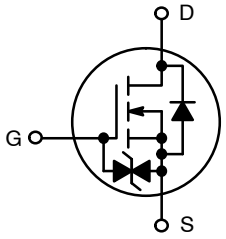
MOSFET - Power, Single N-Channel, SUPERFET®, with Zener Diode, DPAK

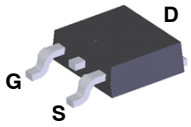
600 V, 280 mΩ, 13 A

NTD280N60S5Z

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
600 V	280 mΩ @ V_{GS} = 10 V	13 A



N−CHANNEL MOSFET



DPAK
CASE 369AS

Description

SUPERFET V MOSFET Easy Drive series combines excellent switching performance without sacrificing ease of use and EMI issues for both hard and soft switching topologies.

Features

- 650 V @ T_J = 150°C, Typ.
- $R_{DS(on)}$ = 224 mΩ
- 100% Avalanche Tested
- Pb−Free, Halogen Free / BFR Free and are RoHS Compliant

Applications

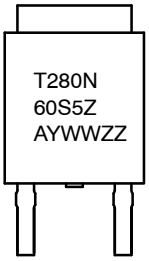
- Computing / Display Power Supplies
- Telecom / Server Power Supplies
- Lighting / Charger / Adapter / Industrial Power Supplies

ABSOLUTE MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	600	V
Gate−to−Source Voltage	DC	V_{GS}	±20	V
	AC (f > 1 Hz)		±20	
Continuous Drain Current	T_C = 25°C	I_D	13	A
	T_C = 100°C		8	
Power Dissipation	T_C = 25°C	P_D	89	W
Pulsed Drain Current (Note 1)	T_C = 25°C	I_{DM}	39	A
Pulsed Source Current (Body Diode) (Note 1)		I_{SM}	39	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode)		I_S	13	A
Single Pulse Avalanche Energy	I_L = 2.9 A, R_G = 25 Ω	E_{AS}	82	mJ
Avalanche Current		I_{AS}	2.9	A
Repetitive Avalanche Energy (Note 1)		E_{AR}	0.89	mJ
MOSFET dv/dt		dv/dt	120	V/ns
Peak Diode Recovery dv/dt (Note 2)			50	
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)		T_L	260	°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.
*Drain current limited by maximum junction temperature.
1. Repetitive rating: pulse−width limited by maximum junction temperature.
2. I_{SD} ≤ 5.5 A, di/dt ≤ 200 A/s, V_{DD} ≤ 400 V, starting T_J = 25°C.

MARKING DIAGRAM



T280N60S5Z = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Lot Code

ORDERING INFORMATION

Device	Package	Shipping†
NTD280N60S5Z	DPAK (Pb−Free)	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	1.4	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	52	

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA, T_J = 25°C	600	–	–	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D = 10 mA, Referenced to 25°C	–	630	–	mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 600 V, T_J = 25°C	–	–	1	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±5	μA
ON CHARACTERISTICS						
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 5.5 A, T_J = 25°C	–	224	280	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS} = V_{DS}, I_D = 1 mA, T_J = 25°C	2.4	–	4	V
Forward Trans−conductance	g_{FS}	V_{DS} = 20 V, I_D = 5.5 A	–	10.6	–	S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{DS} = 400 V, V_{GS} = 0 V, f = 250 kHz	–	978	–	pF
Output Capacitance	C_{OSS}		–	16.8	–	
Time Related Output Capacitance	$C_{OSS(tr)}$	I_D = Constant, V_{DS} = 0 V to 400 V, V_{GS} = 0 V	–	276	–	
Energy Related Output Capacitance	$C_{OSS(er)}$	V_{DS} = 0 V to 400 V, V_{GS} = 0 V	–	30.5	–	
Total Gate Charge	$Q_{G(TOT)}$	V_{DD} = 400 V, I_D = 5.5 A, V_{GS} = 10 V	–	17.9	–	nC
Gate−to−Source Charge	Q_{GS}		–	4.53	–	
Gate−to−Drain Charge	Q_{GD}		–	4.8	–	
Gate Resistance	R_G	f = 1 MHz	–	5.11	–	Ω
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(ON)}$	V_{GS} = 0/10 V, V_{DD} = 400 V, I_D = 5.5 A, R_G = 12 Ω	–	15.5	–	ns
Rise Time	t_r		–	4.27	–	
Turn-Off Delay Time	$t_{d(OFF)}$		–	52	–	
Fall Time	t_f		–	4.53	–	
SOURCE−TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	I_{SD} = 5.5 A, V_{GS} = 0 V, T_J = 25°C	–	–	1.2	V
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_{SD} = 5.5 A, dI/dt = 100 A/μs, V_{DD} = 400 V	–	229	–	ns
Reverse Recovery Charge	Q_{RR}		–	2114	–	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.

