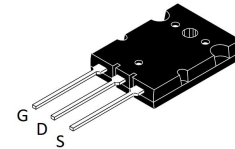
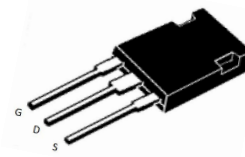


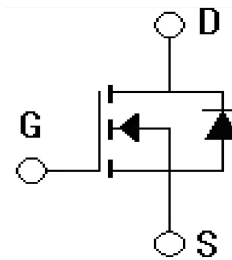
## Features

- $V_{DS}=600V, I_D=60A$   
 $R_{DS(on)} < 0.18\Omega @ V_{GS}=10V$
- 100% avalanche tested
- Minimum Lot-to-Lot variations for robust device
- performance and reliable operation



## Applications

- ZVS phase shifted and other full bridge
- Half bridge
- PFC and other boost converter
- Buck converter
- Single and two switch forward
- Flyback



## Absolute Ratings ( $T_C=25^\circ C$ )

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DSS}$	600	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Drain Current-continuous	$I_D$	60	A
Drain Current-pulse (1)	$I_{DM}$	210	A
Single Pulsed Avalanche Energy (2)	$E_{AS}$	1580	mJ
Avalanche Current, Repetitive or Non-Repetitive	$I_{AR}$	28	A
Maximum Power Dissipation	PD $T_C=25^\circ C$ Derate above $25^\circ C$	1040	W
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55~+150	$^\circ C$

## Electrical Characteristics ( $T_{CASE}=25^\circ C$ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
Drain-Source Voltage	$BV_{DSS}$	$I_D=250\mu A, V_{GS}=0V$	600	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=V_{DSS}, V_{GS}=0V$	-	-	25	$\mu A$

Gate-Body Leakage Current	$I_{GSS}$	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	$\pm 100$	nA
<b>On-Characteristics</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 2.5mA$	2.5	4	5	V
Static Drain-Source On-Resistance (3)	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 28A$	-	0.15	0.18	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 50V, I_D = 28A$	-	55	-	S
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{iss}$	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$	-	11.3	-	nF
Output capacitance	$C_{oss}$		-	1040	-	pF
Reverse transfer capacitance	$C_{rss}$		-	115	-	pF

## Electrical Characteristics ( $T_{CASE} = 25^\circ C$ unless otherwise specified)

Parameter	Symbol	Tests conditions	Min	Typ	Max	Units
<b>Switching-Characteristics</b>						
Turn-On delay time	$t_{d(on)}$	$V_{DS} = 400V, I_D = 28A, R_g = 2.2\Omega, V_{GS} = 15V(4)$	-	65	-	ns
Turn-On rise time	$t_r$		-	75	-	ns
Turn-Off delay time	$t_{d(off)}$		-	190	-	ns
Turn-Off rise time	$t_f$		-	60	-	ns
Total Gate Charge	$Q_g$	$V_{DS} = 300V, I_D = 28A, V_{GS} = 0-10V$	-	280	-	nC
Gate-Source charge	$Q_{gs}$		-	60	-	nC
Gate-Drain charge	$Q_{gd}$		-	120	-	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_{SD}$	$V_{GS} = 0V, I_S = 28A$	-	-	1.0	V
Diode Forward Current	$I_S$	$TC = 25^\circ C$	-	-	60	A
Reverse recovery time	$T_{rr}$	$I_S = 6A, di/dt = 100A/\mu S$	-	250	290	nS
Reverse recovery charge	$Q_{rr}$	$VR = 100V, V_{GS} = 0V(3)$	-	1.41	-	$\mu C$

## Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, junction to Case	$R_{th(j-C)}$	0.12	°C/W
Case to Sink Thermal Resistance, Flat, Greased Surface	$R_{th(C-S)}$	0.11	

## Order Message

Marking	Package
MS60N60HGB3	TO-264
MS60N60HGC1	TO-247plus

### Notes:

1. Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature.
2. Starting at  $T_J = 25^\circ\text{C}$ ,  $L = 4.03\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 28\text{A}$ .
3. Pulse test: Pulse Width <  $380\mu\text{s}$ , duty cycle < 2%
4.  $R_G$  is external gate resistance, not including internal gate resistance or gate driver impedance.

