



**ON Semiconductor®** 

# FDD3690

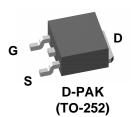
## 100V N-Channel PowerTrench<sup>®</sup> MOSFET

#### **General Description**

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

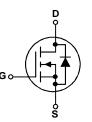
These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable  $R_{\text{DS}(\text{ON})}$  specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.



#### Features

- 22 A, 100 V.  $R_{DS(ON)} = 64 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$  $R_{DS(ON)} = 71 \text{ m}\Omega @ V_{GS} = 6 \text{ V}$
- Low gate charge (28nC typical)
- Fast Switching
- High performance trench technology for extremely low  $R_{\text{DS}(\text{ON})}$
- High power and current handling capability



### Absolute Maximum Ratings T<sub>A=25°C</sub> unless otherwise noted

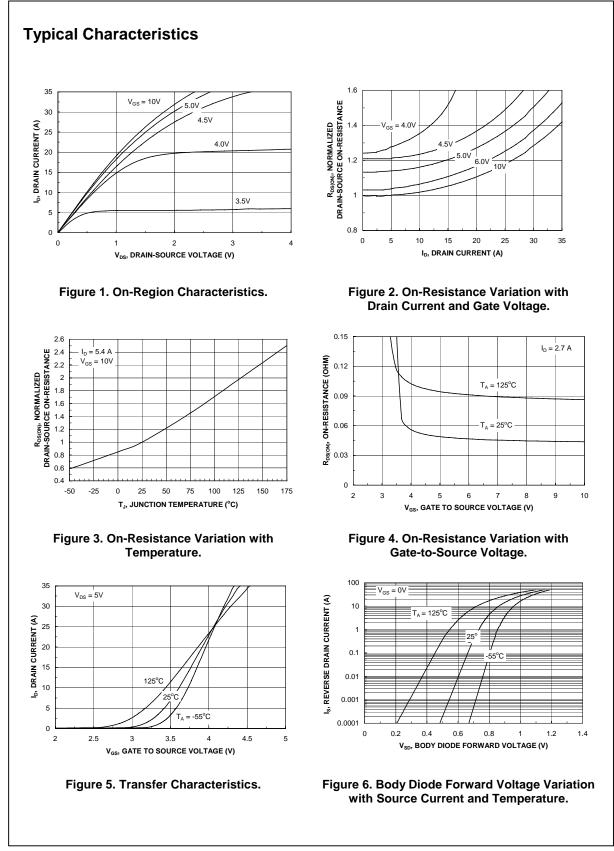
Symbol	Parameter			Ratings	Units	
V <sub>DSS</sub>	Drain-Source Voltage	Drain-Source Voltage		100	V	
V <sub>GSS</sub>	Gate-Source Voltage			±20	V	
ID	Continuous Drain Cur	Continuous Drain Current @T <sub>C</sub> =25°C (Note 3)			А	
		Pulsed	(Note 1a)	75		
PD	Power Dissipation	@T <sub>c</sub> =25°C	(Note 3)	60	W	
		@T <sub>A</sub> =25°C	(Note 1a)	3.8		
		@T <sub>A</sub> =25°C	(Note 1b)	1.6		
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storag	e Junction Tempera	ature Range	-55 to +175	°C	
Therma	I Characteristic	cs				
$R_{\theta JC}$	Thermal Resistance, Junction-to-Cas		(Note 1)	2.5	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Not		(Note 1a)	40	°C/W	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1b)		(Note 1b)	96 °C		
Packag	e Marking and	Ordering Inf	ormation			
Device N		V	el Size	Tape width	Quantity	
FDD3	3690 FDD	3690	13"	16mm	2500 units	

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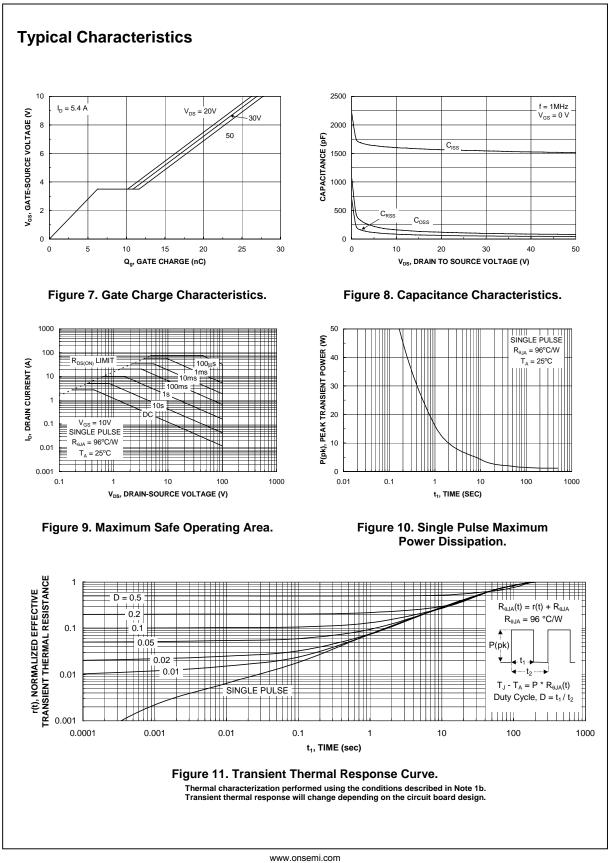
Publication Order Number: FDD3690/D

Drain-Source Avalanche Ratings (Note 2)         Woss       Ningle Pulse Drain-Source       Vos = 50 V.       In = 5.4 Å       17.5       mJ         Are       Maximum Drain-Source Avalanche       Source Avalanche       100       V       V         BYoss       Drain-Source Breakdown Voltage       Vos = 0 V.       In = 250 µA.       100       V         BYoss       Drain-Source Breakdown Voltage       Vos = 0 V.       In = 250 µA.       100       V         Byoss       Drain-Source Breakdown Voltage       Vos = 20 µA.       Referenced to 25° C       78       mV/r0         Arge       Current       Vos = 20 µA.       Referenced to 25° C       78       mV/r0         Operations       Gate Threshold Voltage       Vos = 20 µA.       Vos = 0 V       100       nA         Outcom       Gate Threshold Voltage       Vos = 20 µA.       Vos = 0 V       -100       nA         Order       Gate Threshold Voltage       Vos = 6 V.       In = 5.4 A       Vos = 0 V       -100       nA         Outcom       Gate Threshold Voltage       Vos = 6 V.       In = 5.4 A       20       A       71         Maskinue Coefficient       Vos = 6 V.       In = 5.4 A       20       A       71       71 <t< th=""><th>Symbol</th><th>Parameter</th><th>Test Conditions</th><th>Min</th><th>Тур</th><th>Max</th><th>Units</th></t<>	Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Woss         Single Pulse Drain-Source         V <sub>20</sub> = 50 V,         I <sub>0</sub> = 5.4 A         175         mJ           J <sub>AR</sub> Maximum Drain-Source Avalanche         5.4         A           Off Characteristics         Summer Source Breakdown Voltage         V <sub>00</sub> = 0 V,         I <sub>0</sub> = 250 µA         100         V           BV <sub>005</sub> Drain-Source Breakdown Voltage         V <sub>00</sub> = 