

# MOSFET – POWERTRENCH® N-Channel

80 V, 220 A, 3.0 mΩ

## FDBL86366-F085

### Features

- Typical  $R_{DS(on)}$  = 2.4 mΩ at  $V_{GS} = 10$  V,  $I_D = 80$  A
- Typical  $Q_{g(tot)}$  = 86 nC at  $V_{GS} = 10$  V,  $I_D = 80$  A
- UIS Capability
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- Automotive Engine Control
- PowerTrain Management
- Solenoid and Motor Drivers
- Integrated Starter/Alternator
- Primary Switch for 12 V Systems

### MOSFET MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Ratings	Unit
$V_{DSS}$	Drain-to-Source Voltage	80	V
$V_{GS}$	Gate-to-Source Voltage	±20	V
$I_D$	Drain Current – Continuous ( $V_{GS} = 10$ ), $T_C = 25^\circ\text{C}$ (Note 1)	220	A
	Pulsed Drain Current, $T_C = 25^\circ\text{C}$	See Figure 4	
$E_{AS}$	Single Pulse Avalanche Energy (Note 2)	205	mJ
$P_D$	Power Dissipation	300	W
	Derate Above $25^\circ\text{C}$	2.0	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to +175	$^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.5	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient (Note 3)	43	$^\circ\text{C}/\text{W}$

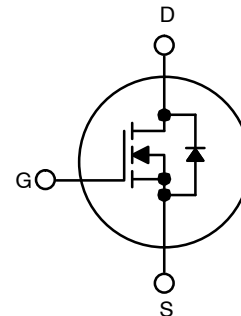
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Current is limited by silicon.
2. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.1$  mH,  $I_{AS} = 64$  A,  $V_{DD} = 80$  V during inductor charging and  $V_{DD} = 0$  V during time in avalanche.
3.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance, where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design, while  $R_{\theta JA}$  is determined by the board design. The maximum rating presented here is based on mounting on a 1 in<sup>2</sup> pad of 2oz copper.



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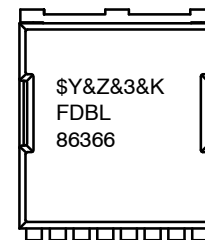


N-Channel



H-PSOF8L  
CASE 100CU

### MARKING DIAGRAM



$\$Y$  = ON Semiconductor Logo  
 $\&Z$  = Assembly Plant Code  
 $\&3$  = Numeric Date Code  
 $\&K$  = Lot Code  
 FDBL86366 = Specific Device Code

### ORDERING INFORMATION

Device	Top Mark	Package	Shipping†
FDBL86366-F085	FDBL86366	H-PSOF8L	2000 Units/ Tape&Reel

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# FDBL86366–F085

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### OFF CHARACTERISTICS

B <sub>V</sub> DSS	Drain-to-Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V	80	–	–	V	
I <sub>DSS</sub>	Drain-to-Source Leakage Current	V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V	T <sub>J</sub> = 25°C	–	–	1	μA
			T <sub>J</sub> = 175°C (Note 4)	–	–	1	mA
I <sub>GSS</sub>	Gate-to-Source Leakage Current	V <sub>GS</sub> = ±20 V	–	–	±100	nA	

### ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	2.0	3.0	4.0	V	
R <sub>DS(on)</sub>	Drain to Source on Resistance	I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V	T <sub>J</sub> = 25°C	–	2.4	3.0	mΩ
			T <sub>J</sub> = 175°C (Note 4)	–	4.9	6.1	mΩ

