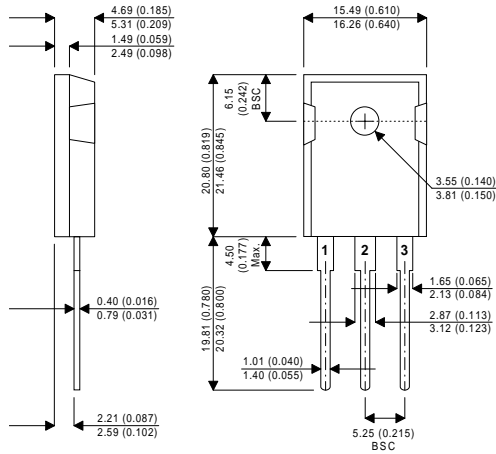


## 4TH GENERATION MOSFET

TO247-AD Package Outline.  
Dimensions in mm (inches)



**N-CHANNEL  
ENHANCEMENT MODE  
HIGH VOLTAGE  
POWER MOSFETS**

**$V_{DSS}$  500V**  
 **$I_{D(cont)}$  23.0A**  
 **$R_{DS(on)}$  0.25 $\Omega$**

**Terminal 1** Gate      **Terminal 2** Drain  
**Terminal 3** Source

### ABSOLUTE MAXIMUM RATINGS ( $T_{case} = 25^{\circ}C$ unless otherwise stated)

$V_{DSS}$	Drain – Source Voltage	500	V
$I_D$	Continuous Drain Current	23	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	92	A
$V_{GS}$	Gate – Source Voltage	$\pm 30$	V
$P_D$	Total Power Dissipation @ $T_{case} = 25^{\circ}C$	310	W
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to 150	$^{\circ}C$
$T_L$	Lead Temperature : 0.063" from Case for 10 Sec.	300	

### STATIC ELECTRICAL RATINGS ( $T_{case} = 25^{\circ}C$ unless otherwise stated)

	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain – Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	500			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0V$ )	$V_{DS} = V_{DSS}$			250	$\mu A$
		$V_{DS} = 0.8V_{DSS}, T_C = 125^{\circ}C$			1000	
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			$\pm 100$	nA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 1.0mA$	2		4	V
$I_{D(ON)}$	On State Drain Current <sup>2</sup>	$V_{DS} > I_{D(ON)} \times R_{DS(ON)}^{Max}$ $V_{GS} = 10V$	23			A
$R_{DS(ON)}$	Drain – Source On State Resistance <sup>2</sup>	$V_{GS} = 10V, I_D = 0.5 I_D [Cont.]$			0.25	$\Omega$

1) Repetitive Rating: Pulse Width limited by maximum junction temperature.

2) Pulse Test: Pulse Width < 380 $\mu S$ , Duty Cycle < 2%

**DYNAMIC CHARACTERISTICS**

	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		2380	2950	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		522	730	
$C_{rss}$	Reverse Transfer Capacitance	$f = 1MHz$		196	290	
$Q_g$	Total Gate Charge <sup>3</sup>	$V_{GS} = 10V$		83	130	nC
$Q_{gs}$	Gate – Source Charge	$V_{DD} = 0.5 V_{DSS}$		12.6	19	
$Q_{gd}$	Gate – Drain (“Miller”) Charge	$I_D = I_D [Cont.] @ 25^\circ C$		51	76	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 15V$		14	28	ns
$t_r$	Rise Time	$V_{DD} = 0.5 V_{DSS}$		27	55	
$t_{d(off)}$	Turn-off Delay Time	$I_D = I_D [Cont.] @ 25^\circ C$		61	92	
$t_f$	Fall Time	$R_G = 1.8\Omega$		36	71	

**SOURCE – DRAIN DIODE RATINGS AND CHARACTERISTICS**

	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	(Body Diode)			23	A
$I_{SM}$	Pulsed Source Current <sup>1</sup>	(Body Diode)			92	
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS} = 0V, I_S = -I_D [Cont.]$			1.3	V
$t_{rr}$	Reverse Recovery Time	$I_S = -I_D [Cont.], di_S / dt = 100A/\mu s$	160	320	640	ns
$Q_{rr}$	Reverse Recovery Charge		2.7	5.5	11	$\mu C$