0 V,         I <sub>0</sub> = 250 µA, Referenced to 25°C         78         mV/°C           Coefficient         V <sub>005</sub> = 0 V,         V <sub>005</sub> = 0 V         100         A           Iggst         Gate Abody Leakage, Forward         V <sub>05</sub> = -20 V,         V <sub>05</sub> = 0 V         100         A           Iggst         Gate Threshold Voltage         V <sub>05</sub> = -20 V,         V <sub>05</sub> = 0 V         -100         A           Voltage         V <sub>05</sub> = -20 V,         V <sub>05</sub> = 0 V         -100         A           Iggst         Gate Threshold Voltage         V <sub>05</sub> = -20 V,         V <sub>05</sub> = 0 V         -000         A           Voltage         V <sub>05</sub> = 0 V,         Ip = 5.4 A         V <sub>05</sub> = 0 V         -6.2         mV/°C           AT_1         Temperature Coefficient         Ip = 5.2 A         47         71         mu           Voltage         Temperature Coefficient         V <sub>05</sub> = 50 V,	-	burce Avalanche Ratings (Not	l e 2)	1			
Image         Maximum Drain-Source Avalanche         5.4         A           Off Characteristics         BV <sub>O36</sub> Drain-Source Breakdown Voltage         V <sub>O5</sub> = 0 V, I <sub>D</sub> = 250 µA, Referenced to 25°C         78         m/V/C           ABVoss         Breakdown Voltage Temperature         Ib = 250 µA, Referenced to 25°C         78         m/V/C           Iosa         Zero Gate Voltage Drain Current         V <sub>O8</sub> = 0 V, V <sub>O8</sub> = 0 V         100         µA           Iquess         Gate-Body Leakage, Forward         V <sub>O8</sub> = 20 V, V <sub>O8</sub> = 0 V         100         µA           Iquess         Gate-Body Leakage, Reverse         V <sub>O8</sub> = 0.20 V, V <sub>O8</sub> = 0 V         100         µA           Iquess         Gate Threshold Voltage         V <sub>O8</sub> = 0.20 V, V <sub>O8</sub> = 0 V         -1000         µA           Masse         Gate Threshold Voltage         V <sub>O8</sub> = 0.20 V, V <sub>O8</sub> = 0 V         2         2.4         4         V           Masse         Gate Threshold Voltage         V <sub>O8</sub> = 10 V, I <sub>D</sub> = 5.4 A         2         2.4         4         M           Masse         Gate Threshold Voltage         V <sub>O8</sub> = 10 V, I <sub>D</sub> = 5.4 A, T <sub>1</sub> = 125°C         88         135         1000°         N         20         A         35         1000°         A         35         100°         20         S		Single Pulse Drain-Source				175	mJ
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	I <sub>AR</sub>	Maximum Drain-Source Avalanche				5.4	A
BV <sub>DSS</sub> Drain–Source Breakdown Voltage         V <sub>os</sub> = 0 V, I <sub>o</sub> = 250 μA         100         V           ΔBV <sub>DSS</sub> Breakdown Voltage Temperature         I <sub>o</sub> = 250 μA, Referenced to 25°C         78         mV/*0           Δgss         Zero Gate Voltage Drain Current         V <sub>DS</sub> = 80 V, V <sub>OS</sub> = 0 V         10         μA           Loss         Gate–Body Leakage, Forward         V <sub>SS</sub> = 20 V, V <sub>OS</sub> = 0 V         100         nA           Loss         Gate–Body Leakage, Forward         V <sub>SS</sub> = 20 V, V <sub>OS</sub> = 0 V         100         nA           Mostion         Gate–Body Leakage, Forward         V <sub>SS</sub> = 20 V, V <sub>OS</sub> = 0 V         100         nA           Mostion         Gate         Gate-Body Leakage, Forward         V <sub>SS</sub> = 20 V, V <sub>OS</sub> = 0 V         100         nA           Mostion         Gate Threshold Voltage         V <sub>DS</sub> = V <sub>OS</sub> + 10 = 250 μA         2         2.4         4         V           Massing         Gate Threshold Voltage         Io = 250 μA, Referenced to 25°C         -6.2         mV/*0         -7         -7         mV/*0           Alg         Jo = 10 V, Io = 5.4 A, T <sub>J</sub> = 125°C         47         71         mV/*0         -7         135         -7         -7         88         135         -7         -7         -7         151	Off Char	acteristics		L			
