

FS16SM-6-VB Datasheet

N-Channel 600 V (D-S) Super Junction MOSFET

PRODUCT SUMMARY					
V _{DS} (V) at T _J max.	600				
R _{DS(on)} (Ω) at 25 °C	$V_{GS} = 10 V$	0.19			
Q _g max. (nC)	106				
Q _{gs} (nC)	14				
Q _{gd} (nC)	33				
Configuration	Single				

FEATURES

- Reduced t_{rr}, Q_{rr}, and I_{RRM}
- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low input capacitance (C_{iss})
- Low switching losses due to reduced Q_{rr}
- Ultra low gate charge (Q_q)
- Avalanche energy rated (UIS)

APPLICATIONS

- Telecommunications
 - Server and telecom power supplies
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Consumer and computing
 - ATX power supplies
- Industrial
 - Welding
 - Battery chargers
- Renewable energy
- Solar (PV inverters)
- Switch mode power supplies (SMPS)

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N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _C	= 25 °C, unl	ess otherwis	se noted)		
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V _{DS}	600	v	
Gate-Source Voltage			V _{GS}	± 30	v
Continuous Drain Current (T _J = 150 °C)	V _{GS} at 10 V	T _C = 25 °C T _C = 100 °C	- I _D -	20	
	V _{GS} at 10 V	T _C = 100 °C		13	А
Pulsed Drain Current ^a			I _{DM}	53	
Linear Derating Factor			1.7	W/°C	
Single Pulse Avalanche Energy ^b		E _{AS}	367	mJ	
Maximum Power Dissipation			P _D	208	W
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 to +150	°C	
Drain-Source Voltage Slope	T _J = 125 °C			37	V/ns
Reverse Diode dV/dt ^d		dV/dt	31	v/ns	
Soldering Recommendations (Peak Temperature) ^c	for	10 s		300	°C

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature. b. $V_{DD} = 50$ V, starting T_J = 25 °C, L = 28.2 mH, R_g = 25 Ω , I_{AS} = 5.1 A.

c. 1.6 mm from case.

d. $I_{SD} \leq I_D$, dl/dt = 100 A/µs, starting T_J = 25 °C.

