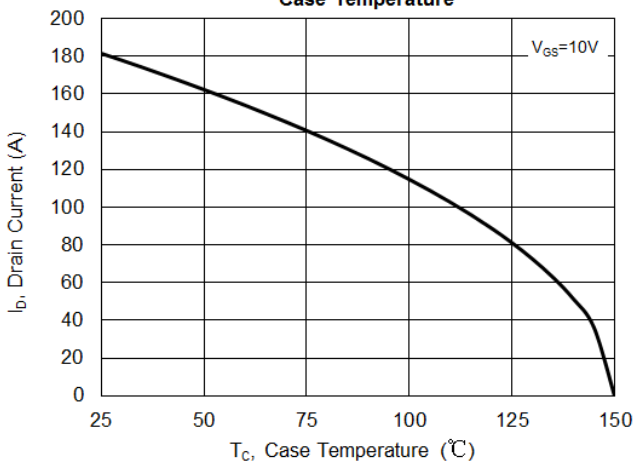


Figure 3. Maximum Continuous Drain Current vs Ambient Temperature

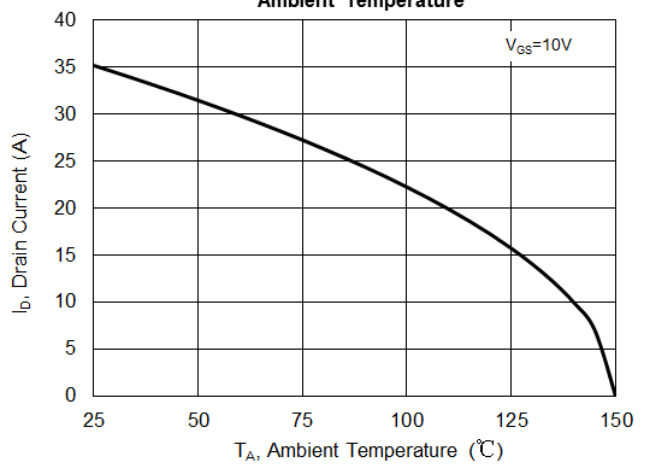


Figure 4. Typical Output Characteristics

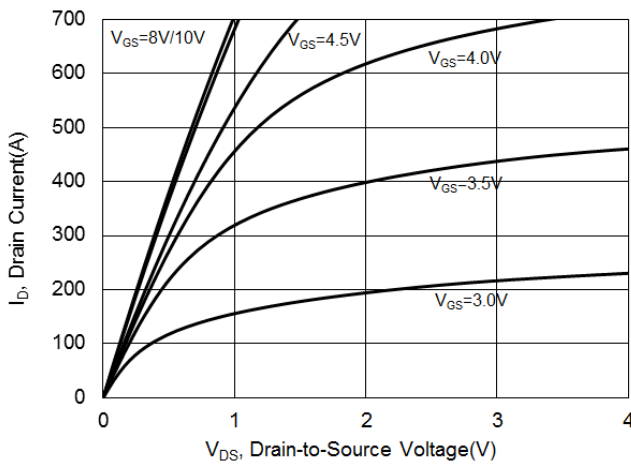


Figure 5. Typical Drain-to-Source ON Resistance vs. Gate Voltage

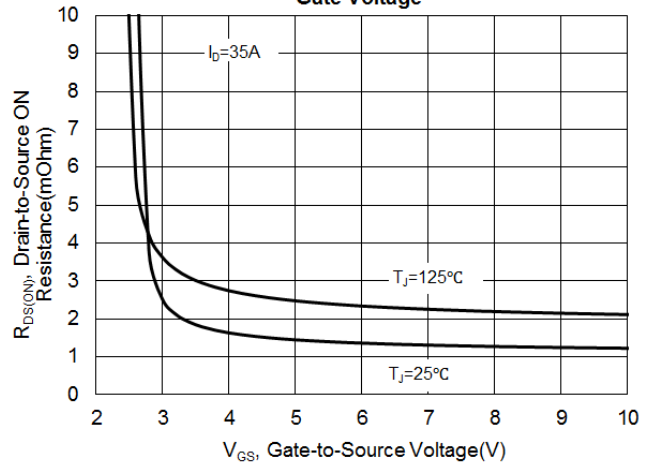


Figure 6. Maximum Peak Current Capability