TYPICAL CHARACTERISTICS

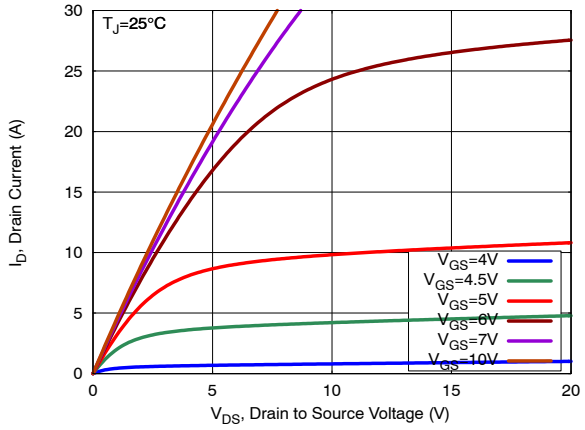


Figure 1. On−Region Characteristics

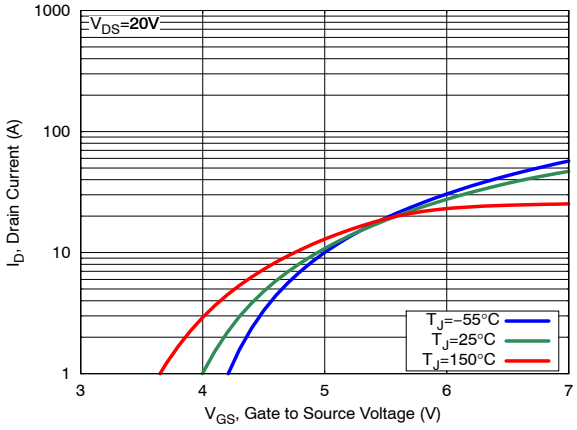


Figure 2. Transfer Characteristics

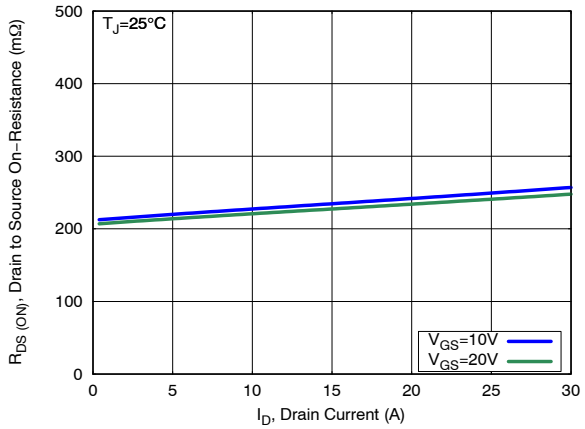


Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

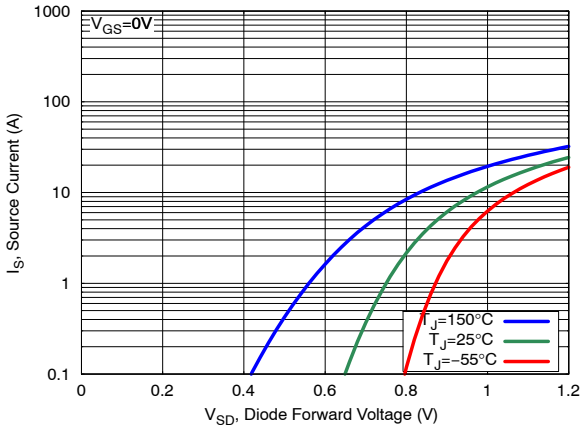


Figure 4. Diode Forward Voltage vs. Source Current