COMPLIANT

HALOGEN



$\begin{tabular}{ c c c c c } \hline PARAMETER & SYMBOL & TYP. & MAX. \\ \hline Maximum Junction-to-Ambient & h_{thJA} & - & 62 \\ \hline Maximum Junction-to-Case (Drain) & h_{thJC} & - & 0.5 \\ \hline \hline Maximum Junction-to-Case (Drain) & h_{thJC} & - & 0.5 \\ \hline \hline Maximum Junction-to-Case (Drain) & h_{thJC} & - & 0.5 \\ \hline \hline SPECIFICATIONS (T_J = 25 °C, unless otherwise noted) \\ \hline PARAMETER & SYMBOL & TEST CONDITIONS \\ \hline Static & & & & & & & & & & & & & & & & & & &$	MIN. 600 - 2 - -		UNIT °C/W MAX.	UNIT
$\begin{array}{ c c c c } \hline Maximum Junction-to-Case (Drain) & R_{thJC} & - & 0.5 \\ \hline \hline \\ \hline $	600 - 2 -	-	1	UNIT
Maximum Junction-to-Case (Drain) R_{thJC} -0.5SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)PARAMETERSYMBOLTEST CONDITIONSStaticDrain-Source Breakdown Voltage V_{DS} $V_{GS} = 0 V$, $I_D = 250 \mu A$ V_{DS} Temperature Coefficient $\Delta V_{DS}/T_J$ Reference to 25 °C, $I_D = 1 mA$ Gate-Source Threshold Voltage (N) $V_{GS(th)}$ $V_{DS} = V_{GS}$, $I_D = 250 \mu A$ $Gate-Source Leakage$ I_{GSS} $V_{GS} = 420 V$ $V_{GS} = 520 V, V_{GS} = 0 V$ $V_{GS} = 520 V, V_{GS} = 0 V$ Zero Gate Voltage Drain Current I_{DSS} $V_{DS} = 520 V, V_{GS} = 0 V$ $I_{Drain-Source On-State Resistance}$ $R_{DS(on)}$ $V_{GS} = 10 V$ $I_D = 11 A$ Forward Transconductance G_{gs} $V_{DS} = 30 V, I_D = 11 A$ DynamicInput Capacitance C_{ciss} $V_{DS} = 100 V$, $f = 1 MHz$ Effective Output Capacitance, Energy Related a $C_{o(tr)}$ $V_{DS} = 0 V$ $V_{DS} = 0 V$ Effective Output Capacitance, Time Related b $C_{o(tr)}$ $V_{Cis} = 10 V$ $I_D = 11 A$,Total Gate Charge Q_g Q_{gs} $I_0 = 11 A$, $V_{DS} = 520 V$ Gate-Source Charge Q_g $Q_{iss} = 10 V$ $I_D = 11 A$ Descenter of the source of t	600 - 2 -	-	1	UNIT
$\begin{tabular}{ c c c c } \hline PARAMETER & SYMBOL & TEST CONDITIONS \\ \hline Static & & & & & & & & & & & & & & & & & & &$	600 - 2 -	-	MAX.	UNIT
$\begin{tabular}{ c c c c } \hline PARAMETER & SYMBOL & TEST CONDITIONS \\ \hline Static & & & & & & & & & & & & & & & & & & &$	600 - 2 -	-	MAX.	UNIT
StaticDrain-Source Breakdown Voltage V_{DS} $V_{GS} = 0$ V, $I_D = 250 \ \mu A$ V_{DS} Temperature Coefficient $\Delta V_{DS}/T_J$ Reference to 25 °C, $I_D = 1$ mAGate-Source Threshold Voltage (N) $V_{GS}(h)$ $V_{DS} = V_{GS}, I_D = 250 \ \mu A$ Gate-Source Leakage I_{GSS} $V_{GS} = \pm 20 \ V$ $Case - Source Leakage$ I_{GSS} $V_{GS} = \pm 20 \ V$ $V_{DS} = 520 \ V, V_{GS} = 0 \ V$ $V_{DS} = 520 \ V, V_{GS} = 0 \ V$ Zero Gate Voltage Drain Current I_{DSS} $V_{DS} = 520 \ V, V_{GS} = 0 \ V$ $V_{DS} = 520 \ V, V_{GS} = 0 \ V, V_{DS} = 520 \ V, V_{GS} = 0 \ V, T_J = 125 \ °C$ $V_{DS} = 520 \ V, V_{GS} = 0 \ V, T_J = 125 \ °C$ Drain-Source On-State Resistance $R_{DS(on)}$ $V_{DS} = 30 \ V, I_D = 11 \ A$ Forward Transconductance G_{iss} $V_{GS} = 10 \ V$ $Input Capacitance$ C_{coss} $V_{DS} = 100 \ V, T_J = 125 \ °C$ Reverse Transfer Capacitance C_{rss} $V_{GS} = 0 \ V, V_{DS} = 100 \ V, T_J = 11 \ A$ Effective Output Capacitance, Energy Related a $V_{Os} = 10 \ V, T_J = 100 \ V, T_J = 1$	600 - 2 -	-	MAX.	UNIT
