NVH025N65S3

Automotive N-Channel SUPERFET® III Easy-drive MOSFET

650 V, 75 A, 25 mΩ

ON Semiconductor®

www.onsemi.com

BV_{DSS}	$R_{DS(on)}$ MAX	I_D MAX
650 V	25 mΩ @ 10 V	75 A

Description

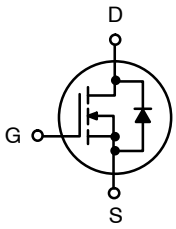
SuperFET III MOSFET is On semiconductor's brand−new high voltage super−junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on−resistance and lower gate charge performance. This advanced technology is tailored to minimize conduction loss provide superior switching performance, and with−stand extreme dv/dt rate. Consequently, SuperFET III MOSFET Easy−drive series helps manage EMI issues and allows for easier design implementation.

Features

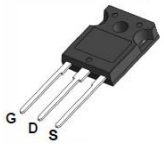
- AEC−Q101 Qualified
- Max Junction Temperature 150°C
- Typ. R_{DS}(on) = 19.9 mΩ
- Ultra Low Gate Charge (Typ. Q_G = 236 nC)
- Low Effective Output Capacitance (Typ. C_{OSS}(eff.) = 2062 pF)
- 100% Avalanche Tested

Typical Applications

- Automotive PHEV−BEV DC−DC Converter
- Automotive Onboard Charger for PHEV−BEV

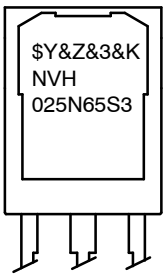


N-Channel MOSFET



TO−247−3LD
CASE 340CK

MARKING DIAGRAM



$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
NVH025N65S3	= Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, Unless otherwise specified)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		650	V
V_{GSS}	Gate to Source Voltage	DC Positive	30	V
		AC Positive, (f > 1 Hz)	30	V
		AC Negative, (f > 1 Hz)	−20	V
I_D	Drain Current	Continuous (Tc = 25°C)	75	A
		Continuous (Tc = 100°C)	65.8	A
I_{DM}	Pulsed Drain Current	Pulsed (Note 1)	300	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		2025	mJ
I_{AS}	Avalanche Current (Note 2)		15	A
E_{AR}	Repetitive Avalanche (Note 1)		5.95	mJ
dv/dt	MOSFET dv/dt		100	V/ns
	Peak Diode Recovery dv/dt (Note 3)		20	V/ns
P_D	Power Dissipation	(Tc = 25°C)	595	W
		Derate Above 25°C	4.76	W/°C
T_J,T_{STG}	Operating and Storage Temperature Range		−55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8” from Case for 5 Seconds		300	°C

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. Repetitive rating: pulse−width limited by maximum junction temperature.
2. I_{AS} = 15 A, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} < 75 A, di/dt ≤ 200 A/ms, VDD ≤ BVDSS, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta J\,C}$	Thermal Resistance, Junction to Case, Max	0.21	°C/W
$R_{\theta J\,A}$	Thermal Resistance, Junction to Ambient, Max	40	°C/W

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Marking	Package	Packing Method	Shipping (Qty / Packing)
NVH025N65S3	NVH025N65S3	TO−247 G03	Tube	30 Units / Tube

