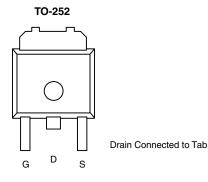


## N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY				
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω) Max.	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ.)	
60	0.073 at V <sub>GS</sub> = 10 V	18.2	19.8	
	0.085 at V <sub>GS</sub> = 4.5 V	13.2	19.0	



#### **FEATURES**

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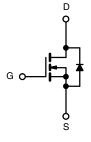
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested
- Material categorization: For definitions of compliance please see



COMPLIANT HALOGEN

#### APPLICATIONS

- DC/DC Converters
- DC/AC Inverters
- Motor Drives



N-Channel MOSFET

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_C = 25 \text{ °C}$ , unless otherwise noted)					
Parameter	Symbol	Limit	Unit		
Drain-Source Voltage	V <sub>DS</sub>	60	V		
Gate-Source Voltage	V <sub>GS</sub>	± 20	v		
Continuous Drain Current	T <sub>C</sub> = 25 °C		16.9		
Continuous Drain Current	T <sub>C</sub> = 70 °C	I <sub>D</sub>	13.6	А	
Pulsed Drain Current (t = 300 µs)	I <sub>DM</sub>	25	~		
Avalanche Current	I <sub>AS</sub>	15			
Single Avalanche Energy <sup>a</sup>	L = 0.1 mH	E <sub>AS</sub>	11.25	mJ	
Maximum Power Dissipation <sup>a</sup>	T <sub>C</sub> = 25 °C	Р	41.7 <sup>b</sup>	w	
	T <sub>A</sub> = 25 °C <sup>c</sup>	– P <sub>D</sub> –	2.1	vv	
Operating Junction and Storage Temper	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C		

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Limit	Unit	
Junction-to-Ambient (PCB Mount) <sup>c</sup>	R <sub>thJA</sub>	60	°C/W	
Junction-to-Case (Drain)	R <sub>thJC</sub>	3		

Notes:

a. Duty cycle  $\leq$  1 %.

b. See SOA curve for voltage derating.

c. When mounted on 1" square PCB (FR-4 material).

d. Base on T<sub>C</sub> = 25 °C.