$\begin{array}{c c c c c c c } \hline Drain-Source Breakdown Voltage & V_{DS} & V_{GS} = 0 \ V, \ I_D = 250 \ \mu A \\ \hline V_{DS} \ Temperature \ Coefficient & \Delta V_{DS}/T_J & Reference \ to 25 \ ^{\circ}C, \ I_D = 1 \ mA \\ \hline Gate-Source Threshold Voltage (N) & V_{GS(th)} & V_{DS} = V_{GS}, \ I_D = 250 \ \mu A \\ \hline V_{GS} = 20 \ V \\ \hline V_{GS} = \pm 20 \ V \\ \hline V_{GS} = \pm 20 \ V \\ \hline V_{GS} = \pm 30 \ V \\ \hline V_{DS} = 520 \ V, \ V_{GS} = 0 \ V \\ \hline V_{DS} = 520 \ V, \ V_{GS} = 0 \ V \\ \hline V_{DS} = 520 \ V, \ V_{GS} = 0 \ V \\ \hline V_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \ T_J = 125 \ ^{\circ}C \\ \hline Drain-Source On-State Resistance & R_{DS(on)} & V_{GS} = 10 \ V & I_D = 11 \ A \\ \hline Porward Transconductance & g_{fs} & V_{DS} = 30 \ V, \ I_D = 11 \ A \\ \hline Dynamic \\ \hline Input \ Capacitance & C_{css} & V_{GS} = 0 \ V, \\ \hline Output \ Capacitance & C_{css} & V_{GS} = 100 \ V, \\ \hline Reverse \ Transfer \ Capacitance, \ Energy \\ Related \ ^{a} & C_{o(tr)} & \\ \hline Effective \ Output \ Capacitance, \ Energy \\ Related \ ^{b} & C_{o(tr)} & \\ \hline Total \ Gate \ Charge & Q_g \\ \hline Gate-Source \ Charge & Q_g \\ \hline Gate-Source \ Charge & Q_{gs} \\ \hline Turn-On \ Delay \ Time & t_{d(on)} \\ \hline Rise \ Time & t_r & \\ \hline V_{DD} = 520 \ V, \ I_D = 11 \ A, \\ \hline \end{array}$	- 2 -			
$ \begin{array}{c c c c c c } V_{DS} \mbox{Temperature Coefficient} & \Delta V_{DS}/T_J & \mbox{Reference to 25 °C, } I_D = 1 \mbox{ mA} \\ \hline \mbox{Gate-Source Threshold Voltage (N)} & V_{GS(th)} & V_{DS} = V_{GS}, I_D = 250 \mbox{ μ} \\ \hline \mbox{Gate-Source Leakage} & I_{GSS} & V_{GS} = \pm 20 \ V \\ \hline \mbox{Gate Voltage Drain Current} & I_{DSS} & V_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 30 \ V, \ I_D = 11 \ A \\ \hline \mbox{Dynamic} & V_{DS} = 30 \ V, \ I_D = 11 \ A \\ \hline \mbox{Dynamic} & V_{DS} = 100 \ V, \\ \hline \mbox{C} = 0 \ V \ V_{DS} = 100 \ V, \\ \hline \mbox{C} = 0 \ V, \\ \hline \mbox{Duptu Capacitance} & C_{iss} & V_{GS} = 0 \ V, \\ \hline \mbox{Duptu Capacitance} & C_{rss} & I \ HHz \\ \hline \mbox{Effective Output Capacitance, Energy} \\ \hline \mbox{Related} ^a & C_{o(er)} & V_{DS} = 0 \ V \ to 520 \ V, \ V_{GS} = 0 \ V \\ \hline \mbox{Effective Output Capacitance, Time} & C_{o(tr)} & V_{GS} = 10 \ V \\ \hline \mbox{Gate-Drain Charge} & Q_{g} & V_{GS} = 10 \ V \\ \hline \mbox{Gate-Drain Charge} & Q_{gg} & V_{GS} = 10 \ V \\ \hline \mbox{Gate-Drain Charge} & Q_{gg} & V_{GS} = 10 \ V \\ \hline \mbox{In mode Theorem 11 A, } \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V,$	- 2 -		1	