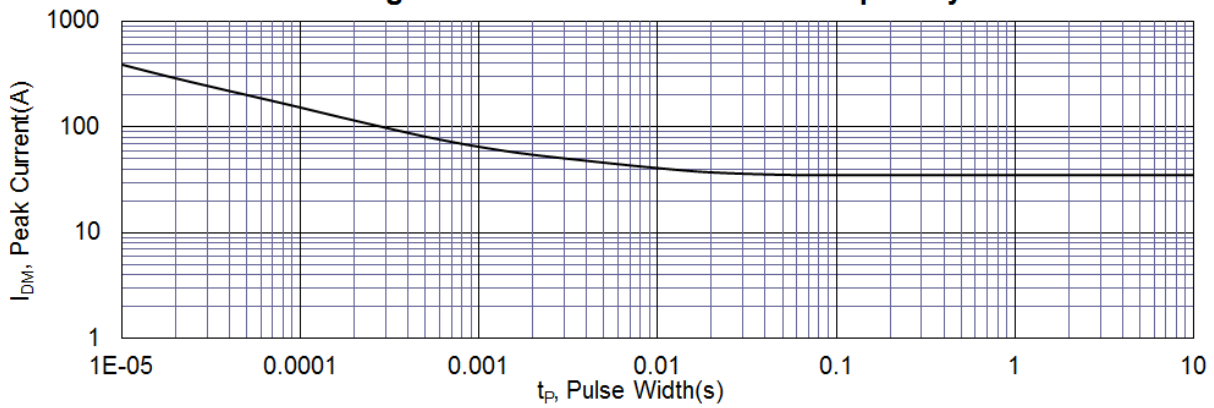


Figure 7. Typical Transfer Characteristics

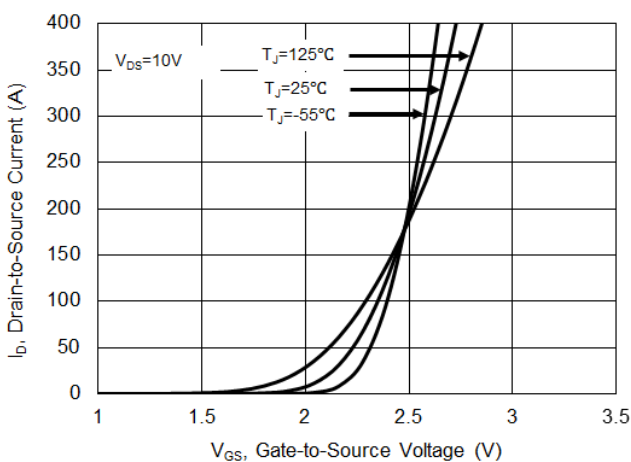


Figure 8. Unclamped Inductive Switching Capability

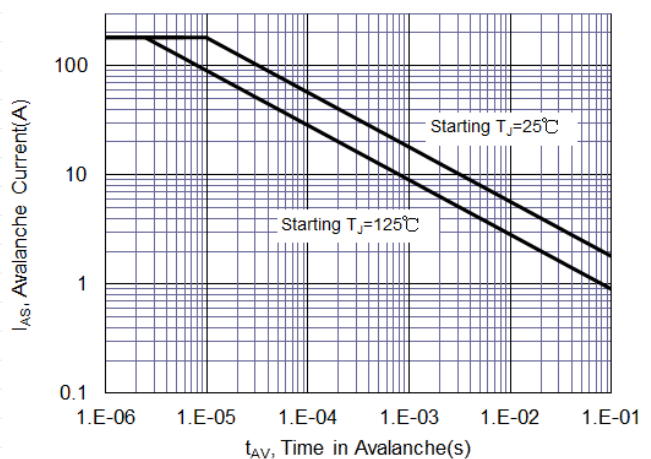


Figure 9. Typical Drain-to-Source ON Resistance

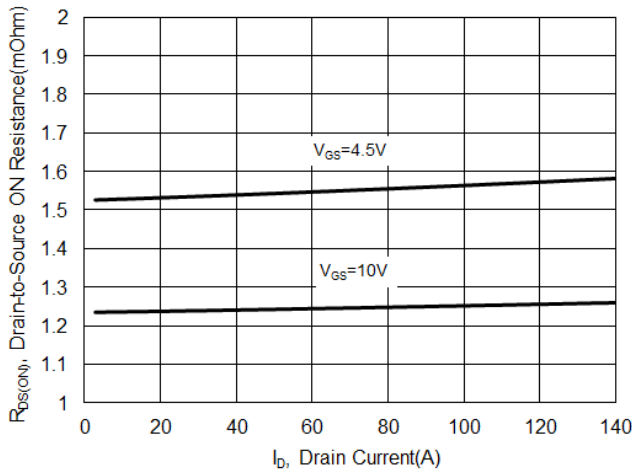