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, f = 1 MHz	–	6320	–	pF
C <sub>oss</sub>	Output Capacitance		–	1030	–	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		–	32	–	pF
R <sub>g</sub>	Gate Resistance	f = 1 MHz	–	2.1	–	Ω
Q <sub>g(toT)</sub>	Total Gate Charge at 10 V	V <sub>GS</sub> = 0 to 10 V V <sub>DD</sub> = 64 V, I <sub>D</sub> = 80 A	–	86	112	nC
Q <sub>g(th)</sub>	Threshold Gate Charge		V <sub>GS</sub> = 0 to 2 V	–	12	18
Q <sub>gs</sub>	Gate-to-Source Gate Charge	V <sub>DD</sub> = 64 V, I <sub>D</sub> = 80 A	–	30	–	nC
Q <sub>gd</sub>	Gate-to-Drain "Miller" Charge		–	18	–	nC

### SWITCHING CHARACTERISTICS

t <sub>on</sub>	Turn-On Time	V <sub>DD</sub> = 40 V, I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω	–	–	98	ns
t <sub>d(on)</sub>	Turn-On Delay		–	30	–	ns
t <sub>r</sub>	Rise Time		–	34	–	ns
t <sub>d(off)</sub>	Turn-Off Delay		–	40	–	ns
t <sub>f</sub>	Fall Time		–	17	–	ns
t <sub>off</sub>	Turn-Off Time		–	–	86	ns

### DRAIN-SOURCE DIODE CHARACTERISTIC

V <sub>SD</sub>	Source-to-Drain Diode Voltage	I <sub>SD</sub> = 80 A, V <sub>GS</sub> = 0 V	–	–	1.25	V
		I <sub>SD</sub> = 40 A, V <sub>GS</sub> = 0 V	–	–	1.2	V
t <sub>rr</sub>	Reverse-Recovery Time	I <sub>F</sub> = 80 A, dI <sub>SD</sub> /dt = 100 A/μs, V <sub>DD</sub> = 64 V	–	80	120	ns
Q <sub>rr</sub>	Reverse-Recovery Charge		–	95	140	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. The maximum value is specified by design at T<sub>J</sub> = 175°C. Product is not tested to this condition in production.