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain−to−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1 mA, T_{VJ} = 25°C	650	713	–	V
		V_{GS} = 0 V, I_D = 1 mA, T_{VJ} = 150°C	650	755	–	V
ΔBVDSS / ΔTJ	Breakdown Voltage Temperature Coefficient	I_D = 1 mA, Referenced to 25°C	–	0.34	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650 V, V_{GS} = 0 V	–	0.30	1	μA
		V_{DS} = 520 V, V_{GS} = 0 V, Tc = 125°C	–	7.92	–	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ± 30V, V_{DS} = 0 V	–	6.45	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 3.0 mA	2.5	3.56	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 37.5 A, T_J = 25°C	–	19.9	25	mΩ
		V_{GS} = 10 V, I_D = 37.5 A, T_J = 100°C	–	34.6	–	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 75 A	–	78.5	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 400 V, V_{GS} = 0 V, f = 1 MHz	–	7330	–	pF
C_{oss}	Output Capacitance		–	197	–	pF
C_{rss}	Reverse Transfer Capacitance		–	33.6	–	pF
$C_{oss(eff.)}$	Effective Output Capacitance	V_{DS} = 0 V to 400 V, V_{GS} = 0 V	–	2062	–	pF
$C_{oss(er.)}$	Energy Related Output Capacitance	V_{DS} = 0 V to 400 V, V_{GS} = 0 V	–	285	–	pF
$Q_{g(tot)}$	Total Gate Charge	V_{DS} = 400 V, V_{GS} = 10 V, I_D = 75 A (Note 4)	–	236	–	nC
Q_{gs}	Gate to Source Gate Charge		–	59.3	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	97.3	–	nC
R_G	Gate Resistance	f = 1 MHz	–	0.818	–	mΩ
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 400 V, I_D = 75 A, V_{GS} = 10 V, R_G = 2 Ω (Note 4)	–	43.3	–	ns
t_r	Turn−On Rise Time		–	109	–	ns
$t_{d(off)}$	Turn−Off Delay Time		–	120	–	ns
t_f	Fall Time		–	107	–	ns
DRAIN−SOURCE DIODE CHARACTERISTICS						
Is	Maximum Continuous Drain to Source Diode Forward Current		–	–	75	A
I_{SM}	Maximum Plused Drain to Source Diode Forward Current		–	–	300	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 37.5 A	–	0.88	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 75 A dI_F/dt = 100 A/μs	–	714	–	nS
Q_{rr}	Reverse Recovery Charge		–	26.4	–	μC

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.