ParameterSymbolTest ConditionsMin.StaticDrain-Source Breakdown Voltage $V_{DS}$ $V_{GS} = 0$ V, $I_D = 250 \ \mu$ A60Gate Threshold Voltage $V_{GS}(h)$ $V_{DS} = V_{GS}$ , $I_D = 250 \ \mu$ A1.0Gate-Body Leakage $I_{GSS}$ $V_{DS} = 0$ V, $V_{GS} = \pm 20$ V20Zero Gate Voltage Drain Current $I_{DSS}$ $V_{DS} = 60$ V, $V_{GS} = 0$ V, $T_J = 125$ °C20On-State Drain Current <sup>a</sup> $I_{D(on)}$ $V_{DS} = 60$ V, $V_{GS} = 0$ V, $T_J = 150$ °C20Drain-Source On-State Resistance <sup>a</sup> $R_{DS(on)}$ $V_{DS} = 10$ V, $V_{GS} = 10$ V20Drain-Source On-State Resistance <sup>a</sup> $g_{fs}$ $V_{DS} = 15$ V, $I_D = 6.6$ A20Dynamic <sup>b</sup> Iput Capacitance $C_{Iss}$ $V_{DS} = 30$ V, $V_{GS} = 0$ V, $I = 1$ MHz20Output Capacitance $C_{res}$ $V_{DS} = 30$ V, $V_{GS} = 10$ V, $I_D = 6.6$ A20Gate-Source Charge <sup>c</sup> $Q_{gg}$ $Q_{gg}$ $V_{DS} = 30$ V, $V_{GS} = 10$ V, $I_D = 6.6$ A20Gate-Drain Charge <sup>c</sup> $Q_{gg}$ $Q_{gg}$ $V_{DS} = 30$ V, $V_{GS} = 10$ V, $I_D = 6.6$ A20Gate-Source Charge <sup>c</sup> $Q_{gg}$ $Q_{gg}$ $I_D = 5.2$ A, $V_{GS} = 10$ V, $I_D = 6.6$ A20Gate-Drain Charge <sup>c</sup> $Q_{gg}$ $I_D = 5.2$ A, $V_{GS} = 10$ V, $I_D = 6.6$ A20Gate-Boy Time <sup>c</sup> $I_d(off)$ $I_D = 5.2$ A, $V_{GS} = 10$ V, $I_D = 1.0$ 20Gate-Brain Charge <sup>c</sup> $I_T$ $V_{DD} = 30$ V, $R_L = 9.6$ $\Omega_L$ 20I'um-Oft Delay Time <sup>c</sup> $I_d(off)$ $I_D = 5.2$	Ture	Max	11
$\begin{array}{ c c c c c } \hline \begin{tabular}{ c c c c c } \hline \begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c c } \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Тур.	Max.	Unit
Gate Threshold Voltage $V_{GS}(th)$ $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$ 1.0Gate-Body Leakage $I_{GSS}$ $V_{DS} = 0  V, V_{GS} = \pm 20  V$ $V_{DS} = 60  V, V_{GS} = \pm 20  V$ Zero Gate Voltage Drain Current $I_{DSS}$ $V_{DS} = 60  V, V_{GS} = 0  V, T_J = 125  ^{\circ}\text{C}$ On-State Drain Current <sup>a</sup> $I_{D(on)}$ $V_{DS} = 60  V, V_{GS} = 0  V, T_J = 150  ^{\circ}\text{C}$ Drain-Source On-State Resistance <sup>a</sup> $R_{DS(on)}$ $V_{DS} = 10  V,  V_{GS} = 10  V$ Proward Transconductance <sup>a</sup> $g_{fs}$ $V_{DS} = 15  V,  I_D = 6.6  A$ Dynamic <sup>b</sup> $V_{DS} = 30  V,  V_{GS} = 0  V,  f = 1  \text{MHz}$ Input Capacitance $C_{rss}$ $V_{DS} = 30  V,  V_{GS} = 10  V,  I_D = 6.6  A$ Output Capacitance $C_{rss}$ $V_{DS} = 30  V,  V_{GS} = 10  V,  I_D = 6.6  A$ Gate-Charge <sup>c</sup> $Q_{gd}$ $Q_{gd}$ Gate-Drain Charge <sup>c</sup> $Q_{gd}$ $V_{DS} = 30  V,  V_{GS} = 10  V,  I_D = 6.6  A$ Turn-On Delay Time <sup>c</sup> $t_q(on)$ $I_D = 5.2  A,  V_{GEN} = 10  V,  R_g = 1  \Omega$ Rise Time <sup>c</sup> $t_q(on)$ $I_D = 5.2  A,  V_{GEN} = 4.5  V,  R_g = 1  \Omega$ Fail Time <sup>c</sup> $t_q(on)$ $I_D = 5.2  A,  V_{GEN} = 4.5  V,  R_g = 1  \Omega$ Fail Time <sup>c</sup> $t_q(on)$ $I_D = 5.2  A,  V_{GEN} = 4.5  V,  R_g = 1  \Omega$ Fail Time <sup>c</sup> $t_q$ $I_F = 5.2  A,  V_{GEN} = 0  V$ Fail Time <sup>c</sup> $t_q$ $I_S$ Pulsed Current $I_S$ $I_F = 5.2  A,  V_{GS} = 0  V$			1
Gate-Body Leakage $I_{GSS}$ $V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$ Zero Gate Voltage Drain Current $I_{DSS}$ $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 125 ^{\circ}\text{C}$ $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 150 ^{\circ}\text{C}$ On-State Drain Current <sup>a</sup> $I_{D(on)}$ $V_{DS} \ge 10 \text{ V}, V_{GS} = 10 \text{ V}$ 20Drain-Source On-State Resistance <sup>a</sup> $R_{DS(on)}$ $V_{GS} = 15 \text{ V}, I_D = 6.6 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 6.6 \text{ A}$ Forward Transconductance $C_{iss}$ $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ $P_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ Input Capacitance $C_{iss}$ $V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6.6 \text{ A}$ $P_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6.6 \text{ A}$ Output Capacitance $C_{rss}$ $V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6.6 \text{ A}$ $P_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6.6 \text{ A}$ Gate-Drain Charge <sup>c</sup> $Q_{g}$ $Q_{g}$ $Q_{g}$ $Q_{g}$ $Q_{g}$ $Q_{G}$ Gate Resistance $R_g$ $f = 1 \text{ MHz}$ $0.4 \text{ Turn-On Delay Time^c}$ $I_d(on)$ Rise Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_L = 9.6 \Omega$ $Q_{D}$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_g = 1 \Omega$ $Q_{D}$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_L = 9.6 \Omega$ $Q_{D}$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_g = 1 \Omega$ $Q_{D}$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_g = 1 \Omega$ $Q_{D}$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_g = 1 \Omega$ $Q$			v
$ \begin{array}{ c c c c c c } \mbox{Zero Gate Voltage Drain Current} & I_{DSS} & V_{DS} = 60 \ V, \ V_{GS} = 0 \ V, \ U_{DS} = 60 \ V, \ V_{GS} = 0 \ V, \ U_{J} = 125 \ ^{\circ}C \ \hline V_{DS} = 60 \ V, \ V_{GS} = 0 \ V, \ U_{J} = 150 \ ^{\circ}C \ \hline V_{DS} = 60 \ V, \ V_{GS} = 10 \ V, \ U_{GS} = 10 \ V \ U_{SS} = 10 \ V, \ U_{SS} = 10 \ V \ U_{SS} = 10 \ V, \$		3.0	_
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		± 250	nA
$\begin{tabular}{ c c c c } \hline V_{DS} = 60 \ V, \ V_{GS} = 0 \ V, \ T_J = 150 \ ^{\circ}\text{C} & \hline V_{DS} \ge 10 \ V, \ V_{GS} = 10 \ V, \ V_{DS} = 10 \ V, \ V_{DS} = 10 \ V, \ V_{DS} = 10 \ V, \ V_{GS} = 10 \ V, \ V_{DS} = 30 \ V, \ V_{GS} = 10 \ V, \ V_{DS} = 30 \ V, \ V_{GS} = 10 \ V, \ V_{DS} = 30 \ V, \ V_{GS} = 10 \ V, \ V_{DS} = 30 \ V, \ V_{GS} = 10 \ V, \ V_{DS} = 30 \ V, \ V_{GS} = 10 \ V, \ V_{DS} = 10 \ V$		1	
$ \begin{array}{c c c c c c c } \hline On-State Drain Current^a & I_D(on) & V_{DS} \geq 10 \ V, \ V_{GS} = 10 \ V, \ V_{GS} = 10 \ V, \ U_{GS} = 10 \ V, \ U_{D} = 6.6 \ A & V_{GS} = 4.5 \ V, \ I_{D} = 6.6 \ A & V_{DS} = 15 \ V, \ I_{D} = 6.6 \ A & V_{DS} = 15 \ V, \ I_{D} = 6.6 \ A & V_{DS} = 15 \ V, \ I_{D} = 6.6 \ A & V_{DS} = 15 \ V, \ I_{D} = 6.6 \ A & V_{DS} = 15 \ V, \ I_{D} = 6.6 \ A & V_{DS} = 15 \ V, \ I_{D} = 6.6 \ A & V_{DS} = 10 \ V, \ U_{DS} = 15 \ V, \ I_{D} = 6.6 \ A & V_{DS} = 10 \ V, \ U_{DS} = 10 \ V, \ U_{DS} = 10 \ V, \ U_{DS} = 10 \ V, \ U_{SS} = 10 \ V, \$		50	μΑ
$\begin{array}{ c c c c } \hline V_{GS} = 10 \ V, \ D = 6.6 \ A \\ \hline V_{GS} = 4.5 \ V, \ I_D = 6.6 \ A \\ \hline V_{GS} = 4.5 \ V, \ I_D = 6.6 \ A \\ \hline V_{GS} = 4.5 \ V, \ I_D = 6.6 \ A \\ \hline V_{GS} = 4.5 \ V, \ I_D = 6.6 \ A \\ \hline V_{DS} = 15 \ V, \ I_D = 6.6 \ A \\ \hline Dynamic^b \\ \hline Dut Capacitance \hline C_{iss} \\ \hline Output Capacitance \hline C_{oss} \\ \hline Output Capacitance \hline C_{rss} \\ \hline Total Gate Charge^c & Q_g \\ Gate-Source Charge^c & Q_{gs} \\ Gate-Source Charge^c & Q_{gd} \\ \hline Gate Resistance \hline R_g & f = 1 \ MHz \\ \hline Unn-On Delay Time^c & t_d \\ \hline Turn-On Delay Time^c & t_f \\ \hline Turn-On Delay Time^c & t_f \\ \hline Turn-On Delay Time^c & t_f \\ \hline Turn-On Delay Time^c & t_d \\ \hline Turn-On Delay Time^c & t_f \\ \hline Turn-On Delay Time^c & t_f \\ \hline Turn-On Delay Time^c & t_f \\ \hline Turn-On Delay Time^c & t_d \\ \hline Turn-On Delay Time^c & t_d \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline D = 5.2 \ A, \ V_{GEN} = 0 \ V \\ \hline $		250	