$ \begin{array}{c c c c c c } V_{DS} \mbox{Temperature Coefficient} & \Delta V_{DS}/T_J & \mbox{Reference to 25 °C, } I_D = 1 \mbox{ mA} \\ \hline \mbox{Gate-Source Threshold Voltage (N)} & V_{GS(th)} & V_{DS} = V_{GS}, I_D = 250 \mbox{ μ} \\ \hline \mbox{Gate-Source Leakage} & I_{GSS} & V_{GS} = \pm 20 \ V \\ \hline \mbox{Gate Voltage Drain Current} & I_{DSS} & V_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 520 \ V, \ V_{GS} = 0 \ V, \\ \hline \mbox{V}_{DS} = 30 \ V, \ I_D = 11 \ A \\ \hline \mbox{Dynamic} & V_{DS} = 30 \ V, \ I_D = 11 \ A \\ \hline \mbox{Dynamic} & V_{DS} = 100 \ V, \\ \hline \mbox{C} = 0 \ V \ V_{DS} = 100 \ V, \\ \hline \mbox{C} = 0 \ V, \\ \hline \mbox{Duptu Capacitance} & C_{iss} & V_{GS} = 0 \ V, \\ \hline \mbox{Duptu Capacitance} & C_{rss} & I \ HHz \\ \hline \mbox{Effective Output Capacitance, Energy} \\ \hline \mbox{Related} ^a & C_{o(er)} & V_{DS} = 0 \ V \ to 520 \ V, \ V_{GS} = 0 \ V \\ \hline \mbox{Effective Output Capacitance, Time} & C_{o(tr)} & V_{GS} = 10 \ V \\ \hline \mbox{Gate-Drain Charge} & Q_{g} & V_{GS} = 10 \ V \\ \hline \mbox{Gate-Drain Charge} & Q_{gg} & V_{GS} = 10 \ V \\ \hline \mbox{Gate-Drain Charge} & Q_{gg} & V_{GS} = 10 \ V \\ \hline \mbox{In mode Theorem 11 A, } \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V, \ I_D = 11 \ A, \\ \hline \mbox{D} = 520 \ V,$	2	0.67	-	V
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	-	0.67	-	V/°C
$ \begin{array}{c c} \hline \text{Gate-Source Leakage} & I_{GSS} & V_{GS} = \pm 30 \text{ V} \\ \hline \\ \hline \text{Zero Gate Voltage Drain Current} & I_{DSS} & V_{DS} = 520 \text{ V}, V_{GS} = 0 \text{ V} \\ \hline \\ \hline \text{V}_{DS} = 520 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 125 \ ^{\circ}\text{C} \\ \hline \text{Drain-Source On-State Resistance} & R_{DS(on)} & V_{GS} = 10 \text{ V} & I_D = 11 \text{ A} \\ \hline \text{Forward Transconductance} & g_{fs} & V_{DS} = 30 \text{ V}, I_D = 11 \text{ A} \\ \hline \\ \hline \text{Dynamic} \\ \hline \\ \hline \text{Input Capacitance} & C_{iss} & V_{GS} = 0 \text{ V}, \\ \hline \text{Output Capacitance} & C_{oss} & V_{DS} = 100 \text{ V}, \\ \hline \text{Reverse Transfer Capacitance} & C_{rss} & f = 1 \text{ MHz} \\ \hline \\ $		-	4	V
$ \begin{array}{c c c c c c } \hline V_{GS} & = \pm 30 \ V \\ \hline V_{GS} & = \pm 30 \ V \\ \hline V_{DS} & = 520 \ V, \ V_{GS} & = 0 \ V \\ \hline V_{DS} & = 520 \ V, \ V_{GS} & = 0 \ V \\ \hline V_{DS} & = 520 \ V, \ V_{GS} & = 0 \ V \\ \hline V_{DS} & = 520 \ V, \ V_{GS} & = 0 \ V \\ \hline V_{DS} & = 520 \ V, \ V_{GS} & = 0 \ V \\ \hline V_{DS} & = 520 \ V, \ V_{GS} & = 0 \ V \\ \hline V_{DS} & = 520 \ V, \ V_{GS} & = 0 \ V \\ \hline V_{DS} & = 30 \ V, \ I_{D} & = 11 \ A \\ \hline \begin{array}{c} \hline Dynamic \\ \hline Dynamic \\ \hline \\ \hline Dynamic \\ \hline \\ \hline \\ Dynamic \\ \hline \\ \hline \\ Input \ Capacitance \\ \hline \\ Capacitance \\ \hline \\ Output \ Capacitance \\ \hline \\ C_{0ss} \\ \hline \\ Output \ Capacitance \\ \hline \\ C_{0ss} \\ \hline \\ \hline \\ Output \ Capacitance \\ \hline \\ C_{0ss} \\ \hline \\ \hline \\ C_{0(er)} \\ \hline \\ \hline \\ Fective \ Output \ Capacitance \ Finegy \\ Related \ ^{a} \\ \hline \\ \hline \\ C_{0(tr)} \\ \hline \\ \hline \\ \hline \\ Total \ Gate \ Charge \\ \hline \\ \\ Gate \ Charge \\ \hline \\ \\ \hline \\ Gate \ Charge \\ \hline \\ \\ \hline \\ \hline \\ Gate \ Charge \\ \hline \\ $	-	-	± 100	nA
Zero Gate Voltage Drain Current I_{DSS} $V_{DS} = 520 \text{ V}, \text{ V}_{GS} = 0 \text{ V}, \text{ T}_{J} = 125 ^{\circ}\text{C}$ Drain-Source On-State Resistance $R_{DS(on)}$ $V_{GS} = 10 \text{ V}$ $I_D = 11 \text{ A}$ Forward Transconductance g_{fs} $V_{DS} = 30 \text{ V}, I_D = 11 \text{ A}$ DynamicInput Capacitance C_{iss} $V_{GS} = 0 \text{ V}, V_{GS} = 0 \text{ V}, V_{DS} = 100 \text{ V}, I_D = 11 \text{ A}$ Output Capacitance C_{oss} $V_{GS} = 100 \text{ V}, I_D = 11 \text{ MHz}$ Effective Querter Capacitance, Energy Related a $C_{o(er)}$ $V_{DS} = 100 \text{ V}, I_S = 0 \text{ V}$ Effective Output Capacitance, Energy Related b $C_{o(er)}$ $V_{DS} = 0 \text{ V}$ to $520 \text{ V}, V_{GS} = 0 \text{ V}$ Total Gate Charge Q_g Q_g $V_{GS} = 10 \text{ V}$ $I_D = 11 \text{ A}, V_{DS} = 520 \text{ V}$ Gate-Drain Charge Q_{gd} Q_{gd} $V_{DD} = 520 \text{ V}, I_D = 11 \text{ A},$ Rise Time t_r $V_{DD} = 520 \text{ V}, I_D = 11 \text{ A},$		-	± 1	μA
Drain-Source On-State Resistance $R_{DS(on)}$ $V_{DS} = 520 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 125 \text{ °C}$ Drain-Source On-State Resistance $R_{DS(on)}$ $V_{GS} = 10 \text{ V}$ $I_D = 11 \text{ A}$ Forward Transconductance g_{fs} $V_{DS} = 30 \text{ V}, I_D = 11 \text{ A}$ DynamicInput Capacitance C_{iss} $V_{GS} = 0 \text{ V},$ Input Capacitance C_{oss} $V_{DS} = 100 \text{ V},$ Reverse Transfer Capacitance C_{rss} $r = 1 \text{ MHz}$ Effective Output Capacitance, Energy Related a $C_{o(er)}$ $V_{DS} = 0 \text{ V}$ to 520 V, $V_{GS} = 0 \text{ V}$ Effective Output Capacitance, Time Related b $C_{o(tr)}$ $V_{DS} = 0 \text{ V}$ to 520 V, $V_{GS} = 0 \text{ V}$ Total Gate Charge Q_g Q_g $I_D = 11 \text{ A}, V_{DS} = 520 \text{ V}$ Gate-Drain Charge Q_{gd} Q_{gd} $I_D = 11 \text{ A}, V_{DS} = 520 \text{ V}$ Turn-On Delay Time $t_{d(on)}$ $V_{DD} = 520 \text{ V}, I_D = 11 \text{ A},$	-	-	1	μA
Forward Transconductance g_{fs} $V_{DS} = 30 \text{ V}, I_D = 11 \text{ A}$ DynamicInput Capacitance C_{iss} $V_{GS} = 0 \text{ V},$ Input Capacitance C_{oss} $V_{DS} = 100 \text{ V},$ Output Capacitance C_{rss} $f = 1 \text{ MHz}$ Effective Output Capacitance, Energy Related a $C_{o(er)}$ $V_{DS} = 0 \text{ V}$ to 520 V, $V_{GS} = 0 \text{ V}$ Effective Output Capacitance, Time Related b $C_{o(er)}$ $V_{DS} = 0 \text{ V}$ to 520 V, $V_{GS} = 0 \text{ V}$ Total Gate Charge Q_g Q_g $Q_{gs} = 10 \text{ V}$ Gate-Drain Charge Q_{gd} $V_{GS} = 10 \text{ V}$ Turn-On Delay Time $t_{d(on)}$ t_r Rise Time t_r $V_{DD} = 520 \text{ V}, I_D = 11 \text{ A},$	-	-	500	
