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# FDD4243

## 40V P-Channel PowerTrench<sup>®</sup> MOSFET

-40V, -14A, 44mΩ

### Features

- Max  $r_{DS(on)}$  = 44mΩ at  $V_{GS} = -10V$ ,  $I_D = -6.7A$
- Max  $r_{DS(on)}$  = 64mΩ at  $V_{GS} = -4.5V$ ,  $I_D = -5.5A$
- High performance trench technology for extremely low  $r_{DS(on)}$
- RoHS Compliant

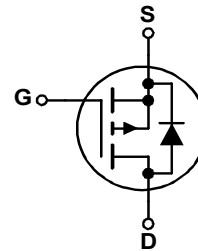
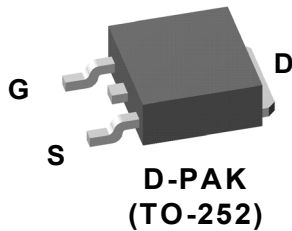


### General Description

This P-Channel MOSFET has been produced using Fairchild Semiconductor's proprietary PowerTrench<sup>®</sup> technology to deliver low  $r_{DS(on)}$  and optimized  $Bvdss$  capability to offer superior performance benefit in the applications.

### Application

- Inverter
- Power Supplies



### MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Conditions	Ratings	Units
$V_{DS}$	Drain to Source Voltage		-40	V
$V_{GS}$	Gate to Source Voltage		±20	V
$I_D$	Drain Current	-Continuous (Package limited) $T_C = 25^\circ C$	-14	A
		-Continuous (Silicon limited) $T_C = 25^\circ C$ (Note 1)	-24	
		-Continuous $T_A = 25^\circ C$ (Note 1a)	-6.7	
		-Pulsed	-60	
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	84	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ C$	42	W
	Power Dissipation	(Note 1a)	3	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range		-55 to +150	$^\circ C$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		3.0	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	40	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD4243	FDD4243	D-PAK(TO-252)	13"	16mm	2500 units

## Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$	-40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-32		$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -32\text{V}$ , $V_{GS} = 0\text{V}$ $T_J = 125^\circ\text{C}$			-1 -100	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250\mu\text{A}$	-1.4	-1.6	-3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$		4.7		$\text{mV}/^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -10\text{V}, I_D = -6.7\text{A}$		36	44	$\text{m}\Omega$
		$V_{GS} = -4.5\text{V}, I_D = -5.5\text{A}$		48	64	
		$V_{GS} = -10\text{V}, I_D = -6.7\text{A}, T_J = 125^\circ\text{C}$		53	69	
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{V}, I_D = -6.7\text{A}$		16		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$		1165	1550	pF
$C_{oss}$	Output Capacitance			165	220	pF
$C_{rss}$	Reverse Transfer Capacitance			90	135	pF
$R_g$	Gate Resistance		$f = 1\text{MHz}$		4	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -20\text{V}, I_D = -6.7\text{A}$ $V_{GS} = -10\text{V}, R_{GEN} = 6\Omega$		6	12	ns
$t_r$	Rise Time			15	26	ns
$t_{d(off)}$	Turn-Off Delay Time			22	35	ns
$t_f$	Fall Time			7	14	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V		$V_{DD} = -20\text{V}, I_D = -6.7\text{A}$		21	29
$Q_{gs}$	Gate to Source Gate Charge	$V_{GS} = -10\text{V}$		3.4		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			4		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -6.7\text{A}$ (Note 2)		0.86	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = -6.7\text{A}, di/dt = 100\text{A}/\mu\text{s}$		29	43	ns
$Q_{rr}$	Reverse Recovery Charge			30	44	nC

#### Notes:

1:  $R_{\theta JA}$  is sum of 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  $R_{\theta JC}$  is determined by the user's board design.

a.  $40^\circ\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper

b.  $96^\circ\text{C}/\text{W}$  when mounted on a minimum pad.

2: Pulse Test: Pulse Width <  $300\mu\text{s}$ , Duty cycle < 2.0%.

3: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 7.5\text{A}$ ,  $V_{DD} = 40\text{V}$ ,  $V_{GS} = 10\text{V}$ .