**SAFE OPERATING AREA CHARACTERISTICS**

	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
SOA1	Safe Operating Area	$V_{DS} = 0.4V_{DSS}, t = 1 \text{ Sec.}$ $I_{DS} = P_D / 0.4V_{DSS}$	310			W
SOA2	Safe Operating Area	$V_{DS} = P_D / I_D [Cont.]$ $I_{DS} = I_D [Cont.], t = 1 \text{ Sec.}$	310			W
$I_{LM}$	Inductive Current Clamped		92			A

**THERMAL CHARACTERISTICS**

	Characteristic	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Junction to Case			0.40	$^\circ C/W$
$R_{\theta JA}$	Junction to Ambient			40	

1) Repetitive Rating: Pulse Width limited by maximum junction temperature.

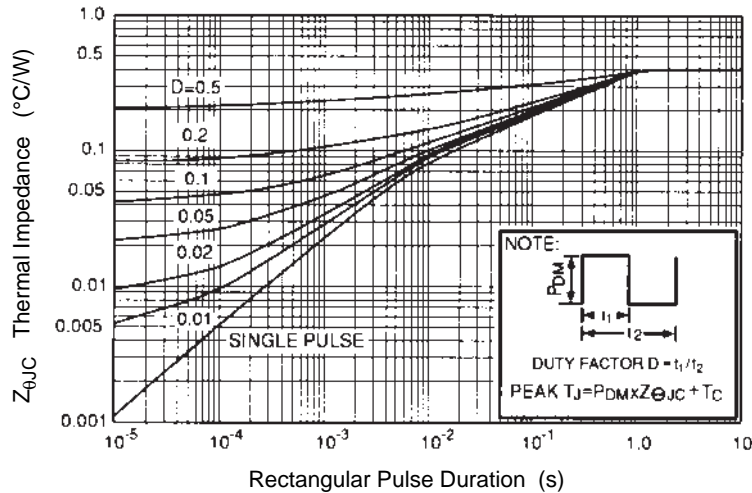
2) Pulse Test: Pulse Width < 380 $\mu s$ , Duty Cycle < 2%

3) See MIL–STD–750 Method 3471

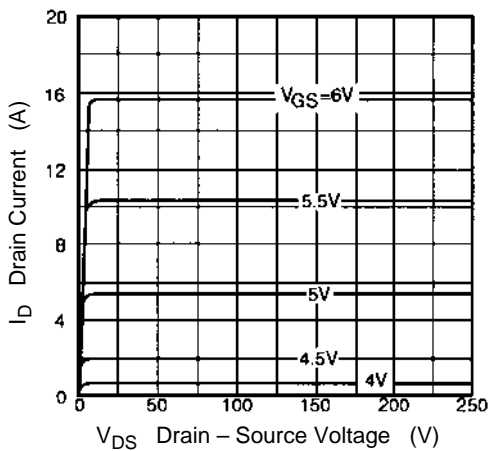


CAUTION — Electrostatic Sensitive Devices. Anti-Static Procedures Must Be Followed.

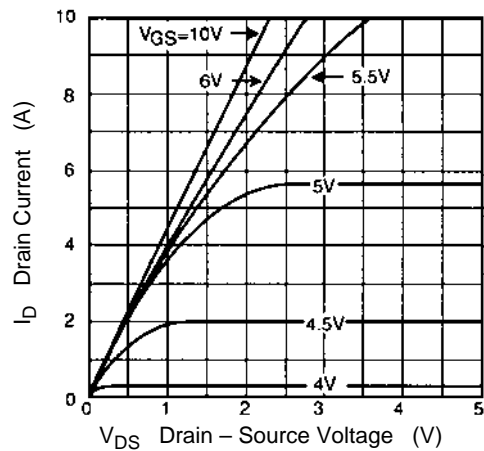
**Figure 1**  
**MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION – CASE vs PULSE DURATION**