ΔBVoss ΔT_         Breakdown Voltage Temperature Coefficient         I <sub>b</sub> = 250 µA, Referenced to 25°C         78         mV/40           Juss         Coefficient         Vos         80 V,         Vos         0         10         µA           Juss         Gate-Body Leakage, Forward         Vos         80 V,         Vos         0         100         µA           Juss         Gate-Body Leakage, Forward         Vos         20 V,         Vos         0         100         µA           Vos         Qas         O         Vos         0         100         µA           Vos         Vos         Vos         Vos         0         100         µA           Vos         Vos         Vos         Vos         Vos         0         100         µA           Vos         Gate Threshold Voltage         Vos         Vos         10         2         2.4         4         V           Vos         10         Vos         10         2.5.4.A         44         46         47         71         mΩ           Mos         10.1         Vos         5.4.A         1.2         2.0         A         88         135         100         20         S <t< td=""><td></td><td></td><td><math>V_{GS} = 0 V</math>, <math>I_D = 250 \mu A</math></td><td>100</td><td></td><td></td><td>V</td></t<>			$V_{GS} = 0 V$ , $I_D = 250 \mu A$	100			V
ΔT <sub>μ</sub> Coefficient         Image of the set of th		•			78		mV/°C
lassr       Gate-Body Leakage, Forward $V_{GS} = 20$ V, $V_{DS} = 0$ V       Image: Constraint of the state o	$\Delta T_{J}$						
Issak       Gate-Body Leakage, Reverse       V <sub>GS</sub> = -20 V       V <sub>DS</sub> = 0 V       -100       nA         On Characteristics       (Note 2)         Vosimi       Gate Threshold Voltage       V <sub>DS</sub> = V <sub>DS</sub> , Ip = 250 µA       2       2.4       4       V         MVGSIMI       Gate Threshold Voltage       Ip = 250 µA, Referenced to 25°C       -6.2       mV/r0         AT_       Temperature Coefficient       Ip = 25.0 µA, Referenced to 25°C       -6.2       mV/r0         Ros(on)       Static Drain-Source       Vos = 10 V, Ip = 5.4 A, TJ = 125°C       47       71         More       On-Resistance       Vos = 10 V, Ip = 5.4 A, TJ = 125°C       48       135         Incerv       Vos = 10 V, Ip = 5.4 A, TJ = 125°C       88       135         Support       Characteristics       Vos = 5 V, Ip = 5.4 A       20       A         Grs       Input Capacitance       VDs = 5 V, Ip = 5.4 A       20       A         Grs       Num-On Delay Time       VDs = 50 V, Vos = 0 V, Ip = 1 A, It 1       20       ns         Static Drain Characteristics       Note 2)       Infu = 00       ns       Infu = 00       ns         Gate       Turn-On Delay Time       VDs = 50 V, Ig = 1 A, Vos = 10 V, Rgen = 6 Ω       Is = 00       Is = 00       Is = 00 <td>I<sub>DSS</sub></td> <td>-</td> <td></td> <td></td> <td></td> <td>-</td> <td></td>	I <sub>DSS</sub>	-				-	