TYPICAL CHARACTERISTICS

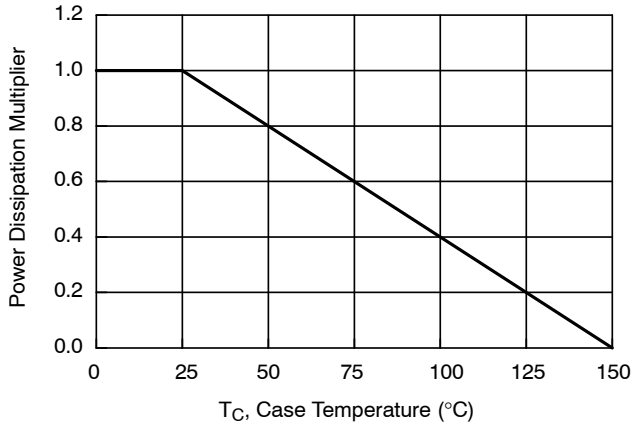


Figure 1. Normalized Power Dissipation vs. Case Temperature

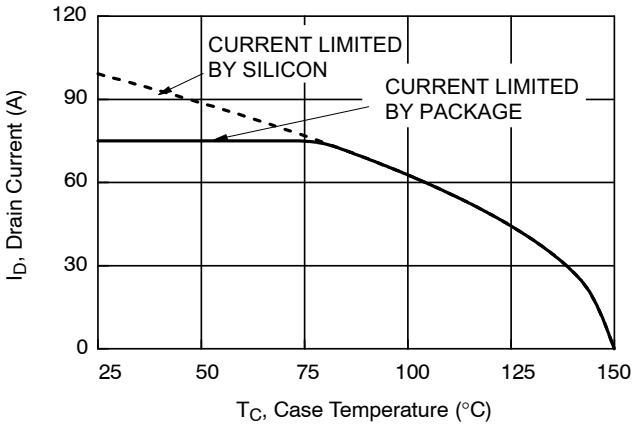


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

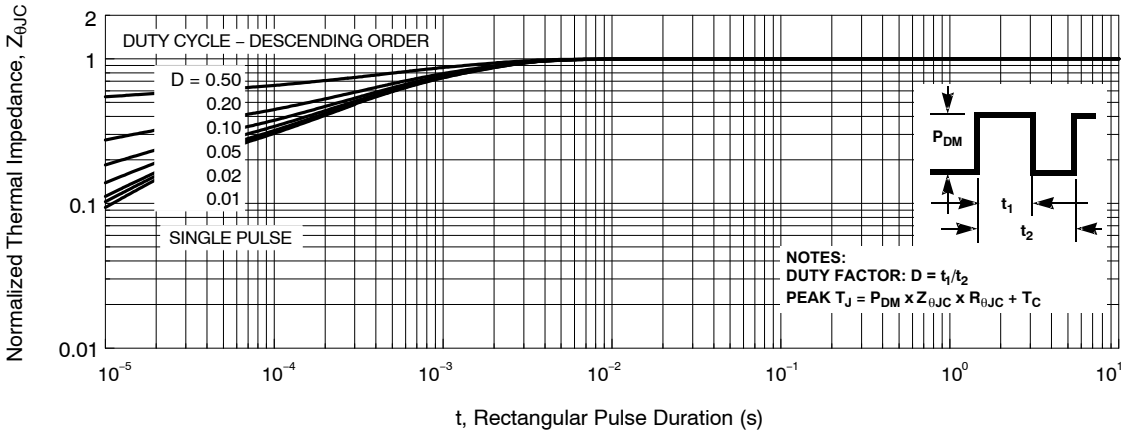