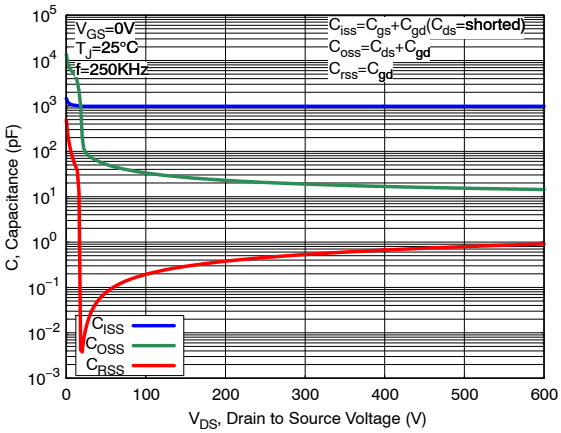


Figure 5. Capacitance Characteristics

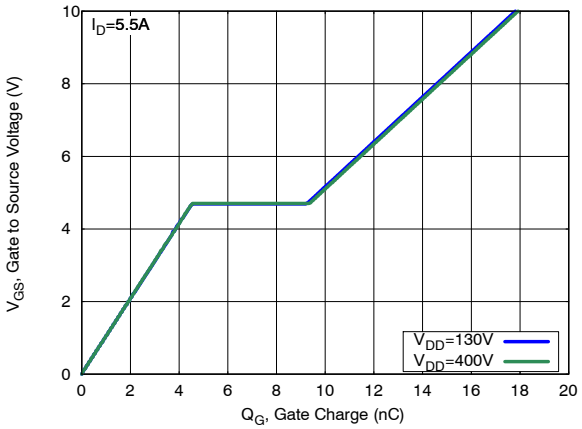


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS

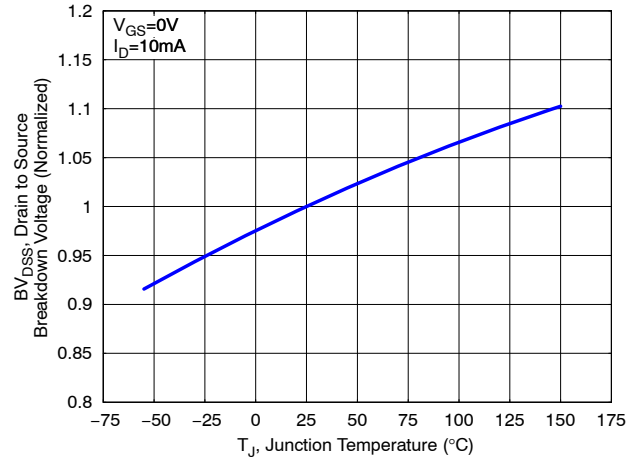


Figure 7. Breakdown Voltage Variation vs. Temperature

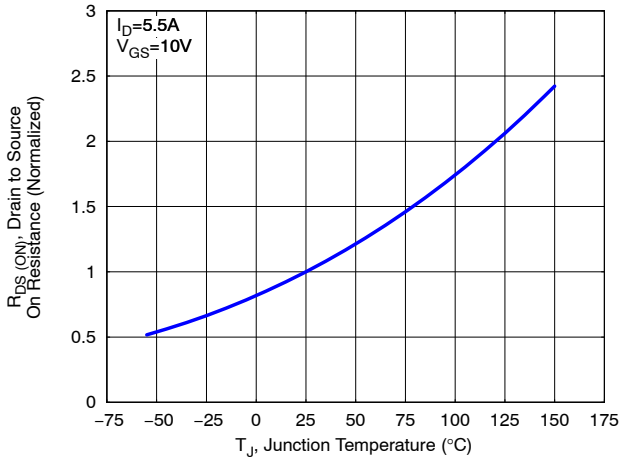


Figure 8. On−Resistance Variation vs. Temperature