Drain-Source On-State Resistance** $H_{DS(on)}$ $V_{GS} = 4.5 \text{ V}, I_D = 6 \text{ A}$ Forward Transconductance* $g_{fs}$ $V_{DS} = 15 \text{ V}, I_D = 6.6 \text{ A}$ Dynamic*Input Capacitance $C_{iss}$ $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ Output Capacitance $C_{css}$ $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ Reverse Transfer Capacitance $C_{rss}$ $V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6.6 \text{ A}$ Gate-Source Charge* $Q_g$ $V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6.6 \text{ A}$ Gate-Source Charge* $Q_{gd}$ $V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6.6 \text{ A}$ Gate Resistance $R_g$ $f = 1 \text{ MHz}$ $0.4$ Turn-On Delay Time* $t_d(on)$ $V_{DD} = 30 \text{ V}, R_L = 9.6 \Omega$ $I_D \cong 5.2 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$ Fall Time* $t_f$ $V_{DD} = 30 \text{ V}, R_L = 9.6 \Omega$ $I_D \cong 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Turn-Off Delay Time* $t_d(onf)$ $I_D \cong 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ $I_D \cong 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Fall Time* $t_f$ $I_D \cong 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ $I_D \cong 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Drain-Source Body Diode Ratings and Characteristics* $T_C = 25 \text{ °C}$ $C$ $C$ Continuous Current $I_S$ $I_F = 5.2 \text{ A}, V_{GS} = 0 \text{ V}$ $I_F = 5.2 \text{ A}, V_{GS} = 0 \text{ V}$			Α
$V_{GS} = 4.5 V, I_D = 6 A$ Forward Transconductance <sup>a</sup> $g_{fs}$ $V_{DS} = 15 V, I_D = 6.6 A$ Dynamic <sup>b</sup> $V_{DS} = 15 V, I_D = 6.6 A$ $V_{DS} = 15 V, I_D = 6.6 A$ $V_{DS} = 30 V, V_{GS} = 0 V, f = 1 MHz$ Reverse Transfer Capacitance $C_{rss}$ Total Gate Charge <sup>c</sup> $Q_g$ Gate-Source Charge <sup>c</sup> $Q_{gd}$ Gate Resistance $R_g$ $f = 1 MHz$ $0.4$ Turn-On Delay Time <sup>c</sup> $T_d(on)$ Rise Time <sup>c</sup> $T_d(on)$ Rise Time <sup>c</sup> $T_f$ $V_{DD} = 30 V, R_L = 9.6 \Omega$ $I_D \approx 5.2 A, V_{GEN} = 10 V, R_g = 1 \Omega$ $I_D \approx 5.2 A, V_{GEN} = 4.5 V, R_g = 1 \Omega$ $I_D \approx 5.2 A, V_{GEN} = 0 V$	0.073		0
DynamicbDot if DInput Capacitance $C_{iss}$ Output Capacitance $C_{oss}$ Reverse Transfer Capacitance $C_{rss}$ Total Gate Charge <sup>c</sup> $Q_g$ Gate-Source Charge <sup>c</sup> $Q_{gd}$ Gate-Drain Charge <sup>c</sup> $Q_{gd}$ Gate Resistance $R_g$ Turn-On Delay Time <sup>c</sup> $t_{d(on)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_d(on)$ Rise Time <sup>c</sup> $t_f$ Turn-On Delay Time <sup>c</sup> $t_{d(on)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_{d(on)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_{d(on)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_{d(on)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_{d(off)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_{d(off)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_{d(off)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_{d(off)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_r$ Pulsed Current $l_S$ Pulsed Current $l_{SM}$ Forward Voltage <sup>a</sup> $V_{SD}$ I = 5.2 A, V_{GS} = 0 V	0.083		Ω
$\begin{array}{c c c c c c c } \hline \mbox{Input Capacitance} & C_{iss} & & & & & & & & & & & & & & & & & & $	25		S
$\begin{array}{c c c c c c c c } \hline Output Capacitance & C_{oss} & V_{DS} = 30 \text{ V}, \text{ V}_{GS} = 0 \text{ V}, \text{ f} = 1 \text{ MHz} & \hline \\ \hline$	1		
$\begin{array}{c c c c c c c c } \hline Output Capacitance & C_{oss} & V_{DS} = 30 \text{ V}, \text{ V}_{GS} = 0 \text{ V}, \text{ f} = 1 \text{ MHz} & \hline \\ \hline$	860		
$\begin{array}{c c c c c c c c c } \hline Reverse Transfer Capacitance & C_{rss} & & & & & & & & & & & & & & & & & & $	85		pF
$\begin{array}{c c c c c c c } \hline Total Gate Charge^c & Q_g \\ \hline Gate-Source Charge^c & Q_{gd} \\ \hline Gate-Drain Charge^c & Q_{gd} \\ \hline \\ \hline Gate Resistance & R_g & f = 1 \ MHz & 0.4 \\ \hline \\ \hline \\ Gate Resistance & R_g & f = 1 \ MHz & 0.4 \\ \hline \\ \hline \\ \hline \\ Turn-On \ Delay Time^c & t_{d(on)} \\ \hline \\ Fall Time^c & t_f \\ \hline \\ \hline \\ Turn-On \ Delay Time^c & t_{d(off)} \\ \hline \\ Fall Time^c & t_f \\ \hline \\ \hline \\ \hline \\ Turn-On \ Delay Time^c & t_{d(on)} \\ \hline \\ Rise Time^c & t_f \\ \hline \\ \hline \\ \hline \\ \hline \\ Turn-On \ Delay Time^c & t_{d(on)} \\ \hline \\ Rise Time^c & t_f \\ \hline \\ \hline \\ \hline \\ \hline \\ Turn-On \ Delay Time^c & t_{d(off)} \\ \hline \\ \hline \\ Fall Time^c & t_f \\ \hline \\ Fall Time^c & t_f \\ \hline \\ $	40		1