Figure 10. Typical Drain-to-Source On Resistance vs. Junction Temperature

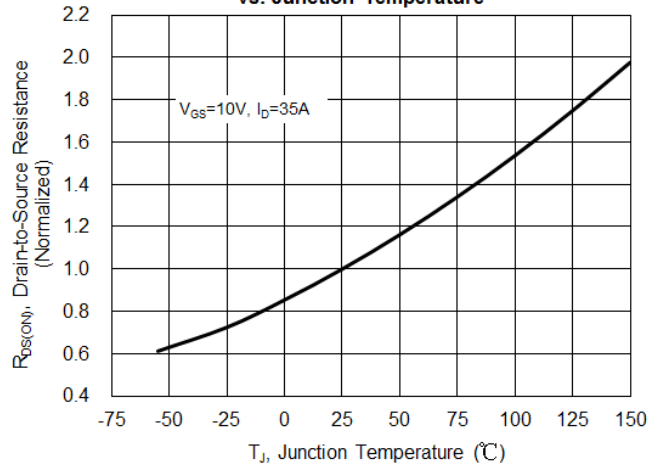


Figure 11. Typical Breakdown Voltage vs. Junction Temperature

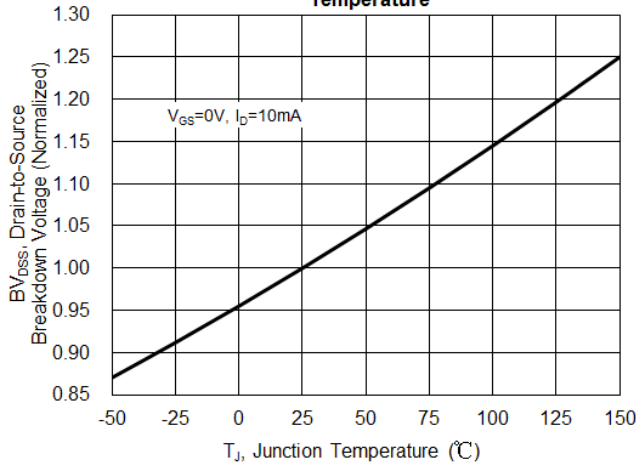


Figure 12. Typical Threshold Voltage vs. Junction Temperature

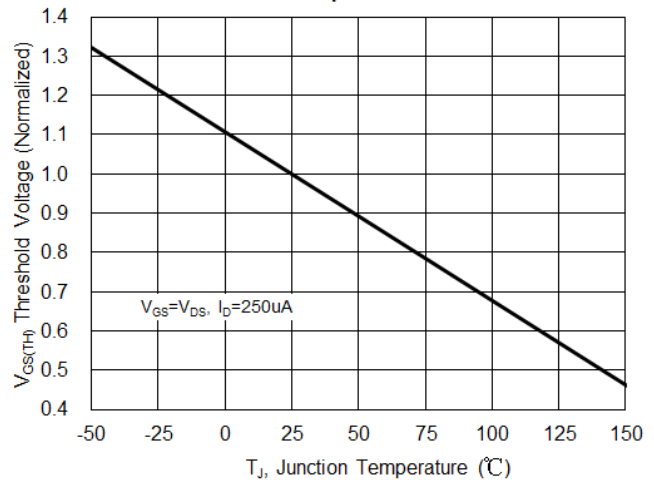


Figure 13. Maximum Forward Safe Operation Area

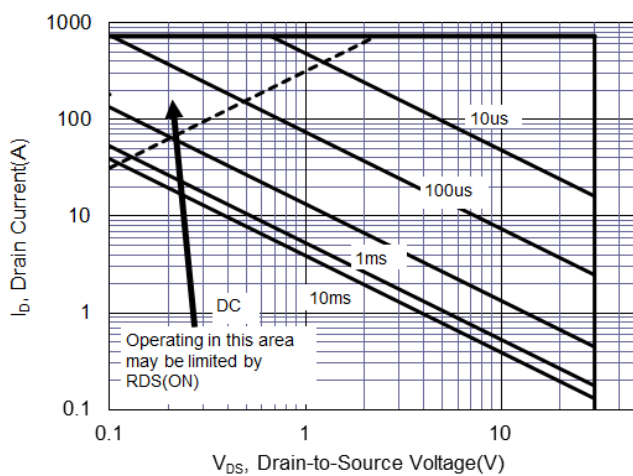