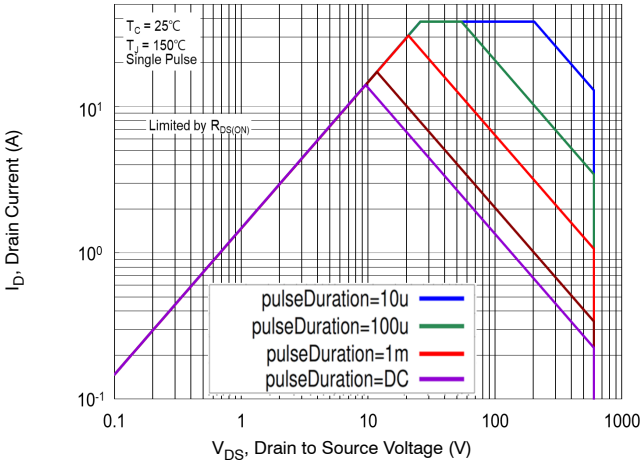


Figure 9. Maximum Safe Operating Area

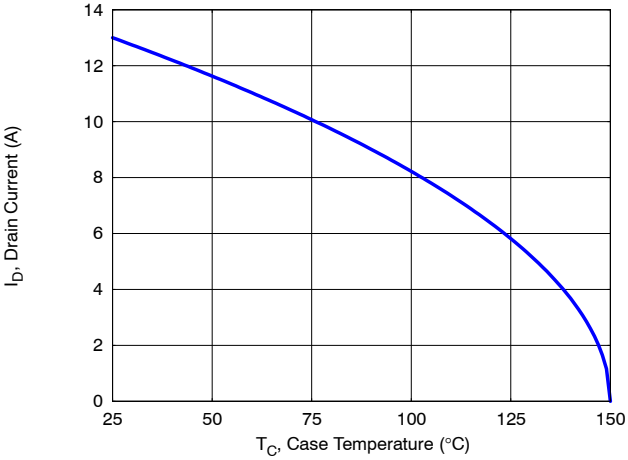


Figure 10. Maximum Drain Current vs. Case Temperature

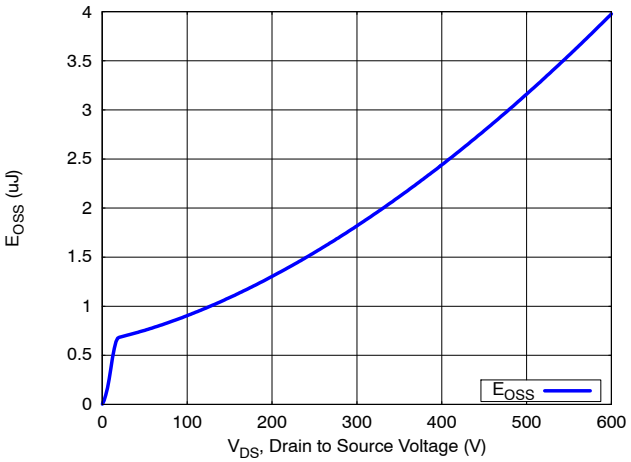


Figure 11. Eoss vs. Drain−to−Source Voltage

TYPICAL CHARACTERISTICS

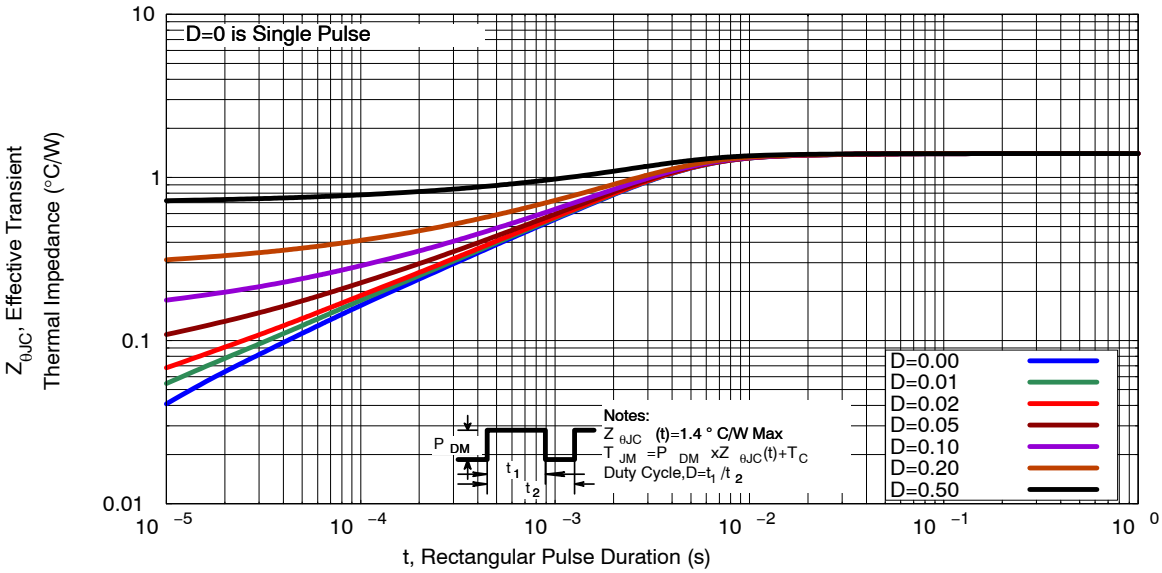
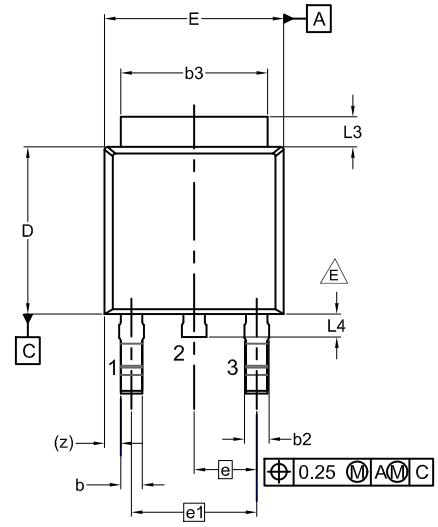