TYPICAL CHARACTERISTICS

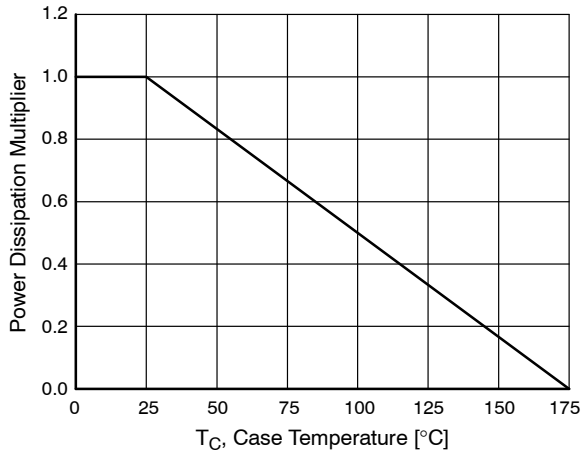


Figure 1. Normalized Power Dissipation vs. Case Temperature

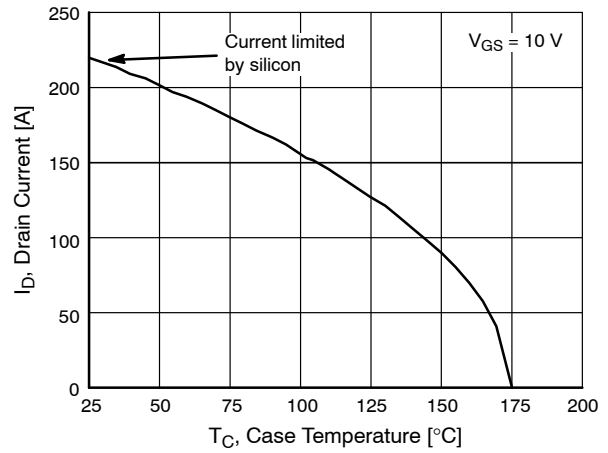


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

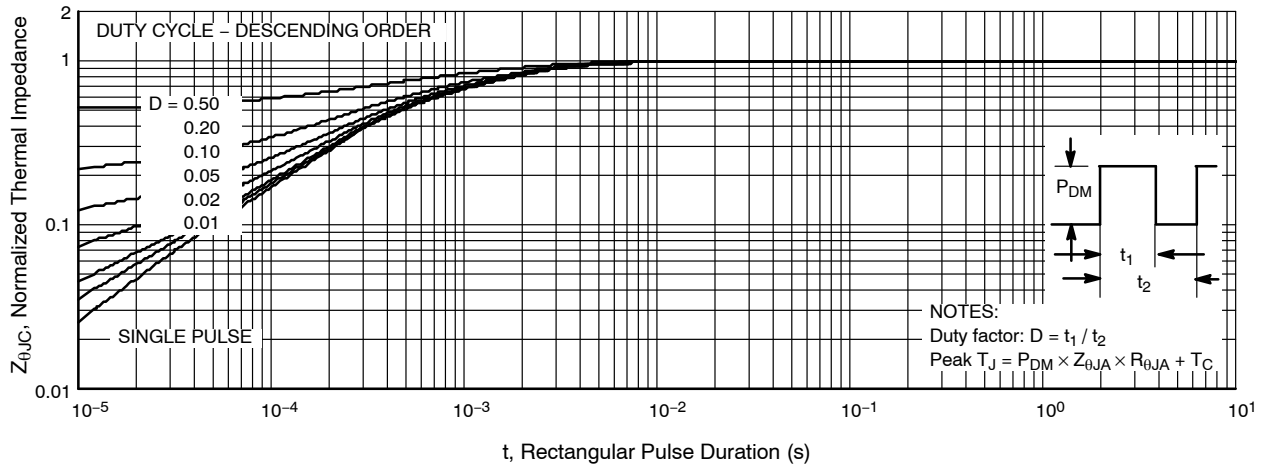


Figure 3. Normalized Maximum Transient Thermal Impedance

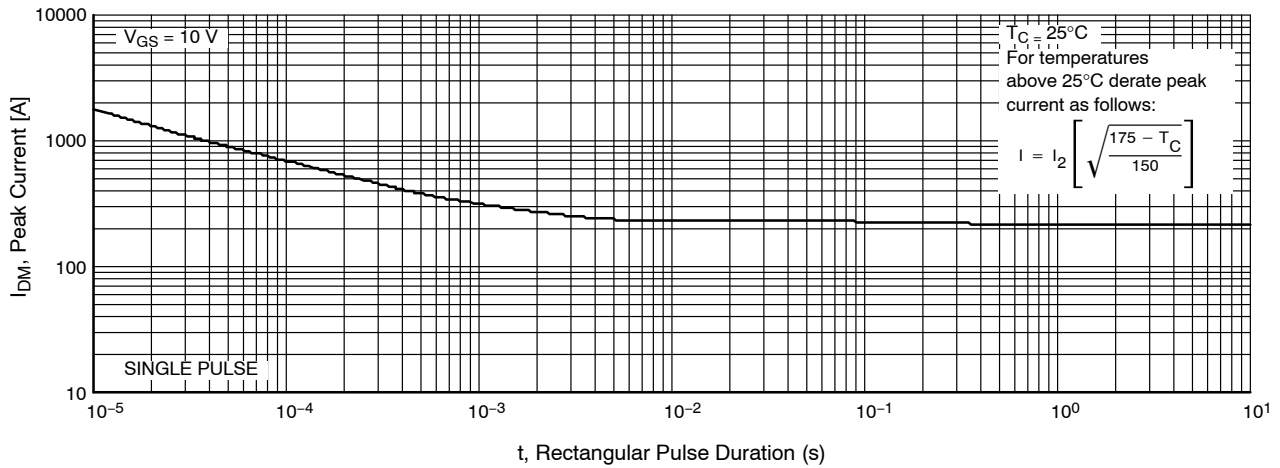


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS (continued)