Figure 14. Typical Capacitance vs. Drain-to-Source Voltage

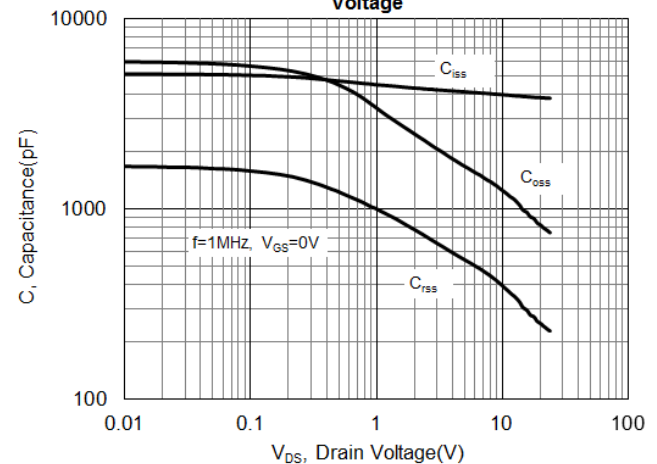


Figure 15. Typical Gate Charge vs. Gate-to-Source Voltage

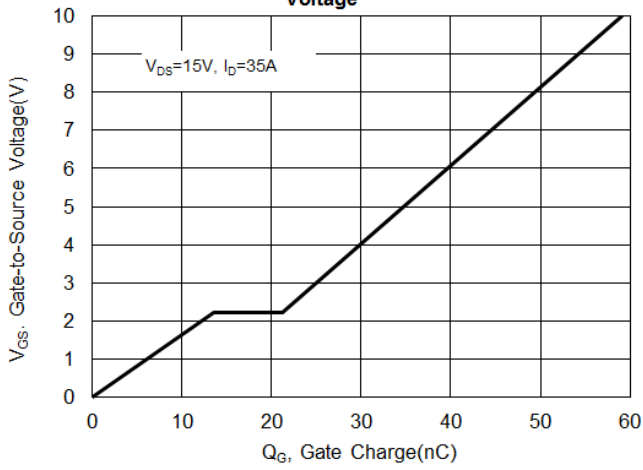
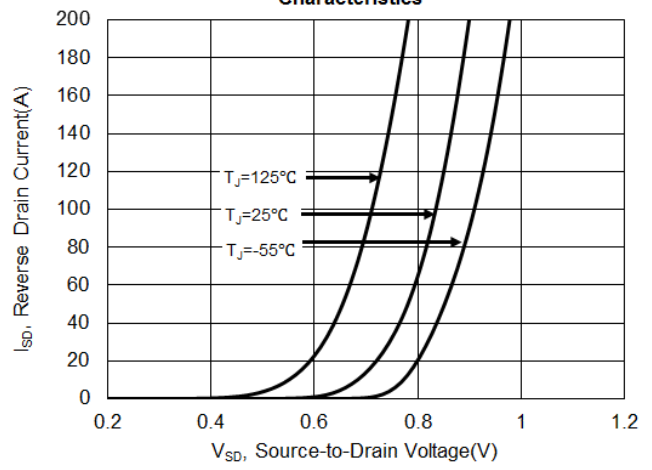


Figure 16. Typical Body Diode Transfer Characteristics



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