DynamicSisDiscrete (N, P)Input Capacitance C_{iss} $V_{GS} = 0 V$, $V_{DS} = 100 V$, f = 1 MHzReverse Transfer Capacitance C_{rss} $F = 1 \text{ MHz}$ Effective Output Capacitance, Energy Related a $C_{o(er)}$ $V_{DS} = 0 V$ to 520 V, $V_{GS} = 0 V$ Effective Output Capacitance, Time Related b $C_{o(tr)}$ $V_{DS} = 0 V$ to 520 V, $V_{GS} = 0 V$ Total Gate Charge Q_g Q_g $U_{GS} = 10 V$ $I_D = 11 A$, $V_{DS} = 520 V$ Gate-Drain Charge Q_{gd} $Q_{DD} = 520 V$, $I_D = 11 A$,Rise Time t_r $V_{DD} = 520 V$, $I_D = 11 A$,	-	0.19	-	Ω
$\begin{tabular}{ c c c c c } \hline Input Capacitance & C_{iss} & V_{GS} = 0 \ V, \\ \hline Output Capacitance & C_{oss} & V_{DS} = 100 \ V, \\ \hline Reverse Transfer Capacitance & C_{rss} & f = 1 \ MHz & \\ \hline Effective Output Capacitance, Energy \\ \hline Related a & C_{o(er)} & \\ \hline Effective Output Capacitance, Time & C_{o(er)} & \\ \hline Effective Output Capacitance, Time & C_{o(tr)} & \\ \hline Total Gate Charge & Q_g & \\ \hline Gate-Source Charge & Q_{gs} & \\ \hline Gate-Drain Charge & Q_{gd} & \\ \hline Turn-On Delay Time & t_{d(on)} & \\ \hline Rise Time & t_r & V_{DD} = 520 \ V, \ I_D = 11 \ A, \ I_D = 11 \ A, \\ \hline \end{tabular}$	-	7.0	-	S
$ \begin{array}{c c} Output Capacitance & C_{oss} & V_{DS} = 100 \text{ V}, \\ \hline Reverse Transfer Capacitance & C_{rss} & f = 1 \text{ MHz} \\ \hline \\ Effective Output Capacitance, Energy \\ Related a & C_{o(er)} & \\ \hline \\ \hline \\ Effective Output Capacitance, Time & C_{o(tr)} & \\ \hline \\ \hline \\ Total Gate Charge & Q_g & \\ \hline \\ Gate-Source Charge & Q_{gs} & \\ \hline \\ \hline \\ \hline \\ Gate-Drain Charge & Q_{gd} & \\ \hline \\ \hline \\ \hline \\ \\ \hline \\ \hline \\ \\ \hline \\ \hline \\ \\ \hline \\ \\ \hline \\ \\ \hline \\ \hline \\ \\ \hline \\ \\ \hline \\ \\ \hline \\ \hline \\ \\ \hline \\ \\ \hline \\ \hline \\ \hline \\ \hline \\ \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \hline \\ \hline \\ \hline \hline \\ \hline \hline \\ \hline \\ \hline \hline \hline \\ \hline \hline \hline \\ \hline \hline \hline \hline \\ \hline \hline \hline \hline \hline \\ \hline \hline \hline \hline \hline \hline \hline \hline \\ \hline \hline$			•	
$ \begin{array}{c c} Output Capacitance & C_{oss} & V_{DS} = 100 \text{ V}, \\ \hline Reverse Transfer Capacitance & C_{rss} & f = 1 \text{ MHz} \\ \hline Effective Output Capacitance, Energy \\ Related a & C_{o(er)} & \\ \hline Effective Output Capacitance, Time & C_{o(er)} & \\ \hline Effective Output Capacitance, Time & C_{o(tr)} & \\ \hline Total Gate Charge & Q_g & \\ \hline Gate-Source Charge & Q_{gs} & \\ \hline Gate-Drain Charge & Q_{gd} & \\ \hline Turn-On Delay Time & t_{d(on)} & \\ \hline Rise Time & t_r & \\ \hline V_{DD} = 520 \text{ V}, \text{ I}_D = 11 \text{ A}, \\ \hline V_{DD} = 520 \text{ V}, \text{ I}_D = 11 \text{ A}, \\ \hline \end{array} $	-	2322	-	