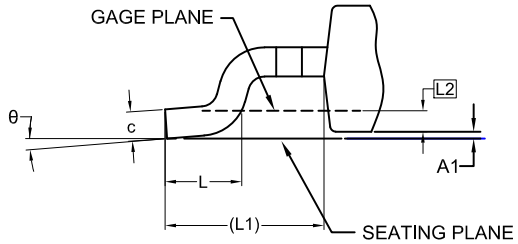
Figure 12. Transient Thermal Impedance

PACKAGE DIMENSIONS

DPAK3 (TO−252 3 LD)
CASE 369AS
ISSUE A



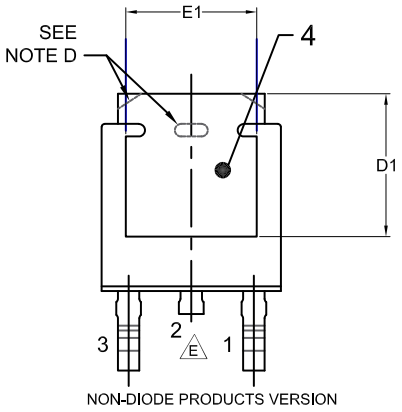
NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
E) FOR DIODE PRODUCTS, L4 IS 0.25 MM MAX.
F) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.

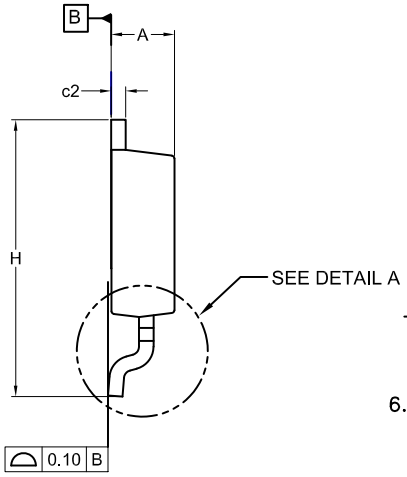


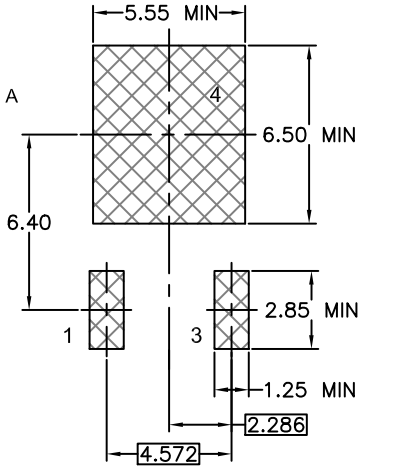
DETAIL A
(ROTATED -90°)
SCALE: 12X

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	2.18	2.29	2.39
A1	0.00	-	0.127
b	0.64	0.77	0.89
b2	0.76	0.95	1.14
b3	5.21	5.34	5.46
c	0.45	0.53	0.61
c2	0.45	0.52	0.58
D	5.97	6.10	6.22
D1	5.21	—	—
E	6.35	6.54	6.73
E1	4.32	—	—
e	2.286 BSC		
e1	4.572 BSC		
H	9.40	9.91	10.41
L	1.40	1.59	1.78
L1	2.90 REF		
L2	0.51 BSC		
L3	0.89	1.08	1.27
L4	—	—	1.02
θ	0°	--	10°

NON-DIODE PRODUCTS VERSION







LAND PATTERN RECOMMENDATION

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

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