On Characteristics       (Note 2)         VGS(m)       Gate Threshold Voltage $V_{DS} = V_{DS}$ , $I_D = 250 \mu A$ 2       2.4       4       V $\Delta V_{GS(m)}$ Gate Threshold Voltage $I_D = 250 \mu A$ , Referenced to 25°C       -6.2       mV/PC $\Delta T_J$ Temperature Coefficient $I_D = 5.4 A$ 44       64       mV/PC $Br(s)$ Static Drain Source $V_{GS} = 10 V$ , $I_D = 5.4 A$ , $T_J = 125°C$ 88       135 $I_D(em)$ On-State Drain Current $V_{GS} = 10 V$ , $V_{DS} = 5 V$ 20       A $grs$ Forward Transconductance $V_{DS} = 5 V$ , $I_D = 5.4 A$ 20       S <b>Dynamic Characteristics</b> $V_{DS} = 50 V$ , $V_{DS} = 50 V$ , $I_D = 5.4 A$ 20       S <b>Dynamic Characteristics</b> $I_{44}$ $pF$ Switching Characteristics (Note 2) $I_{44}$ $pF$ $V_{DS} = 50 V$ , $I_D = 1A$ , $V_{CS} = 0 V$ , $I_D = 1A$ , $I_T$ <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
Vasimi Vasimi QuestionGate Threshold Voltage Threshold Voltage AT_JVDS Fermerature CoefficientVDS LD LD LD LDVDS LD LD LDVDS 	GSSR	Gate–Body Leakage, Reverse	$V_{GS} = -20 \text{ V} \qquad V_{DS} = 0 \text{ V}$			-100	nA
		acteristics (Note 2)	1		1	1	1
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		5		2		4	
VGB = 10 V, ID = 5.4 A, TJ = 125°C88135Indem)On-State Drain CurrentVGB = 10 V, VGB = 5 V20AgrsForward TransconductanceVDB = 5 V, ID = 5.4 A20SDynamic CharacteristicsConstanceVDB = 50 V, VGB = 0 V, ID = 5.4 A20SOutput CapacitanceVDB = 50 V, VGB = 0 V, ID = 5.4 A20SDynamic CharacteristicsOutput CapacitanceVDB = 50 V, VGB = 0 V, ID HHZSwitching Characteristics (Note 2)Turm-On Delay Timeta(on)Turm-On Delay TimeVDD = 50 V, ID = 1 A,1120nsta(on)Turm-Off Belay TimeVGB = 10 V, RGEN = 6 Ω6.515nsta(eff)Turm-Off Fall TimeVGB = 50 V, ID = 5.4 A,2839nCQgTotal Gate ChargeVDB = 50 V, ID = 5.4 A,2839nCQgaGate-Source ChargeVGB = 10 V6.2nCQgaGate-Drain ChargeVGB = 10 V6.2nCDgadGate-Drain ChargeVGB = 0 V, ID = 5.4 A,200.731.2VsbDrain-Source Diode Characteristics and Maximum RatingsIsMaximum Continuous Drain-Source Diode Forward Current3.2AVsbDrain-Source Diode Forward VoltageVGB = 0 V, ID = 3.2 A(Note 2)0.731.2VsbDrain-Source Diode Forward VoltageVGB = 0 V, ID = 3.2 ANote 2)0.73 </td <td></td> <td>5</td> <td>·</td> <td></td> <td>-6.2</td> <td></td> <td>mV/°C</td>		5	·		-6.2		mV/°C
VGB = 10 V, ID = 5.4 A, TJ = 125°C88135Indem)On-State Drain CurrentVGB = 10 V, VGB = 5 V20AgrsForward TransconductanceVDB = 5 V, ID = 5.4 A20SDynamic CharacteristicsConstanceVDB = 50 V, VGB = 0 V, ID = 5.4 A20SOutput CapacitanceVDB = 50 V, VGB = 0 V, ID = 5.4 A20SDynamic CharacteristicsOutput CapacitanceVDB = 50 V, VGB = 0 V, ID HHZSwitching Characteristics (Note 2)Turm-On Delay Timeta(on)Turm-On Delay TimeVDD = 50 V, ID = 1 A,1120nsta(on)Turm-Off Belay TimeVGB = 10 V, RGEN = 6 Ω6.515nsta(eff)Turm-Off Fall TimeVGB = 50 V, ID = 5.4 A,2839nCQgTotal Gate ChargeVDB = 50 V, ID = 5.4 A,2839nCQgaGate-Source ChargeVGB = 10 V6.2nCQgaGate-Drain ChargeVGB = 10 V6.2nCDgadGate-Drain ChargeVGB = 0 V, ID = 5.4 A,200.731.2VsbDrain-Source Diode Characteristics and Maximum RatingsIsMaximum Continuous Drain-Source Diode Forward Current3.2AVsbDrain-Source Diode Forward VoltageVGB = 0 V, ID = 3.2 A(Note 2)0.731.2VsbDrain-Source Diode Forward VoltageVGB = 0 V, ID = 3.2 ANote 2)0.73 </td <td>R<sub>DS(on)</sub></td> <td></td> <td><math>V_{GS} = 10 V, I_D = 5.4 A</math></td> <td></td> <td></td> <td>-</td> <td>mΩ</td>	R <sub>DS(on)</sub>		$V_{GS} = 10 V, I_D = 5.4 A$			-	mΩ
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		On-Resistance					