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

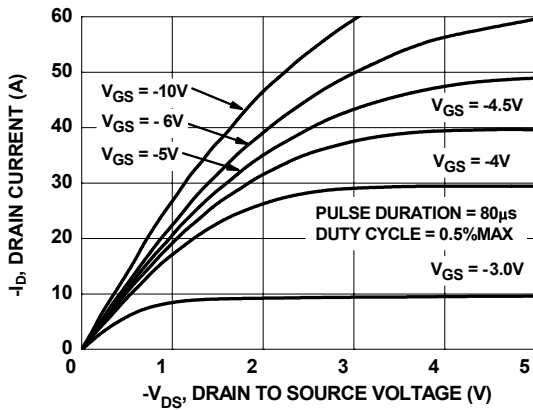


Figure 1. On Region Characteristics

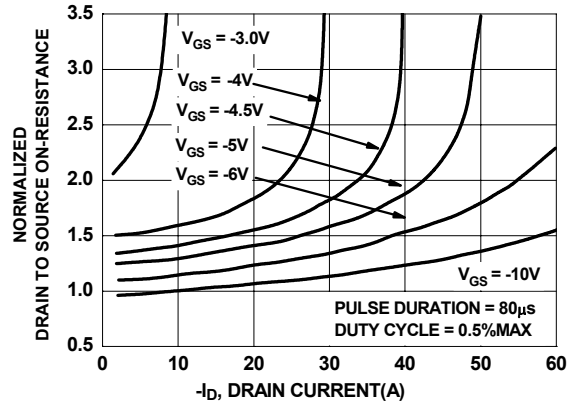


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

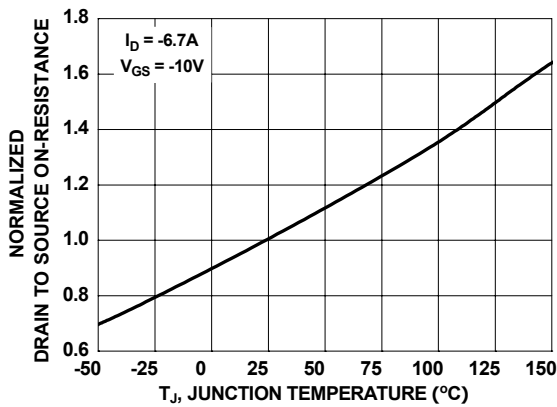


Figure 3. Normalized On Resistance vs Junction Temperature

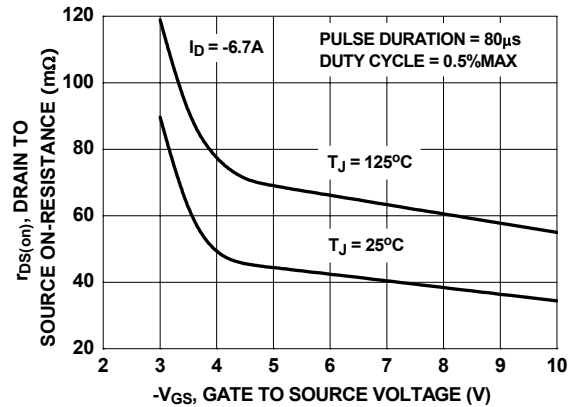


Figure 4. On-Resistance vs Gate to Source Voltage

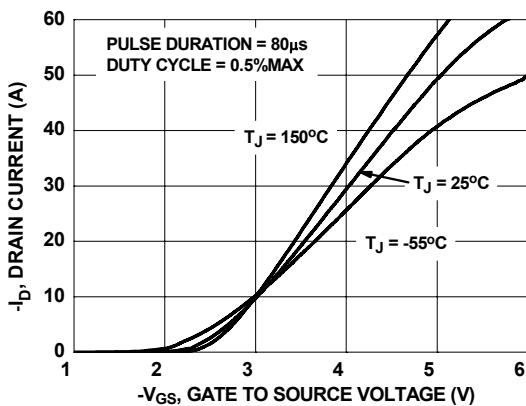