Figure 3. Normalized Maximum Transient Thermal Impedance

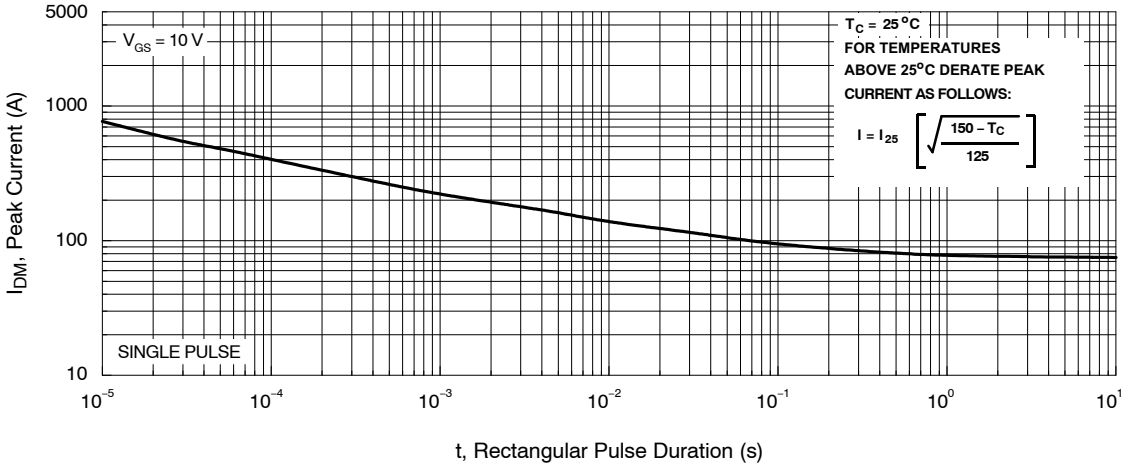


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS (continued)

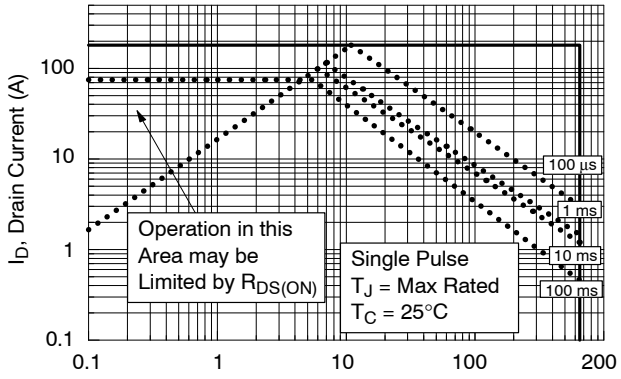
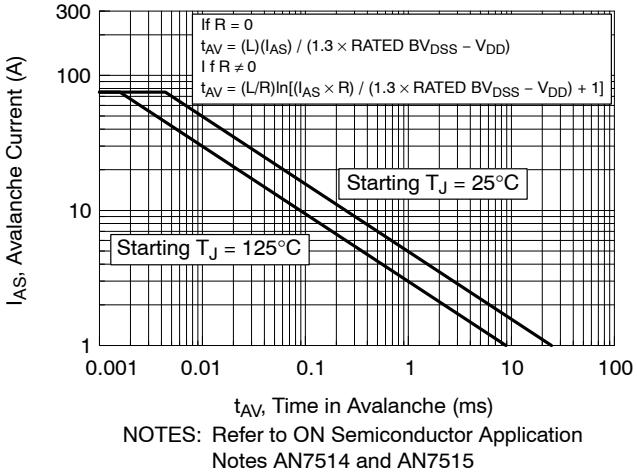