$g_{FS}$ Forward Transconductance $V_{DS} = 5 V$ , $I_D = 5.4 A$ 20SDynamic Characteristics $C_{ISS}$ Input Capacitance $V_{DS} = 50 V$ , $V_{GS} = 0 V$ , $I = 1.0 MHz$ $I = 1.0 MHz$ $B22$ $pF$ $C_{OSS}$ Output Capacitance $f = 1.0 MHz$ $B22$ $pF$ $B22$ $pF$ $C_{ISS}$ Reverse Transfer Capacitance $V_{DD} = 50 V$ , $I_D = 1 A$ , $I = 1.0 MHz$ $B22$ $pF$ Switching Characteristics (Note 2) $V_{CS} = 10 V$ , $R_{GEN} = 6 \Omega$ $I = 1.0 MHz$ $I = 29$ $I = 0.5 M$ $I_{cont}$ Turn-On Delay Time $V_{DS} = 50 V$ , $I_D = 1 A$ , $I = 29$ $I = 0.5 M$ $I = 29$ $I = 0.5 M$ $I_{cont}$ Turn-Off Delay Time $V_{DS} = 50 V$ , $I_D = 5.4 A$ , $I = 28$ $I = 0.5 M$ $I = 29$ $I = 0.5 M$ $I_{adm}$ Turn-Off Fall Time $I = 0.0 M$ $Q_g$ Total Gate Charge $V_{DS} = 50 V$ , $I_D = 5.4 A$ , $I = 0.0 M$ $I = 0.0 M$ $I = 0.0 M$ $I = 0.0 M$ $Q_g$ Gate-Drain Charge $V_{DS} = 10 V$ $I_D = 5.4 A$ , $I = 0.0 M$ $I = 0.0 M$ $I = 0.0 M$ $Q_{gd}$ Gate-Drain Charge $V_{DS} = 0 V$ , $I_S = 3.2 A$ (Note 2) $I = 0.7 3$ $I = 0.0 M$ $V_{SD}$ Drain-Source Diode Characteristics and Maximum Ratings $I_S$ Maximum Continuous Drain-Source Diode Forward Voltage $V_{OS} = 0 V$ , $I_S = 3.2 A$ (Note 2) $I = 0.7 3$ $I = 0.0 M$ $V_{SD}$ Is the sum of the junction-to-case and case-to-ambleint thermal resistance where the ca	I <sub>D(on)</sub>	On-State Drain Current		20			Α
Ciss       Input Capacitance $V_{DS} = 50 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$ $1514$ pF         Coss       Output Capacitance $f = 1.0 \text{ MHz}$ $82$ pF         Switching Characteristics       (Note 2) $444$ pF         Switching Characteristics       (Note 2) $444$ pF         Switching Characteristics       (Note 2) $444$ pF         Switching Characteristics       (Note 2) $6.5$ $15$ ns $t_q(on)$ Turn-On Rise Time $V_{OS} = 50 \text{ V}$ , $R_{GEN} = 6 \Omega$ $6.5$ $15$ ns $t_q(on)$ Turn-Off Delay Time $V_{OS} = 50 \text{ V}$ , $R_{GEN} = 6 \Omega$ $6.2$ $10$ $20$ $ns$ $t_q(on)$ Turn-Off Fall Time $V_{OS} = 50 \text{ V}$ , $R_{GEN} = 6 \Omega$ $6.2$ $nC$ $Q_g$ Gate-Drain Charge $V_{OS} = 10 \text{ V}$ $6.2$ $nC$ $Q_{gd}$ Gate-Drain Charge $V_{SS} = 0 \text{ V}$ , $I_S = 3.2 \text{ A}$ $Note 2$ $0.73$ $1.2$ $V$ $S_{gd}$ Maximum Continuous Drain-Source Diode Forward Current $3.2 \text{ A}$ $N_{SL}$ $N_{SL}$ $0.733$ $1.2$ $V$ <t< td=""><td></td><td>Forward Transconductance</td><td></td><td></td><td>20</td><td></td><td>S</td></t<>		Forward Transconductance			20		S
Ciss       Input Capacitance $V_{DS} = 50 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$ $1514$ pF         Coss       Output Capacitance $f = 1.0 \text{ MHz}$ $82$ pF         Switching Characteristics (note 2) $444$ pF         t_d(on)       Turn-On Delay Time $V_{DD} = 50 \text{ V}$ , $I_D = 1 \text{ A}$ , $V_{GS} = 6 \Omega$ $6.5$ $155 \text{ ns}$ t_d(on)       Turn-On Rise Time $V_{OS} = 50 \text{ V}$ , $R_{GEN} = 6 \Omega$ $6.5$ $15 \text{ ns}$ t_d(on)       Turn-Off Delay Time $V_{OS} = 50 \text{ V}$ , $R_{GEN} = 6 \Omega$ $6.5$ $15 \text{ ns}$ t_d(on)       Turn-Off Fall Time $V_{OS} = 50 \text{ V}$ , $R_{GEN} = 6 \Omega$ $6.2$ $nC$ $Q_g$ Total Gate Charge $V_{OS} = 50 \text{ V}$ , $I_D = 5.4 \text{ A}$ , $28$ $39 \text{ nC}$ $6.2$ $nC$ $Q_{gd}$ Gate-Drain Charge $V_{OS} = 10 \text{ V}$ $6.2$ $nC$ $D_{gd}$ Gate-Drain Charge $V_{SS} = 0 \text{ V}$ , $I_S = 3.2 \text{ A}$ $(Note 2)$ $0.73  1.2$ $V$ $V_{SD}$ Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}$ , $I_S = 3.2 \text{ A}$ $(Note 2)$ $0.73  1.2$ $V$ $N_{SD}$ Drain-Source Diode Forward Quite e user's board design. <td>Dynamic</td> <td>Characteristics</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Dynamic	Characteristics					
Coses       Output Capacitance       f = 1.0 MHz       82       pF         Coses       Reverse Transfer Capacitance       44       pF         Switching Characteristics (Note 2)       444       pF         talcon       Turn-On Delay Time       VDD = 50 V, ID = 1 A, ID = 1 A, ID = 1 A, ID = 1 A, ID = 10 D = 10 D, ID = 10			$V_{DS} = 50 \text{ V},  V_{GS} = 0 \text{ V},$		1514		pF