Gate-Source Charge <sup>c</sup> $Q_{gs}$ $V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 6.6 \text{ A}$ Gate-Drain Charge <sup>c</sup> $Q_{gd}$ $Q_{gd}$ $Q_{gd}$ Gate Resistance $R_g$ $f = 1 \text{ MHz}$ $0.4$ Turn-On Delay Time <sup>c</sup> $t_{d(on)}$ $V_{DD} = 30 \text{ V}, R_t = 9.6 \Omega$ $D_T = 5.2 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_t = 9.6 \Omega$ $D_T = 5.2 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_t = 9.6 \Omega$ $D_T = 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Rise Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_t = 9.6 \Omega$ $D_T = 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Turn-On Delay Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_t = 9.6 \Omega$ $D_T = 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_t = 9.6 \Omega$ $D_T = 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_t = 9.6 \Omega$ $D_T = 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Fall Time <sup>c</sup> $t_f$ $V_{DD} = 30 \text{ V}, R_t = 9.6 \Omega$ $D_T = 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> $T_C = 25 \text{ °C}$ $D_T = 5.2 \text{ A}, V_{GS} = 0 \text{ V}$ $D_T = 5.2 \text{ A}, V_{GS} = 0 \text{ V}$ Pulsed Current $I_S$ $I_F = 5.2 \text{ A}, V_{GS} = 0 \text{ V}$ $D_T = 5.2 \text{ A}, V_{GS} = 0 \text{ V}$	19.8	30	
$\begin{array}{c c c c c c c c } \hline Gate-Drain Charge^{c} & Q_{gd} & & & & & \\ \hline Gate Resistance & R_{g} & f = 1 \ \text{MHz} & 0.4 \\ \hline \\ $	3.6		nC
$\begin{array}{c c c c c c c } \hline Gate Resistance & R_g & f = 1 \ \text{MHz} & 0.4 \\ \hline \mbox{Turn-On Delay Time}^c & t_{d(on)} & & & & & & \\ \hline \mbox{Rise Time}^c & t_r & & & & & & & & & \\ \hline \mbox{Turn-Off Delay Time}^c & t_{d(off)} & & & & & & & & & & \\ \hline \mbox{Turn-On Delay Time}^c & t_f & & & & & & & & & & \\ \hline \mbox{Turn-On Delay Time}^c & t_d(on) & & & & & & & & & \\ \hline \mbox{Turn-On Delay Time}^c & t_d(on) & & & & & & & & & \\ \hline \mbox{Rise Time}^c & t_r & & & & & & & & & & \\ \hline \mbox{Turn-Off Delay Time}^c & t_r & & & & & & & & & & \\ \hline \mbox{Turn-Off Delay Time}^c & t_f & & & & & & & & & & \\ \hline \mbox{Turn-Off Delay Time}^c & t_f & & & & & & & & & \\ \hline \mbox{Turn-Off Delay Time}^c & t_f & & & & & & & & \\ \hline \mbox{Turn-Off Delay Time}^c & t_f & & & & & & & & \\ \hline \mbox{Turn-Off Delay Time}^c & t_f & & & & & & & & \\ \hline \mbox{Drain-Source Body Diode Ratings and Characteristics}^b \ \mbox{T}_C = 25 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	4.1		
$\begin{array}{c c c c c c c } \hline Turn-On \ Delay \ Time^c & t_{d(on)} \\ \hline Rise \ Time^c & t_r \\ \hline Turn-Off \ Delay \ Time^c & t_{d(off)} \\ \hline Fall \ Time^c & t_f \\ \hline Turn-On \ Delay \ Time^c & t_f \\ \hline Turn-On \ Delay \ Time^c & t_{d(on)} \\ \hline Rise \ Time^c & t_r \\ \hline Turn-Off \ Delay \ Time^c & t_r \\ \hline Turn-Off \ Delay \ Time^c & t_r \\ \hline Turn-Off \ Delay \ Time^c & t_f \\ \hline \hline Turn-Off \ Delay \ Time^c & t_f \\ \hline Turn-Off \ Delay \ Time^c & t_f \\ \hline \hline Turn-Off \ Delay \ Time^c & t_f \\ \hline \hline Turn-Off \ Delay \ Time^c & t_f \\ \hline \hline Turn-Off \ Delay \ Time^c & t_f \\ \hline \hline Pain-Source \ Body \ Diode \ Ratings \ and \ Characteristics^b \ T_C = 25 \ ^cC \\ \hline \hline Continuous \ Current & I_S \\ \hline Pulsed \ Current & I_S \\ \hline Forward \ Voltage^a & V_{SD} & I_F = 5.2 \ A, \ V_{GS} = 0 \ V \\ \hline \end{array}$	2	4	Ω