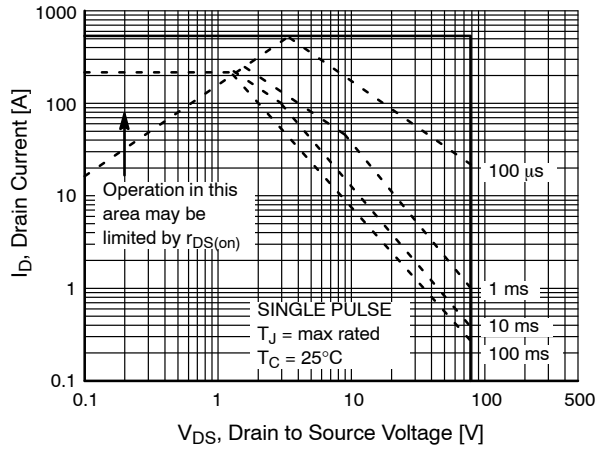
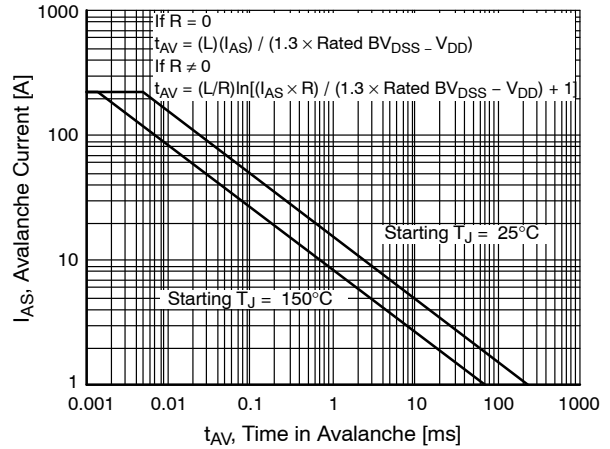


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes [AN7514](#) and [AN7515](#).