Cress       Reverse Transfer Capacitance       44       pF         Switching Characteristics       (Note 2)         t_d(m)       Turn-On Delay Time       VDD = 50 V, VDB = 6 Ω       ID = 1 A, VDB = 6 Ω       11       20       ns         t_r       Turn-On Rise Time       VDD = 50 V, RGEN = 6 Ω       ID = 1 A, COM = 6.5       15       ns         t_d(df)       Turn-Off Delay Time       VDB = 50 V, RGEN = 6 Ω       6.5       15       ns         t_d(df)       Turn-Off Fall Time       VDB = 50 V, RGEN = 6 Ω       ID = 5.4 A, COM = 28       29       60       ns         Qg       Total Gate Charge       VDB = 50 V, RGEN = 6 Ω       ID = 5.4 A, COM = 28       28       39       nC         Qgs       Gate-Drain Charge       VDB = 50 V, RGEN = 6 Ω       ID = 5.4 A, COM = 20       0.0       ns         Drain-Source Diode Characteristics and Maximum Ratings       IS       Maximum Continuous Drain-Source Diode Forward Current       3.2       A         Vsb       Drain-Source Diode Forward Voltage       VGB = 0 V, IS = 3.2 A       Note 2)       0.73       1.2       V         Maximum Continuous Drain-Source Diode Forward Voltage       VGB = 0 V, IS = 3.2 A       Note 2)       0.73       1.2       V          Maximum Continuous Drain-Source Dio							<u> </u>
Switching Characteristics (Note 2)         tar       Turn-On Delay Time       V_{DD} = 50 V,       I_D = 1 A,       11       20       ns         tr,       Turn-On Rise Time       V_{GS} = 10 V,       R_{GEN} = 6 \Omega       6.5       15       ns         tar       Turn-Off Delay Time       V_{GS} = 50 V,       I_D = 1 A,       11       20       ns         tar       Turn-Off Delay Time       V_{GS} = 10 V,       R_{GEN} = 6 \Omega       6.5       15       ns         Qg       Total Gate Charge       V_{DS} = 50 V,       I_D = 5.4 A,       28       39       nC         Qgd       Gate-Drain Charge       V_{GS} = 10 V       I_D = 5.4 A,       2.8       39       nC         Dggd       Gate-Drain Charge       V_{GS} = 0 V,       I_D = 5.4 A,       2.8       39       nC         Dggd       Gate-Drain Charge       V_GS = 10 V       I_D = 5.4 A,       2.8       3.2       A         Dggd       Gate-Drain Charge       V_GS = 0 V,       I_S = 3.2 A       Not 2)       0.73       1.2       V         Base       Maximum Continuous Drain-Source Diode Forward Voltage       V_GS = 0 V,       I_S = 3.2 A       Not 2)       0.73       1.2       V         State 1: 1 on letter size gaper </td <td></td> <td></td> <td></td> <td></td> <td>44</td> <td></td> <td><u> </u></td>					44		<u> </u>
td(on)       Turn-On Delay Time $V_{DD} = 50 \text{ V}$ , $I_D = 1 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_{GEN} = 6 \Omega$ 11       20       ns         td(off)       Turn-Off Delay Time       V_{SS} = 10 \text{ V}, $R_{GEN} = 6 \Omega$ 6.5       15       ns         t_d(off)       Turn-Off Delay Time       10       20       ns         t_t       Turn-Off Fall Time       10       20       ns         Q_g       Total Gate Charge $V_{DS} = 50 \text{ V}$ , $I_D = 5.4 \text{ A}$ , $Q_{SS} = 10 \text{ V}$ 6.2       nC         Q_{gd}       Gate-Drain Charge $V_{GS} = 10 \text{ V}$ 6.2       nC         D_{gd}       Gate-Drain Charge $V_{GS} = 10 \text{ V}$ 6.2       nC         D_{gd}       Gate-Drain Charge $V_{GS} = 0 \text{ V}$ , $I_S = 3.2 \text{ A}$ (Note 2)       0.73       1.2       V         Is Maximum Continuous Drain-Source Diode Forward Current       3.2       A         V_{SD}       Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}$ , $I_S = 3.2 \text{ A}$ (Note 2)       0.73       1.2       V         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 the drain pins. $R_{B_{2G}}$ is guaranteed by design while $R_{B_{2A}} = 40^{\circ}C/W$ when mounted on a minimum pad.       b) $R_{B_{2A}} = 96^{\circ}C/W$ when mounted on a mi		· · ·					