Figure 5. Transfer Characteristics

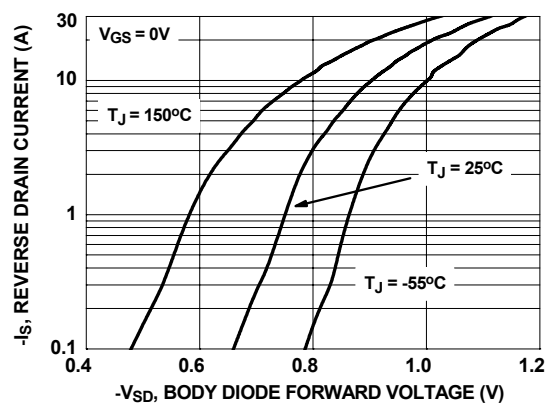
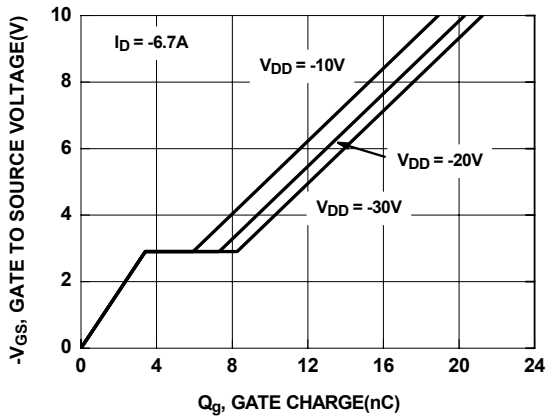
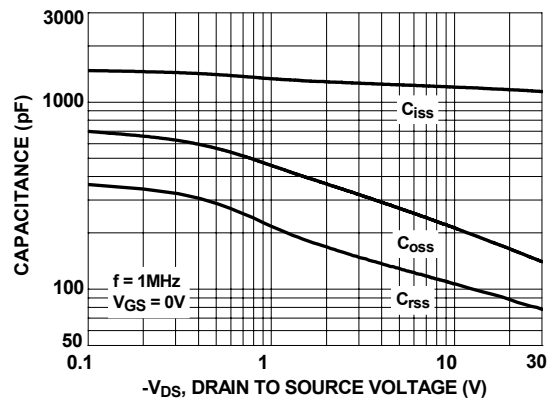


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

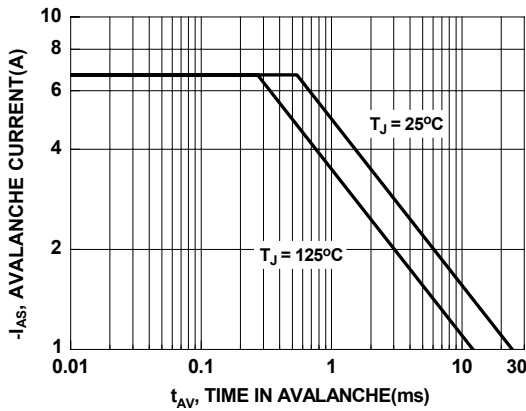
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



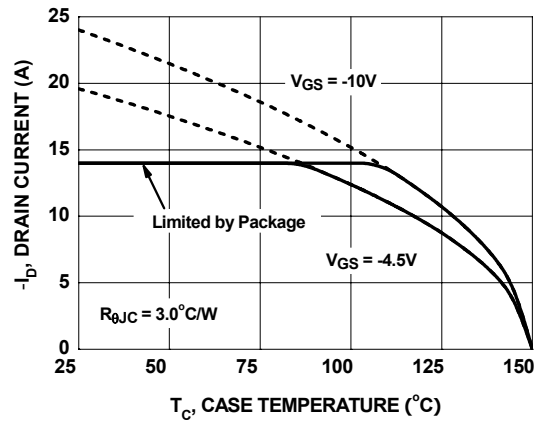
**Figure 7. Gate Charge Characteristics**



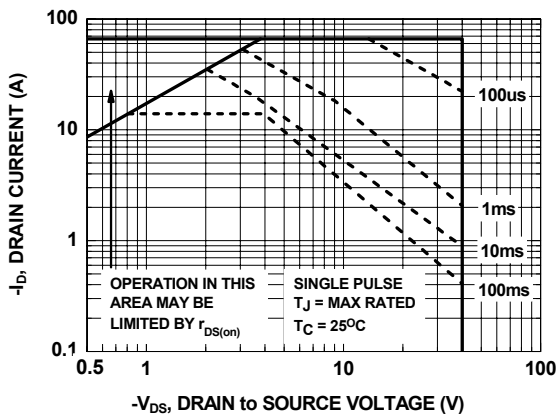
**Figure 8. Capacitance vs Drain to Source Voltage**