$\begin{tabular}{ c c c c } \hline Reverse Transfer Capacitance & C_{rss} & f = 1 \mbox{ MHz} \\ \hline Effective Output Capacitance, Energy Related a & $V_{DS} = 0 \mbox{ V} to 520 \mbox{ V}, V_{GS} = 0 \mbox{ V} \\ \hline Effective Output Capacitance, Time & $C_{o(tr)}$ & $V_{DS} = 0 \mbox{ V} to 520 \mbox{ V}, V_{GS} = 0 \mbox{ V} \\ \hline Effective Output Capacitance, Time & Q_g & $V_{GS} = 10 \mbox{ V} & $I_D = 11 \mbox{ A}, V_{DS} = 520 \mbox{ V}, I_D = 11 \mbox{ A}, V_{DD} = 520 \mbox{ V}, I_D = 11 \mbox{ A}, \end{tabular}$	-	105	-	pF
$\begin{tabular}{ c c c c c } \hline Related a & C_{O(er)} & V_{DS} = 0 \ V \ to \ 520 \ V, \ V_{GS} = 0 \ V \\ \hline \end{tabular} Effective Output Capacitance, Time & C_{O(tr)} & V_{DS} = 0 \ V \ to \ 520 \ V, \ V_{GS} = 0 \ V \\ \hline \end{tabular} Total \ Gate \ Charge & Q_g & V_{GS} = 10 \ V & I_D = 11 \ A, \ V_{DS} = 520 \ V \\ \hline \end{tabular} Gate \ Drain \ Charge & Q_{gd} & V_{GS} = 10 \ V & I_D = 11 \ A, \ V_{DS} = 520 \ V \\ \hline \end{tabular} Fise \ Time & t_d(on) & V_{DD} = 520 \ V, \ I_D = 11 \ A, \ V_{DD} = 10 \ A \ A \ A \ A \ A \ A \ A \ A \ A \ $	-	4	-	
Effective Output Capacitance, Time Related b $C_{o(tr)}$ $C_{o(tr)}$ Total Gate Charge Q_g Gate-Source Charge Q_{gs} VGS = 10 V $I_D = 11 \text{ A}, V_{DS} = 520 \text{ V}$ Gate-Drain Charge Q_{gd} Turn-On Delay Time $t_{d(on)}$ Rise Time t_r VDD = 520 V, ID = 11 A,	-	84	-	
$\begin{tabular}{ c c c c c } \hline Gate-Source Charge & Q_{gs} & V_{GS} = 10 V & I_{D} = 11 A, V_{DS} = 520 V \\ \hline Gate-Drain Charge & Q_{gd} & $$I_{D}$ = 11 A, V_{DS} = 520 V \\ \hline Turn-On Delay Time & $t_{d(on)}$ & $$V_{DD}$ = 520 V, I_{D} = 11 A, V_{DD} = 520 V, V_{DD} = 520 VV$	-	293	-	
Gate-Drain Charge Qgd Turn-On Delay Time td(on) Rise Time tr VDD = 520 V, ID = 11 A,	-	71	106	nC
Gate-Drain Charge Qgd Turn-On Delay Time td(on) Rise Time tr VDD = 520 V, ID = 11 A,	-	14	-	
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	-	33	-	1
vpp = 020 v, 10 = 117,	-	22	44	ns
	-	34	68	
	-	68	102	
Fall Time t _f	-	42	84	
Gate Input Resistance R _g f = 1 MHz, open drain	-	0.78	-	Ω
Drain-Source Body Diode Characteristics				
Continuous Source-Drain Diode Current I _S MOSFET symbol showing the	-	-	21	A
Pulsed Diode Forward Current I _{SM} integral reverse p - n junction diode	-	-	53	
Diode Forward Voltage V_{SD} $T_J = 25 \text{ °C}, I_S = 11 \text{ A}, V_{GS} = 0 \text{ V}$	-	0.9	1.2	V
Reverse Recovery Time trr	-	160	-	ns
$T_J = 25 \text{ °C}, I_F = I_S = 11 \text{ A},$		1.2	-	μC
Reverse Recovery Current U_{rr} dl/dt = 100 A/µs, V_{R} = 25 V	-	14	-	A