$\begin{array}{c c c c c c c c } \hline Rise Time^c & t_r \\ \hline Turn-Off Delay Time^c & t_{d(off)} \\ \hline Fall Time^c & t_f \\ \hline Turn-On Delay Time^c & t_{d(on)} \\ \hline Rise Time^c & t_r \\ \hline Turn-Off Delay Time^c & t_{d(on)} \\ \hline Turn-Off Delay Time^c & t_r \\ \hline Turn-Off Delay Time^c & t_f \\ \hline Turn-Off Delay Time^c & t_f \\ \hline Drain-Source Body Diode Ratings and Characteristics {}^{b} T_{C} = 25 \ ^{c}C \\ \hline Continuous Current & I_{S} \\ \hline Pulsed Current & I_{SM} \\ \hline Forward Voltage^a & V_{SD} & I_{F} = 5.2 \ ^{A}, \ V_{GS} = 0 \ V \\ \hline \end{array}$	8	16	
$\begin{tabular}{ c c c c c } \hline Turn-Off Delay Time^c & t_{d(off)} \\ \hline Fall Time^c & t_f \\ \hline Turn-On Delay Time^c & t_{d(on)} \\ \hline Rise Time^c & t_r & V_{DD} = 30 \ V, \ R_L = 9.6 \ \Omega \\ \hline I_D \cong 5.2 \ A, \ V_{GEN} = 10 \ V, \ R_g = 1 \ \Omega \\ \hline I_D \cong 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline I_D \cong 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_g = 1 \ \Omega \\ \hline Drain-Source Body Diode Ratings and Characteristics \ T_C = 25 \ ^C \\ \hline Continuous \ Current & I_S \\ \hline Pulsed \ Current & I_{SM} \\ \hline Forward \ Voltage^a & V_{SD} & I_F = 5.2 \ A, \ V_{GS} = 0 \ V \\ \hline \end{tabular}$	11	20	-
Fall Time <sup>c</sup> $t_f$ Turn-On Delay Time <sup>c</sup> $t_{d(on)}$ Rise Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_r$ Turn-Off Delay Time <sup>c</sup> $t_{d(off)}$ Fall Time <sup>c</sup> $t_f$ Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> T <sub>C</sub> = 25 °CContinuous Current $I_S$ Pulsed Current $I_{SM}$ Forward Voltage <sup>a</sup> $V_{SD}$ I $I_F = 5.2 \text{ A}, V_{GS} = 0 \text{ V}$	18	27	-
$\begin{tabular}{ c c c c c } \hline Turn-On Delay Time^c & t_{d(on)} \\ \hline Rise Time^c & t_r & \\ \hline Turn-Off Delay Time^c & t_{d(off)} \\ \hline Tall Time^c & t_f & \\ \hline \hline \end{tabular} Drain-Source Body Diode Ratings and Characteristics^b $T_C = 25 $^\circ$C \\ \hline \end{tabular} Continuous Current & I_S & \\ \hline \end{tabular} Pulsed Current & I_{SM} & \\ \hline \end{tabular} Forward Voltage^a & V_{SD} & I_F = 5.2 $A, $V_{GS} = 0 $V$ & \\ \hline \end{tabular}$	5	10	-
$\begin{tabular}{ c c c c c c } \hline Rise Time^{C} & t_{r} & \\ \hline Turn-Off Delay Time^{C} & t_{d(off)} & \\ \hline Fall Time^{C} & t_{f} & \\ \hline \end{tabular} U_{DD} = 30 \ V, \ R_{L} = 9.6 \ \Omega & \\ I_{D} \cong 5.2 \ A, \ V_{GEN} = 4.5 \ V, \ R_{g} = 1 \ \Omega & \\ \hline \end{tabular} \\ \hline$	38	57	ns
Turn-Off Delay Time <sup>c</sup> $t_{d(off)}$ $I_D \cong 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Fall Time <sup>c</sup> $t_f$ ID $\cong 5.2 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$ Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> $T_C = 25 \text{ °C}$ Continuous CurrentIsIsPulsed CurrentIsForward Voltage <sup>a</sup> V_{SD}IF = 5.2 A, V_{GS} = 0 V	58	87	-
Fall Time <sup>c</sup> $t_f$ Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> T <sub>C</sub> = 25 °C         Continuous Current $I_S$ Pulsed Current $I_{SM}$ Forward Voltage <sup>a</sup> $V_{SD}$ $I_F$ = 5.2 A, $V_{GS}$ = 0 V	18	27	1
Image: Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> $T_C = 25 \text{ °C}$ Continuous Current     Is       Pulsed Current     IsM       Forward Voltage <sup>a</sup> V <sub>SD</sub> I <sub>F</sub> = 5.2 A, V <sub>GS</sub> = 0 V	8	16	
Continuous CurrentISPulsed CurrentISMForward VoltageaVSDIF = 5.2 A, VGS = 0 V	1 -		
Pulsed CurrentI SMForward VoltageaV SDI FF5.2 A, V GSV		16.9	
Forward Voltage <sup>a</sup> $V_{SD}$ $I_F = 5.2 \text{ A}, V_{GS} = 0 \text{ V}$		25	A
	0.8	1.5	v
	34	51	ns
Peak Reverse Recovery Current I <sub>BM(BEC)</sub> I <sub>F</sub> = 5.2 A, dl/dt = 100 A/µs	3	5	A
Peak Reverse Recovery Current     I <sub>RM(REC)</sub> I <sub>F</sub> = 5.2 Å, dl/dt = 100 Å/μs       Reverse Recovery Charge     Q <sub>rr</sub>	50	75	nC