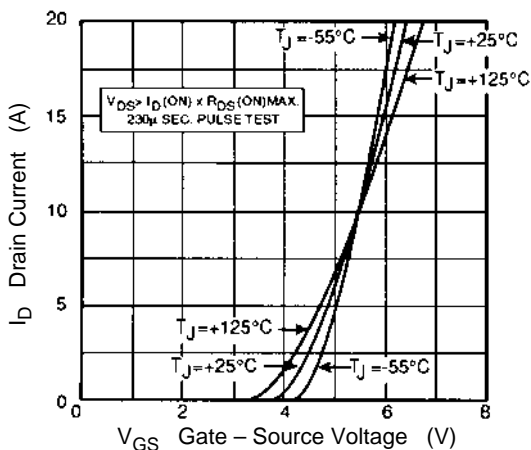
**Figure 2**  
**TYPICAL OUTPUT CHARACTERISTICS**



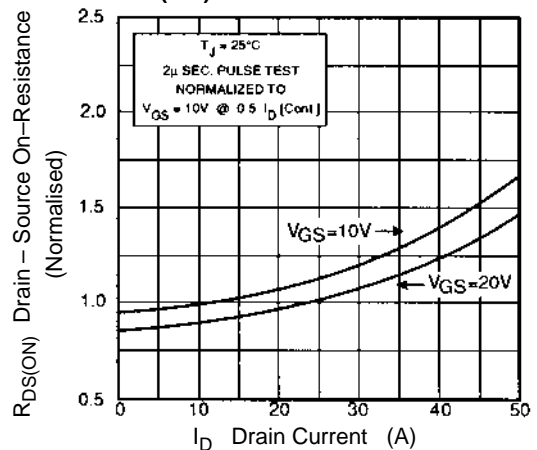
**Figure 3**  
**TYPICAL OUTPUT CHARACTERISTICS**



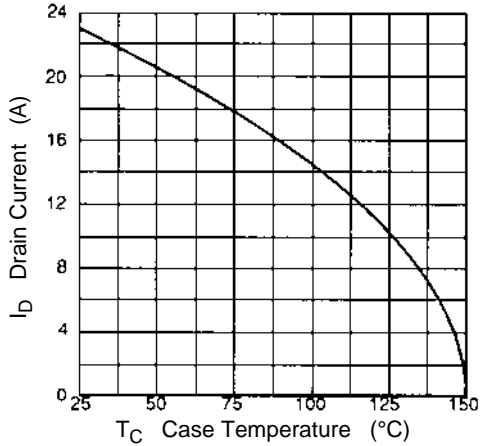
**Figure 4**  
**TYPICAL TRANSFER CHARACTERISTICS**



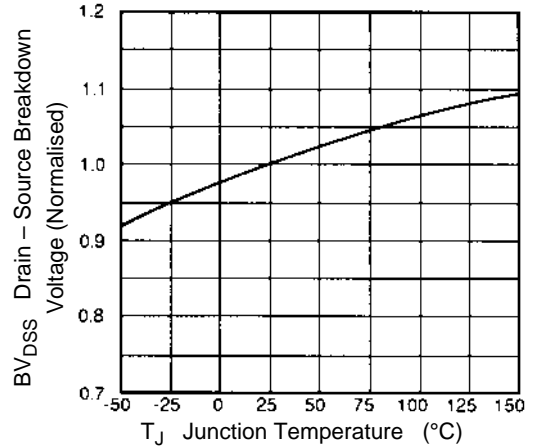
**Figure 5**  
 **$R_{DS(ON)}$  vs DRAIN CURRENT**



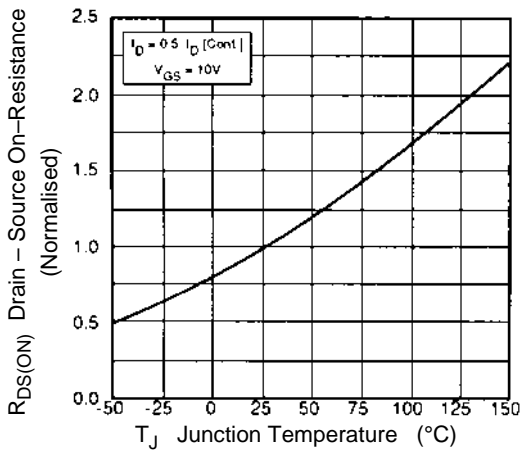
**Figure 6**  
**MAXIMUM DRAIN CURRENT vs**  
**CASE TEMPERATURE**