tr       Turn-On Rise Time $V_{GS} = 10 \text{ V}$ , $R_{GEN} = 6 \Omega$ $6.5$ $15$ ns         t_d(off)       Turn-Off Delay Time $10$ $20$ ns $t_t$ Turn-Off Fall Time $10$ $20$ ns $Q_g$ Total Gate Charge $V_{DS} = 50 \text{ V}$ , $I_D = 5.4 \text{ A}$ , $28$ $39$ nC $Q_{gd}$ Gate-Source Charge $V_{GS} = 10 \text{ V}$ $I_D = 5.4 \text{ A}$ , $28$ $39$ nC $Q_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ $I_D = 5.4 \text{ A}$ , $28$ $39$ $nC$ $Q_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ $I_D = 5.4 \text{ A}$ , $28$ $39$ $nC$ $Q_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ $I_D = 5.4 \text{ A}$ , $28$ $39$ $nC$ Drain-Source Diode Characteristics and Maximum Ratings $I_S$ $Maximum$ Continuous Drain-Source Diode Forward Current $3.2 \text{ A}$ $N_{SD}$ $0.73  1.2 \text{ V}$ Nsb       Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}$ , $I_S = 3.2 \text{ A}$ (Note 2) $0.73  1.2 \text{ V}$ Image: R_{GA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case t			$V_{re} = 50 V$ $I_{re} = 1.4$		11	20	ns
Turn-Off Delay Time       29       60       ns $t_{t}$ Turn-Off Fall Time       10       20       ns $Q_{g}$ Total Gate Charge $V_{DS} = 50 \text{ V}$ , $I_{D} = 5.4 \text{ A}$ ,       28       39       nC $Q_{gd}$ Gate-Source Charge $V_{GS} = 10 \text{ V}$ 6.2       nC $Q_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ 6.2       nC         Drain-Source Diode Characteristics and Maximum Ratings         Is       Maximum Continuous Drain-Source Diode Forward Current       3.2       A $V_{SD}$ Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}$ , $I_S = 3.2 \text{ A}$ (Note 2)       0.73       1.2       V         the       a) $R_{BJA} = 40^{\circ}$ C/W when mounted on a $1in^2$ pad of 2 oz copper       b) $R_{BJA} = 96^{\circ}$ C/W when mounted on a minimum pad.       Scale 1 : 1 on letter size paper       b) $R_{BJA} = 96^{\circ}$ C/W when mounted on a minimum pad.         Scale 1 : 1 on letter size paper			$V_{\text{DD}} = 30 \text{ V}, \qquad \text{ID} = 1 \text{ A}, \qquad V_{\text{GS}} = 10 \text{ V}, \qquad \text{R}_{\text{GEN}} = 6 \Omega$				
Image: Construct of the second se						-	-
$Q_g$ Total Gate Charge $V_{DS} = 50 \text{ V},$ $I_D = 5.4 \text{ A},$ $28$ $39$ nC $Q_{gs}$ Gate-Source Charge $V_{GS} = 10 \text{ V}$ $6.2$ nC $Q_{gd}$ Gate-Drain Charge $5.4$ nC         Drain-Source Diode Characteristics and Maximum Ratings $I_S$ Maximum Continuous Drain-Source Diode Forward Current $3.2$ $A$ $V_{SD}$ Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V},$ $I_S = 3.2 \text{ A}$ (Note 2) $0.73$ $1.2$ $V$ others: $R_{gA}$ 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 the drain pins. $R_{gJC}$ is guaranteed by design while $R_{eCA}$ is determined by the user's board design.       b) $R_{gJA} = 96^{\circ}C/W$ when mounted on a $1n^2$ pad of 2 oz copper       case 1 : 1 on letter size paper         Pulse Test: Pulse Width < 300 µs, Duty Cycle < 2.0%		,			10	20	ns
$Q_{gs}$ Gate-Source Charge $V_{GS} = 10 \text{ V}$ $6.2$ nC $Q_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ $6.2$ nC         Drain-Source Diode Characteristics and Maximum Ratings         Is       Maximum Continuous Drain-Source Diode Forward Current $3.2$ A $V_{SD}$ Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}$ , $I_S = 3.2 \text{ A}$ (Note 2) $0.73$ $1.2$ V         othes: $R_{gJA}$ 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 the drain pins. $R_{gJA}$ is guaranteed by design while $R_{gCA}$ is determined by the user's board design.       b) $R_{gJA} = 96^{\circ}$ C/W when mounted on a $11n^2$ pad of 2 oz copper       b) $R_{gJA} = 96^{\circ}$ C/W when mounted on a minimum pad.         Scale 1 : 1 on letter size paper         Pulse Test: Pulse Width < 300 µs, Duty Cycle < 2.0%		Total Gate Charge	$V_{DS} = 50 \text{ V}, \qquad I_D = 5.4 \text{ A},$				