Notes:

a. Pulse test; pulse width  $\leq$  300  $\mu s,$  duty cycle  $\leq$  2 %.

b. Guaranteed by design, not subject to production testing.

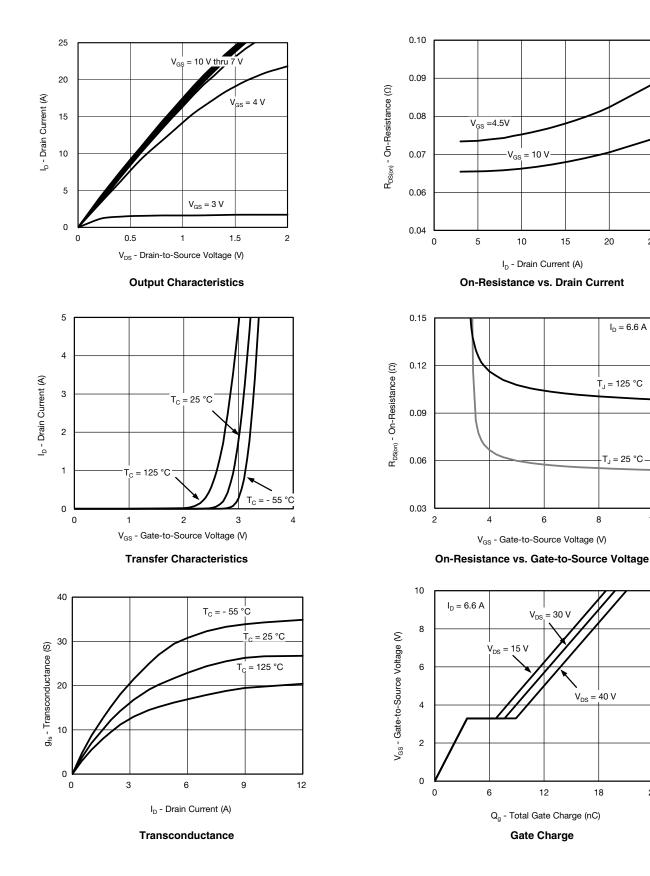
c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