Figure 6. Unclamped Inductive Switching Capability

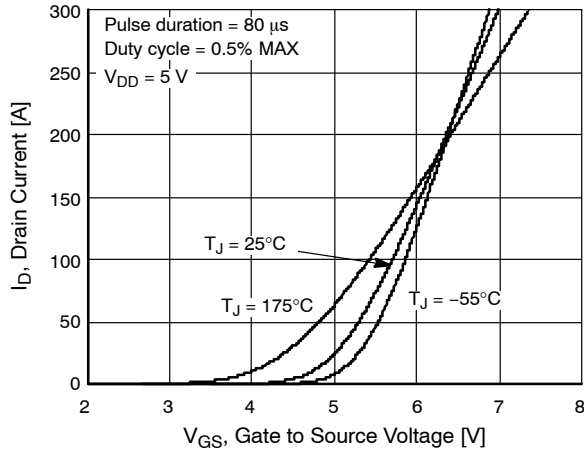


Figure 7. Transfer Characteristics

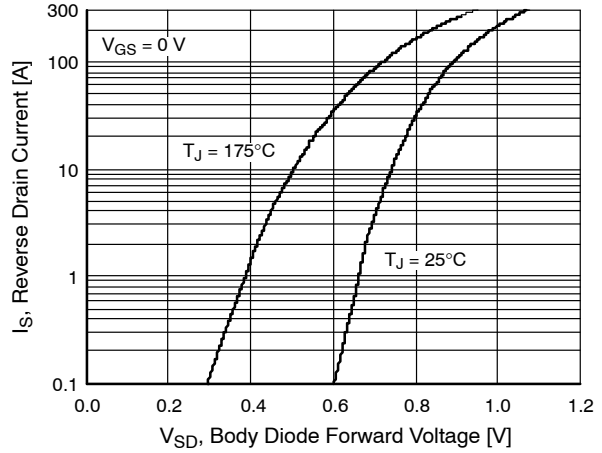


Figure 8. Forward Diode Characteristics

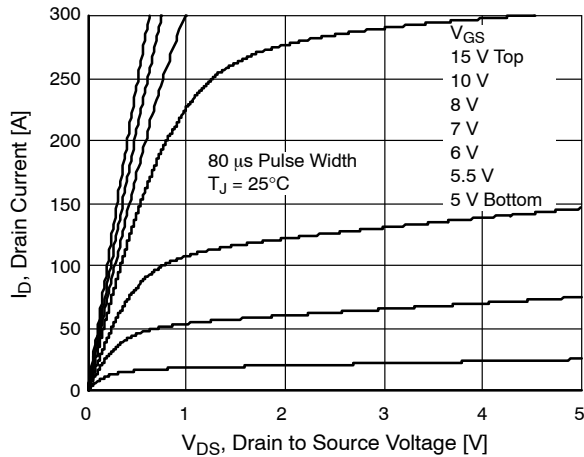


Figure 9. Saturation Characteristics

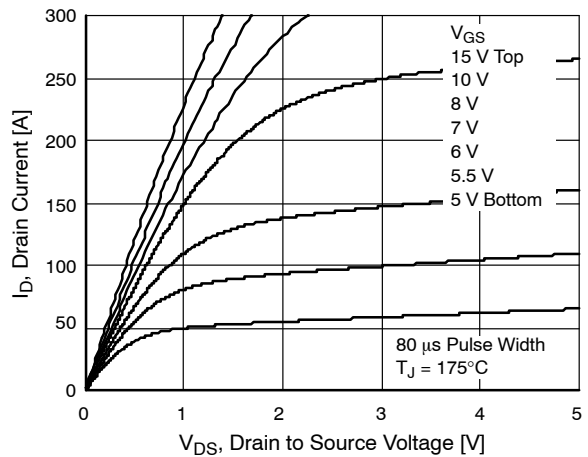


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS (continued)