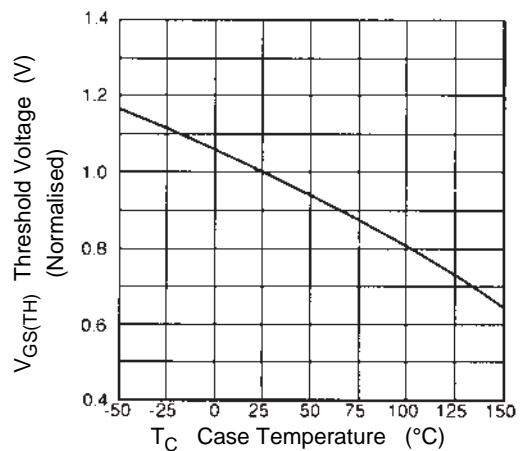
**Figure 7**  
**BREAKDOWN VOLTAGE vs TEMPERATURE**



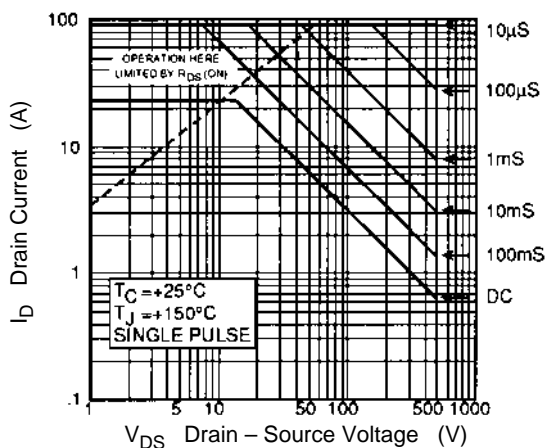
**Figure 8**  
**ON RESISTANCE vs TEMPERATURE**



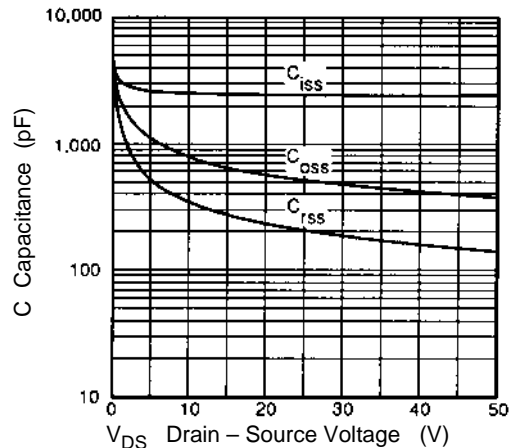
**Figure 9**  
**THRESHOLD VOLTAGE vs TEMPERATURE**



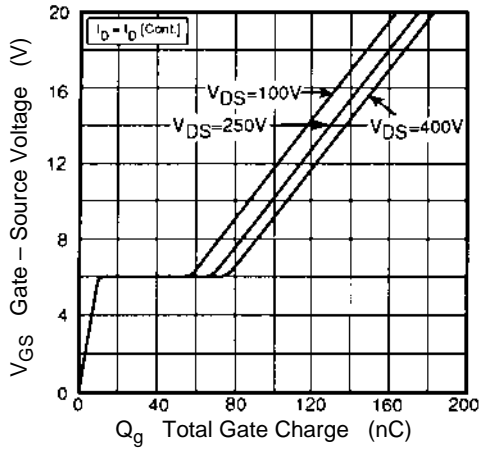
**Figure 10**  
**MAXIMUM SAFE OPERATING AREA**



**Figure 11**  
**TYPICAL CAPACITANCE vs**  
**DRAIN - SOURCE VOLTAGE**



**Figure 12**  
**GATE CHARGES vs GATE – SOURCE VOLTAGE**



**Figure 13**  
**TYPICAL SOURCE – DRAIN DIODE FORWARD VOLTAGE**