Notes

a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} . b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

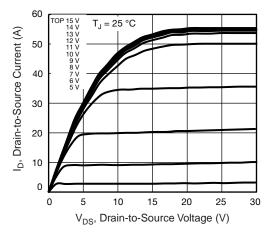


Fig. 1 - Typical Output Characteristics



Fig. 2 - Typical Output Characteristics

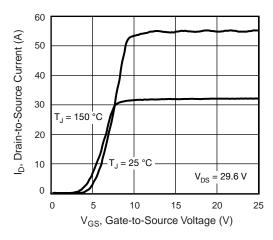


Fig. 3 - Typical Transfer Characteristics

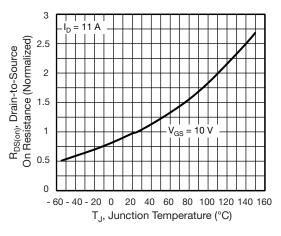


Fig. 4 - Normalized On-Resistance vs. Temperature

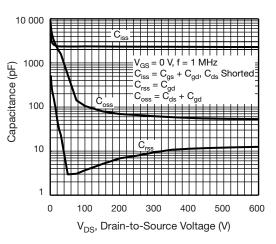


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

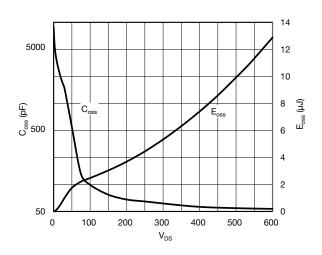


Fig. 6 - C_{oss} and E_{oss} vs. V_{DS}



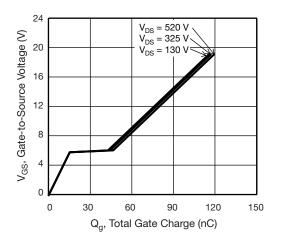


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

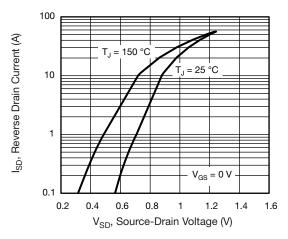


Fig. 8 - Typical Source-Drain Diode Forward Voltage

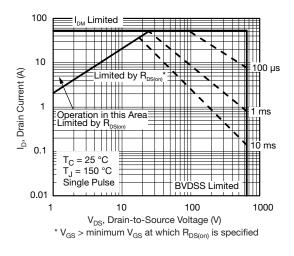


Fig. 9 - Maximum Safe Operating Area

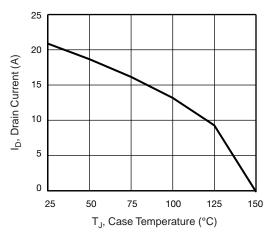


Fig. 10 - Maximum Drain Current vs. Case Temperature



Fig. 11 - Temperature vs. Drain-to-Source Voltage



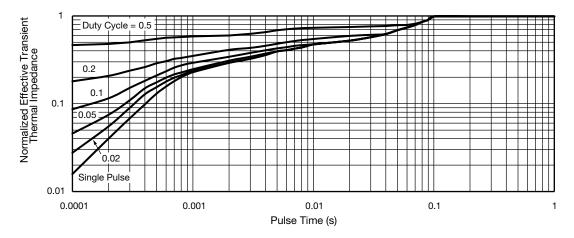


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case



Fig. 13 - Switching Time Test Circuit



Fig. 14 - Switching Time Waveforms

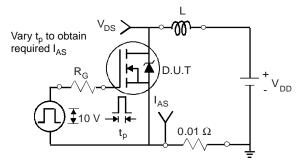


Fig. 15 - Unclamped Inductive Test Circuit

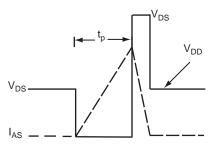


Fig. 16 - Unclamped Inductive Waveforms

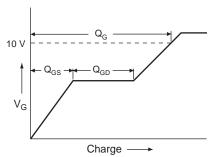
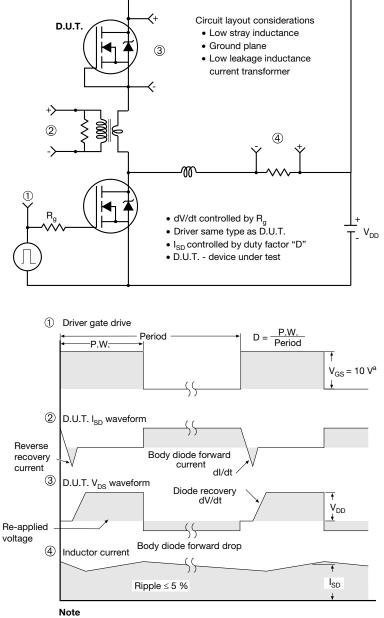


Fig. 17 - Basic Gate Charge Waveform





Peak Diode Recovery dV/dt Test Circuit



a. $V_{GS} = 5$ V for logic level devices

Fig. 19 - For N-Channel



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