Figure 5. Forward Bias Safe Operating Area



NOTES: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

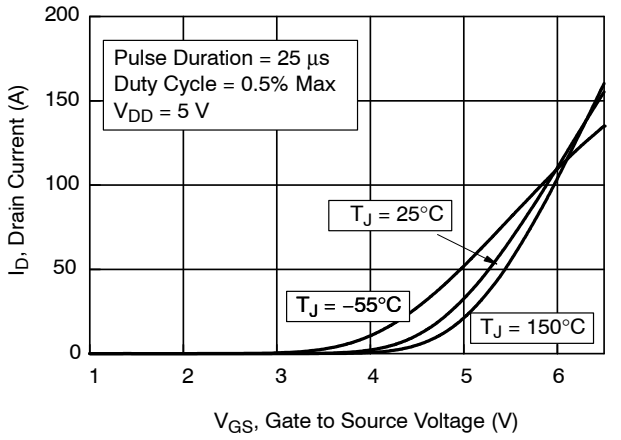


Figure 7. Transfer Characteristic

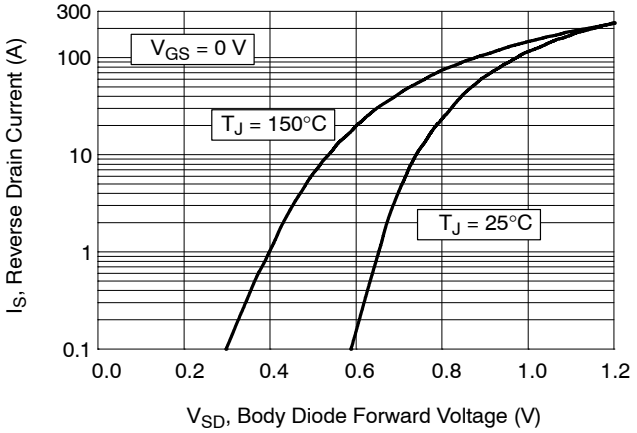


Figure 8. Forward Diode Characteristics

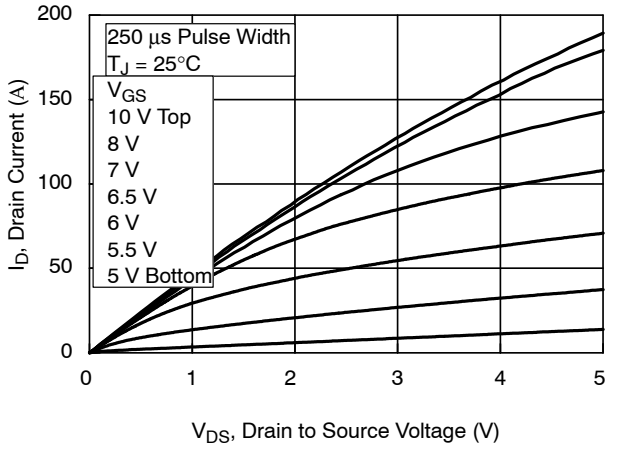


Figure 9. Saturation Characteristics

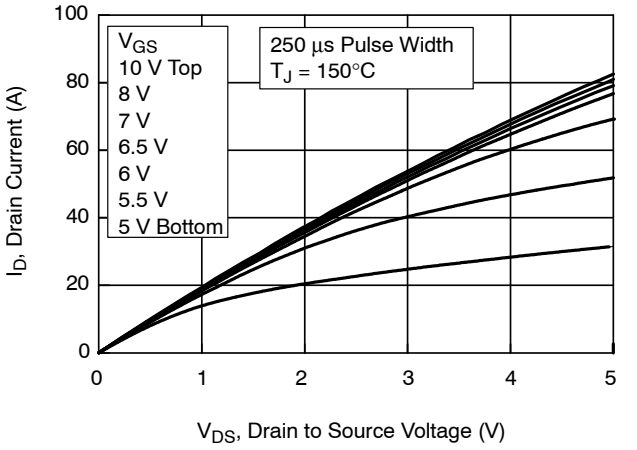


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS (continued)