Q <sub>gd</sub> Gate-Drain Charge       5.4       nC         Drain-Source Diode Characteristics and Maximum Ratings         Is       Maximum Continuous Drain-Source Diode Forward Current       3.2       A         V <sub>SD</sub> Drain-Source Diode Forward Voltage       V <sub>GS</sub> = 0 V, I <sub>S</sub> = 3.2 A (Note 2)       0.73       1.2       V         Otes:       R <sub>8JA</sub> 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 the drain pins. R <sub>8JC</sub> is guaranteed by design while R <sub>8CA</sub> is determined by the user's board design.       b)       R <sub>8JA</sub> = 96°C/W when mounted on a 1in <sup>2</sup> pad of 2 oz copper       b)       R <sub>8JA</sub> = 96°C/W when mounted on a minimum pad.         Scale 1 : 1 on letter size paper		-			6.2		nC
Is       Maximum Continuous Drain–Source Diode Forward Current       3.2       A         Vsb       Drain–Source Diode Forward Voltage $V_{GS} = 0 V$ , $I_S = 3.2 A$ (Note 2)       0.73       1.2       V         Otes:       R <sub>6JA</sub> 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 the drain pins. R <sub>6JC</sub> is guaranteed by design while R <sub>6CA</sub> is determined by the user's board design.       b)       R <sub>8JA</sub> = 96°C/W when mounted on a 1in <sup>2</sup> pad of 2 oz copper       b)       R <sub>8JA</sub> = 96°C/W when mounted on a minimum pad.         Scale 1 : 1 on letter size paper		Gate–Drain Charge			5.4		nC
Is       Maximum Continuous Drain–Source Diode Forward Current       3.2       A         Vsb       Drain–Source Diode Forward Voltage       V <sub>GS</sub> = 0 V, I <sub>S</sub> = 3.2 A       (Note 2)       0.73       1.2       V         otes:       R <sub>0JA</sub> 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 the drain pins. R <sub>0JC</sub> is guaranteed by design while R <sub>0CA</sub> is determined by the user's board design.       b)       R <sub>0JA</sub> = 96°C/W when mounted on a 1in <sup>2</sup> pad of 2 oz copper       b)       R <sub>0JA</sub> = 96°C/W when mounted on a minimum pad.         Scale 1 : 1 on letter size paper	Drain_S	ource Diode Characteristics	and Maximum Ratings	1	1	1	1
Vsb       Drain-Source Diode Forward Voltage       V <sub>GS</sub> = 0 V, I <sub>S</sub> = 3.2 A       (Note 2)       0.73       1.2       V         otes: $R_{eJA}$ 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 the drain pins. $R_{eJC}$ is guaranteed by design while $R_{eCA}$ is determined by the user's board design.       b) $R_{aJA} = 96^{\circ}$ C/W when mounted on a 1 in <sup>2</sup> pad of 2 oz copper       b) $R_{aJA} = 96^{\circ}$ C/W when mounted on a minimum pad.         Scale 1 : 1 on letter size paper						3.2	А
Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0%	-				0.73		
_ P <sub>D</sub>	the drain pins.	R <sub>0JC</sub> is guaranteed by design while R <sub>0CA</sub> is deter a) R <sub>0JA</sub> = 40°C/ 1in <sup>2</sup> pad of 2 lse Width < 300 $\mu$ s, Duty Cycle < 2.0%	when mounted on a	b) R <sub>0J</sub> A	( = 96°C/W	when mou	
Maximum current is calculated as: $\sqrt{R_{DS(ON)}}$ where P <sub>D</sub> is maximum power dissipation at T <sub>c</sub> = 25°C and R <sub>DS(ON)</sub> is at T <sub>J(max)</sub> and V <sub>GS</sub> = 10V. Package current limitation is 21A	Maximum curr	rent is calculated as: $\sqrt{\frac{P_D}{R_{DS(ON)}}}$					

FDD3690



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