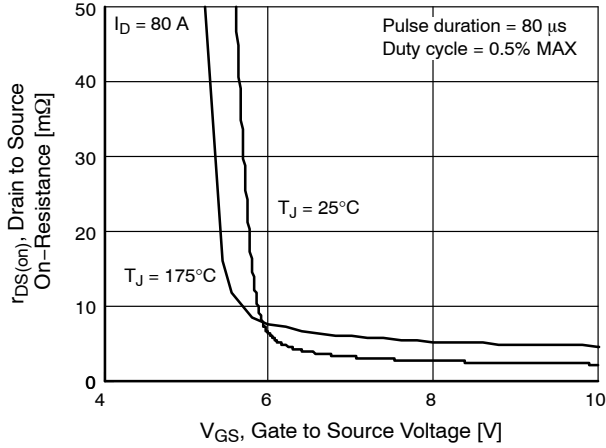


Figure 11.  $R_{DS(on)}$  vs. Gate Voltage

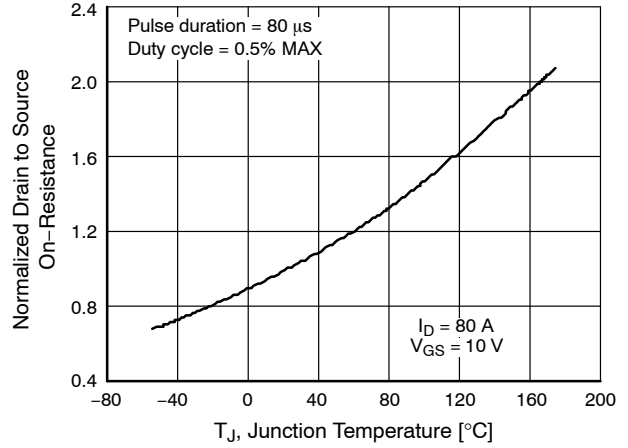


Figure 12. Normalized  $R_{DS(on)}$  vs. Junction Temperature

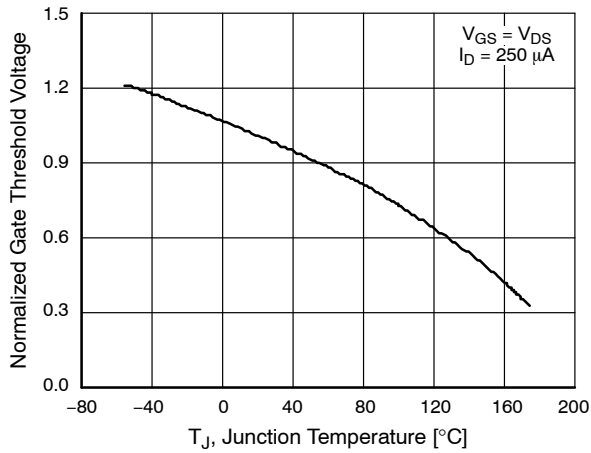


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

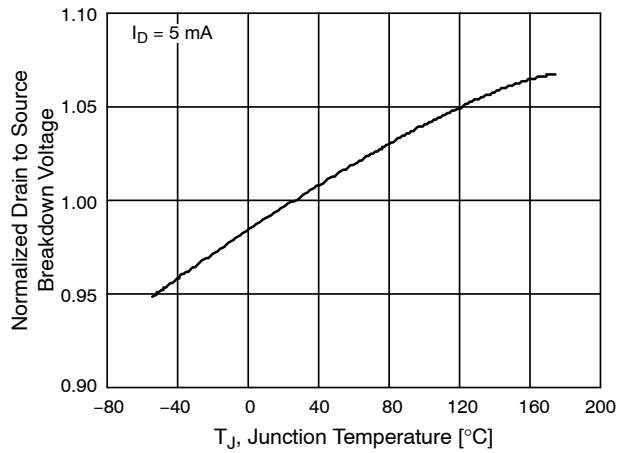


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

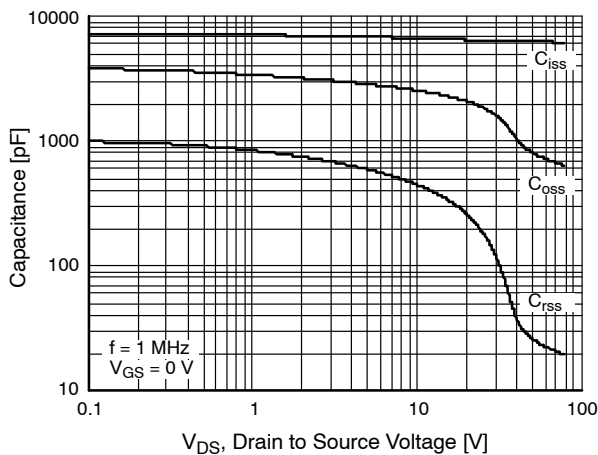


Figure 15. Capacitance vs. Drain to Source Voltage

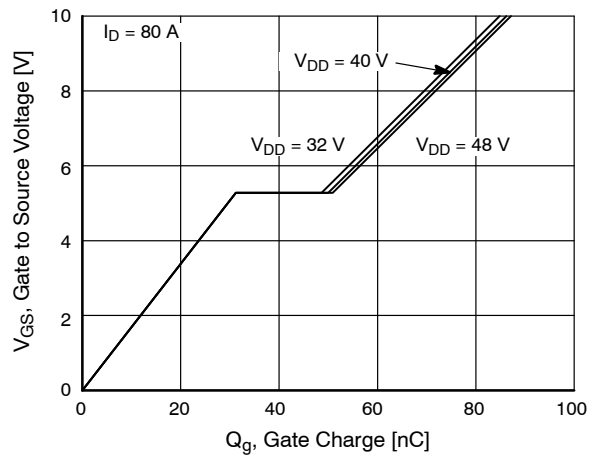


Figure 16. Gate Charge vs. Gate to Source Voltage

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