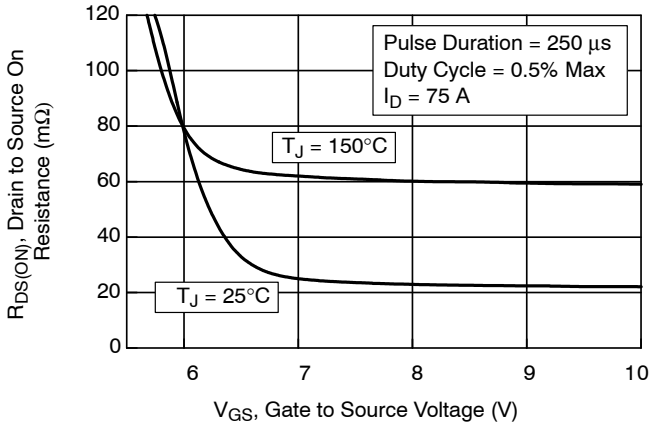


Figure 11. R_{DSON} vs. Gate Voltage

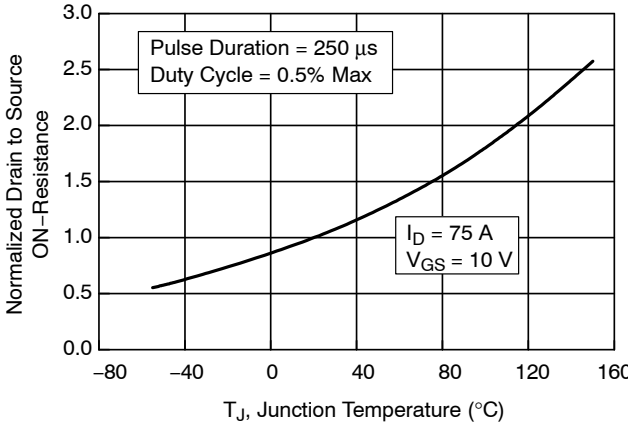


Figure 12. Normalized R_{DSON} vs. Junction Temperature

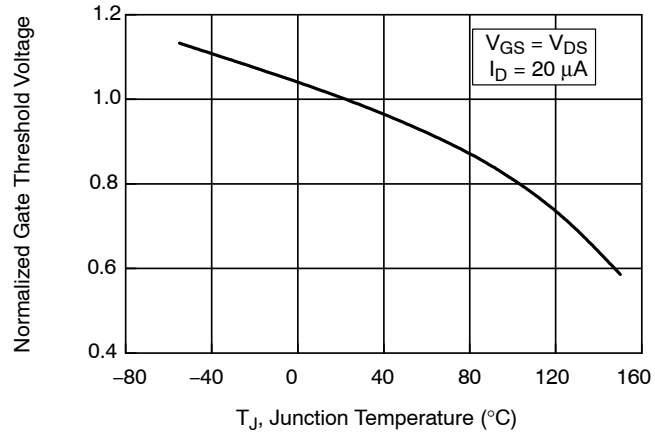


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

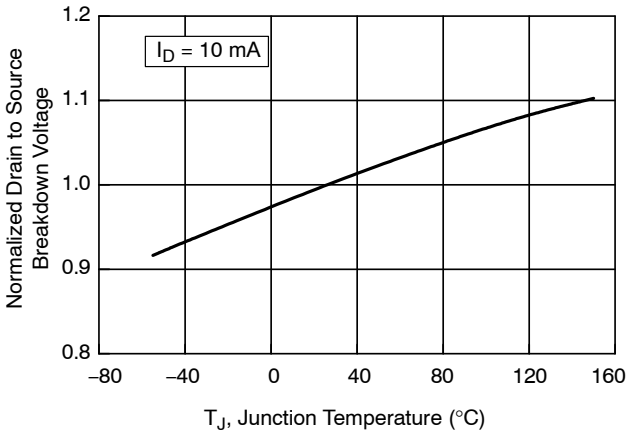


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

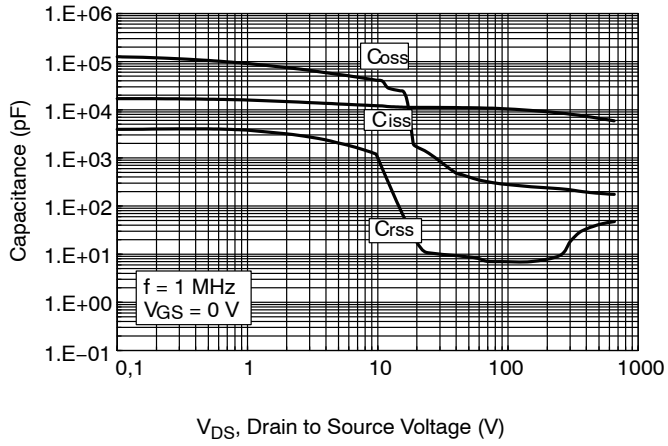


Figure 15. Capacitance vs. Drain to Source Volatage

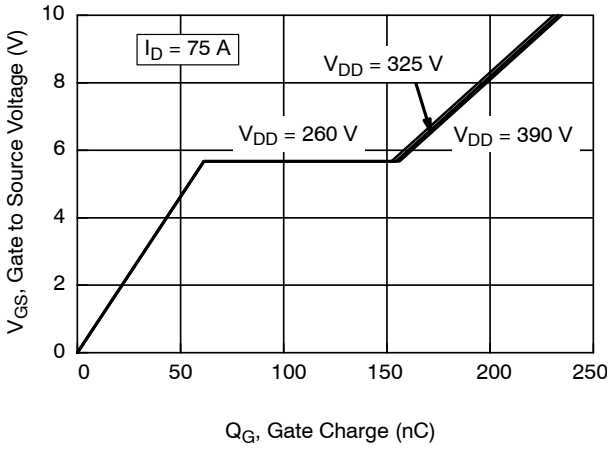


Figure 16. Gate Charge vs. Gate to Source Voltage

TYPICAL CHARACTERISTICS (continued)