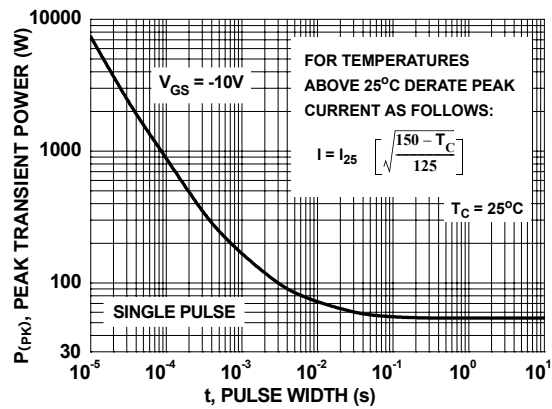
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

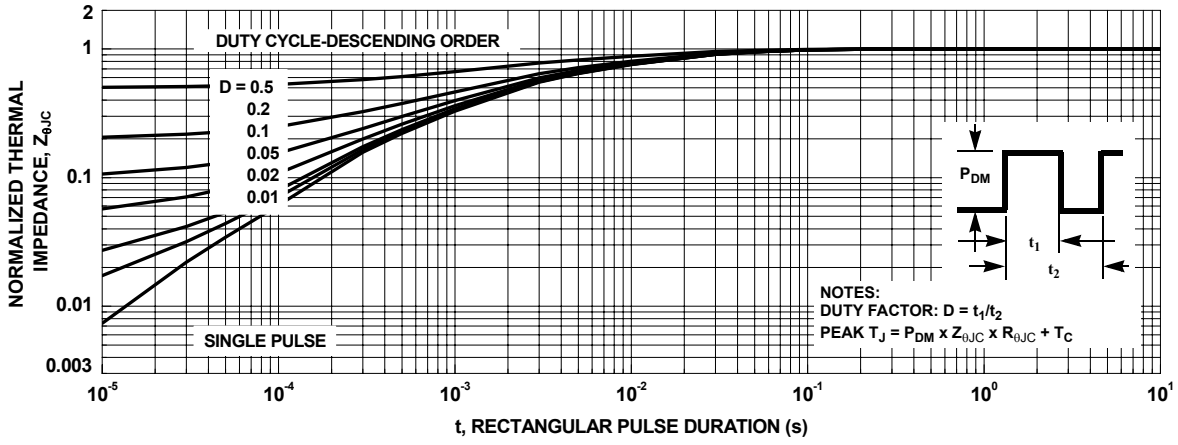


**Figure 11. Forward Bias Safe Operating Area**

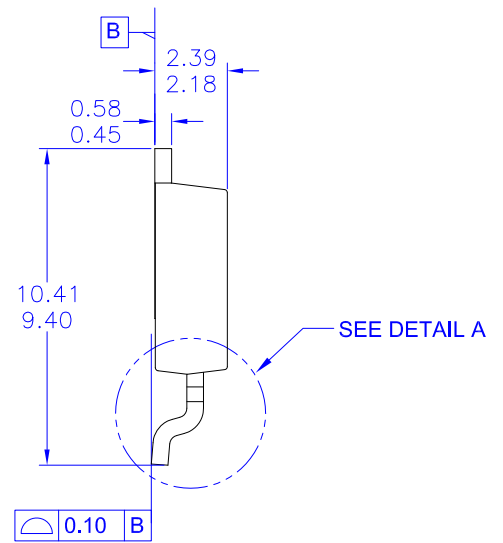
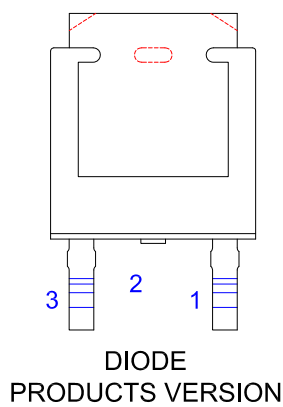
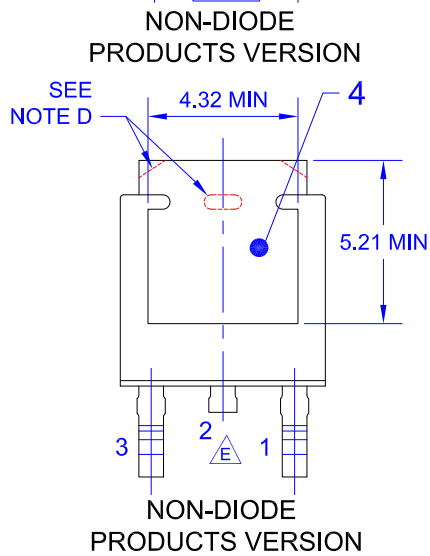
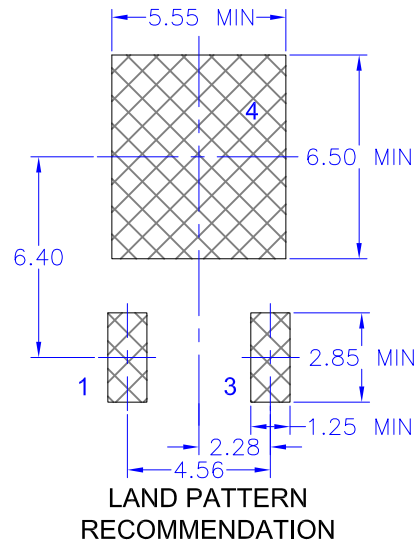
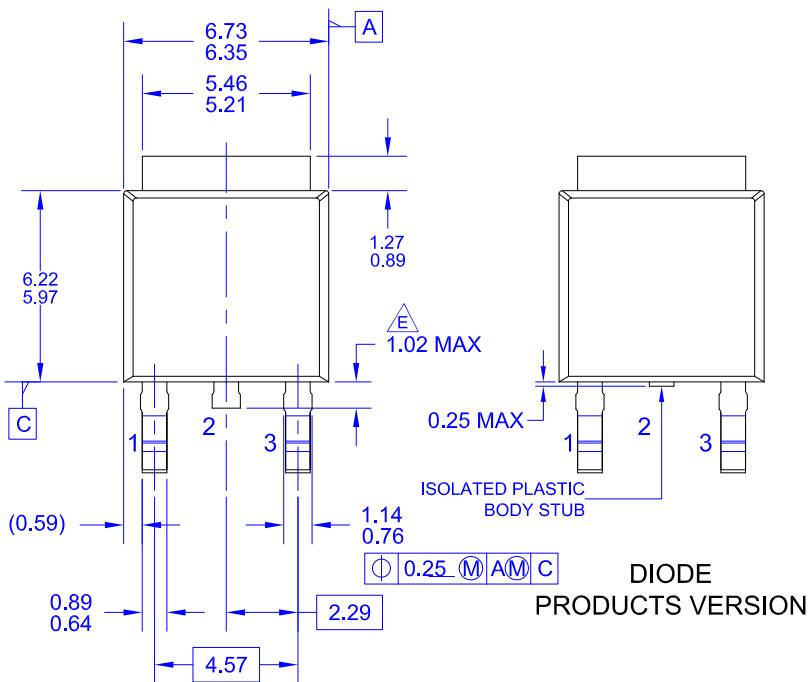


**Figure 12. Single Pulse Maximum Power Dissipation**

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

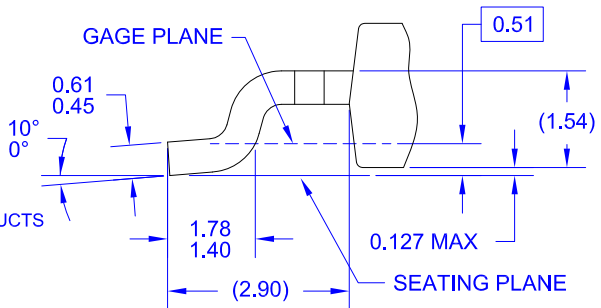


**Figure 13. Transient Thermal Response Curve**



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- 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) TRIMMED METAL CENTER LEAD IS PRESENT ON FOR NON-DIODE PRODUCTS
- F) DIMENSIONS ARE EXCLUSIVE OF BURS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.
- H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV11







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