emi

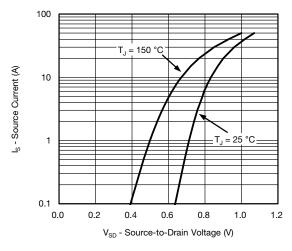


#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

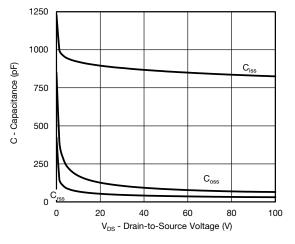




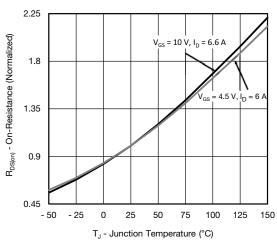
### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



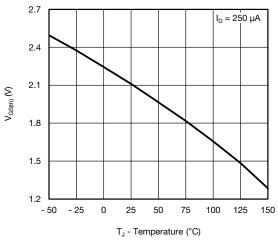
Source-Drain Diode Forward Voltage



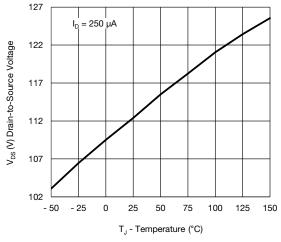




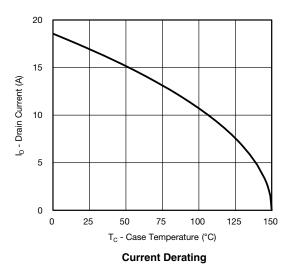
On-Resistance vs. Junction Temperature



**Threshold Voltage** 

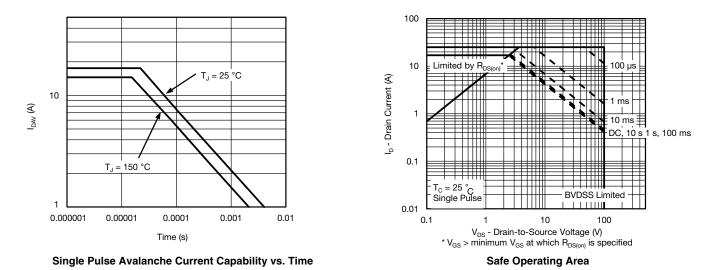


Drain Source Breakdown vs. Junction Temperature

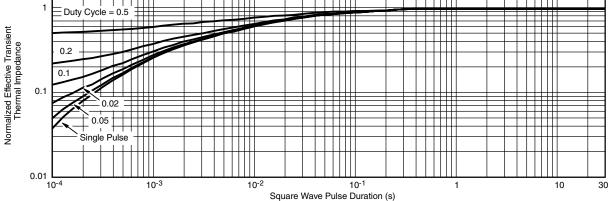




### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



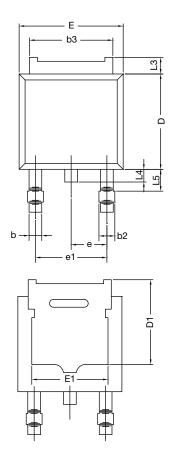


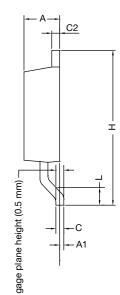


Normalized Thermal Transient Impedance, Junction-to-Case



# **TO-252AA Case Outline**





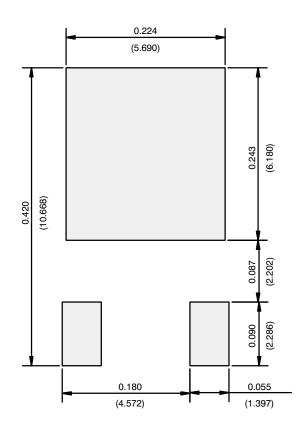
	MILLIMETERS		INC	HES
DIM.	MIN.	MAX.	MIN.	MAX.
А	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
С	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	4.10	-	0.161	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
Н	9.40	10.41	0.370	0.410
е	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.01	1.52	0.040	0.060
ECN: T16-0236-Rev. P, 16-May-16 DWG: 5347				

#### Notes

• Dimension L3 is for reference only.



**RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)** 



Recommended Minimum Pads Dimensions in Inches/(mm)



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