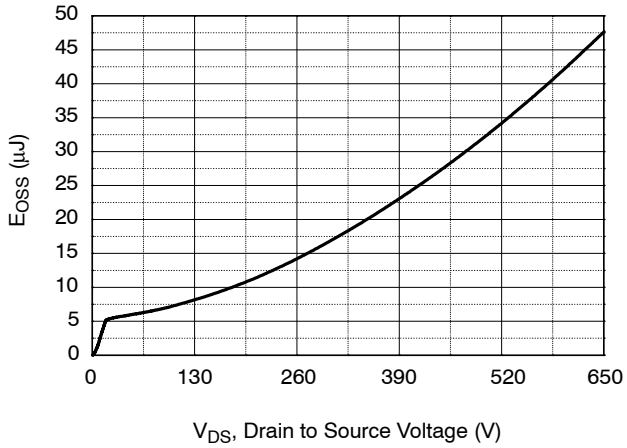


Figure 17. E_{OSS} vs. Drain to Source Voltage

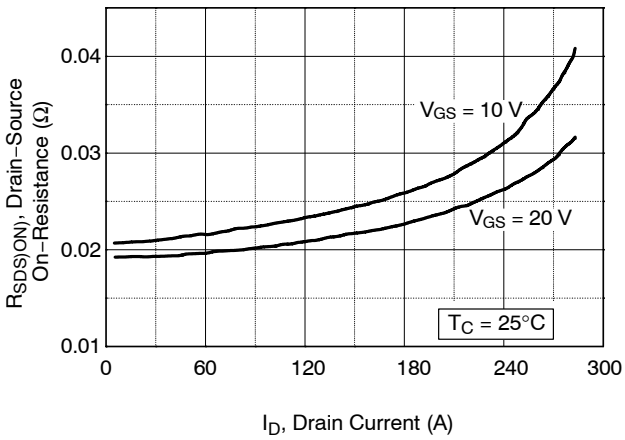
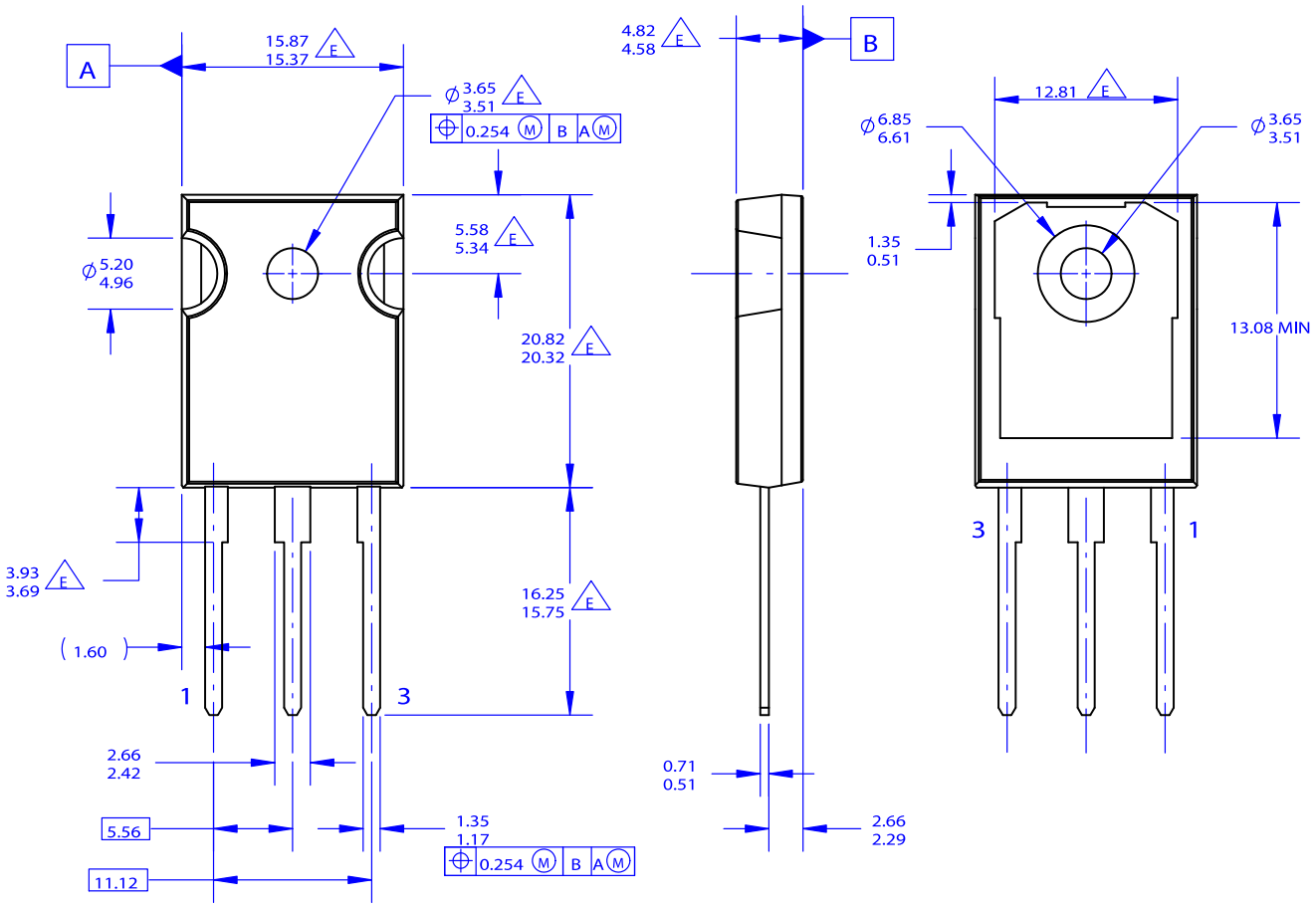


Figure 18. On−Resistance Variation vs. Drain Current and Gate Voltage

PACKAGE DIMENSIONS

TO−247−3LD
CASE 340CK
ISSUE O



NOTES: UNLESS OTHERWISE SPECIFIED.

A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DRAWING CONFORMS TO ASME Y14.5 - 1994

E DOES NOT COMPLY JEDEC STANDARD VALUE

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