## Electrical Characteristics

Figure 1, Output Characteristics

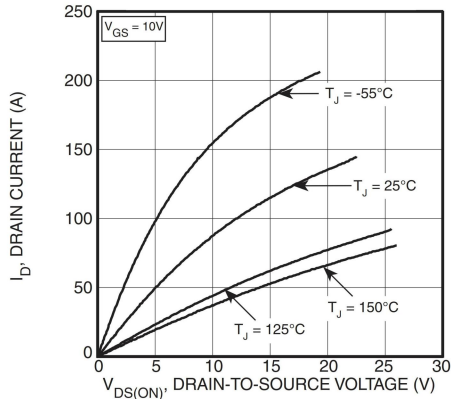


Figure 2, Output Characteristics

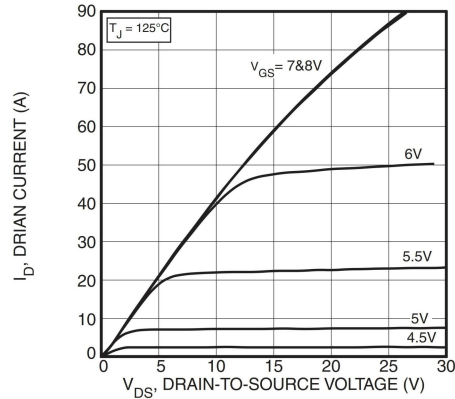


Figure 3,  $R_{DS(ON)}$  vs Junction Temperature

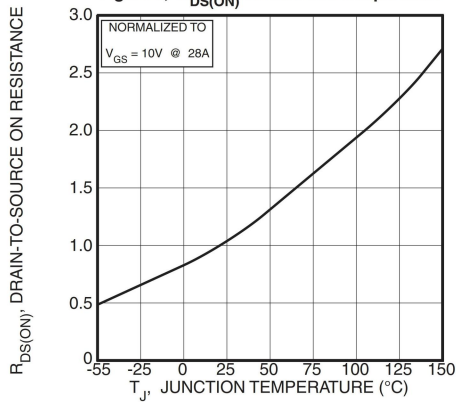


Figure 4, Transfer Characteristics

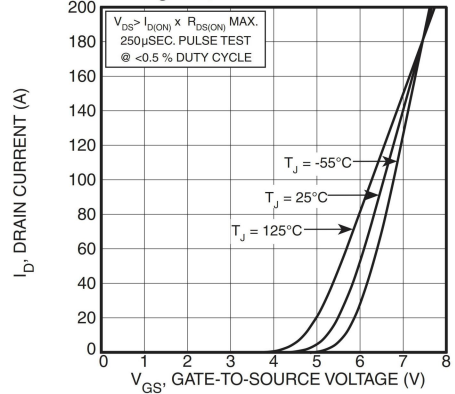


Figure 5, Gain vs Drain Current

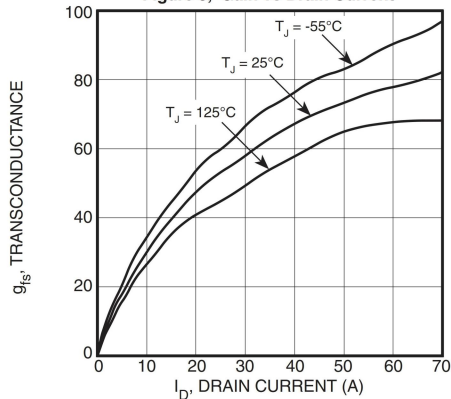


Figure 6, Capacitance vs Drain-to-Source Voltage

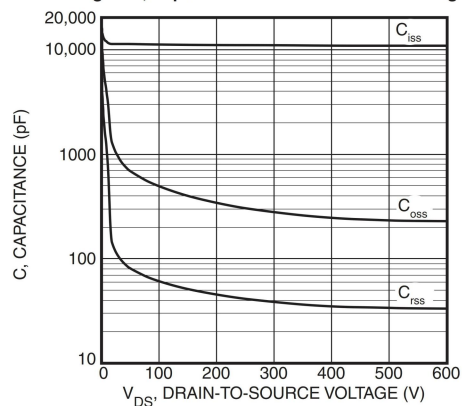


Figure 7, Gate Charge vs Gate-to-Source Voltage

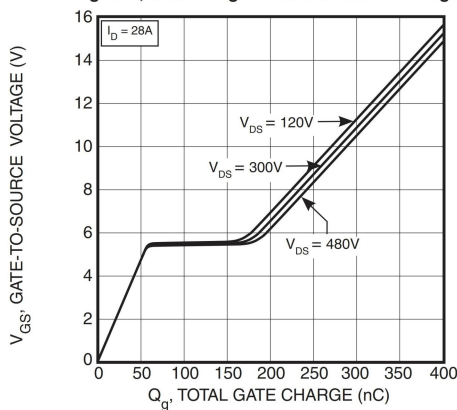


Figure 8, Reverse Drain Current vs Source-to-Drain Voltage

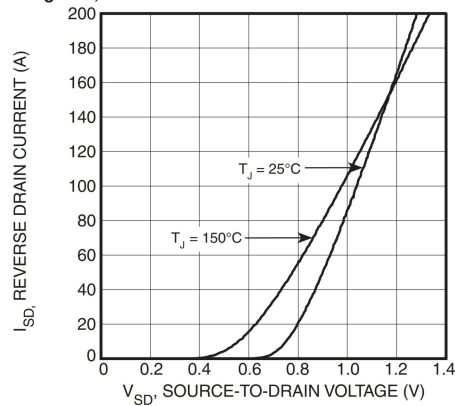


Figure 9, Forward Safe Operating Area

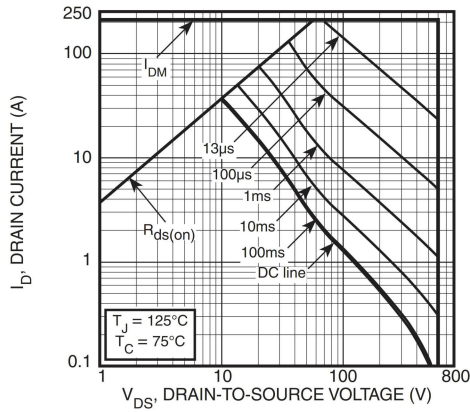


Figure 10, Maximum Forward Safe Operating Area

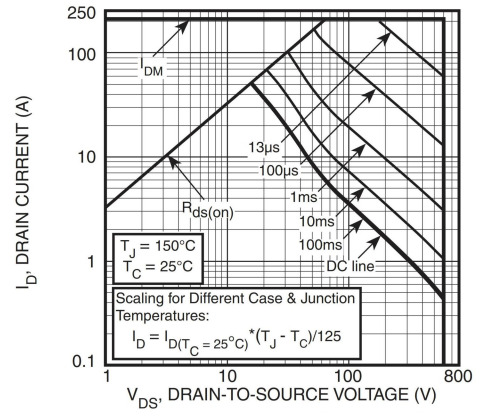
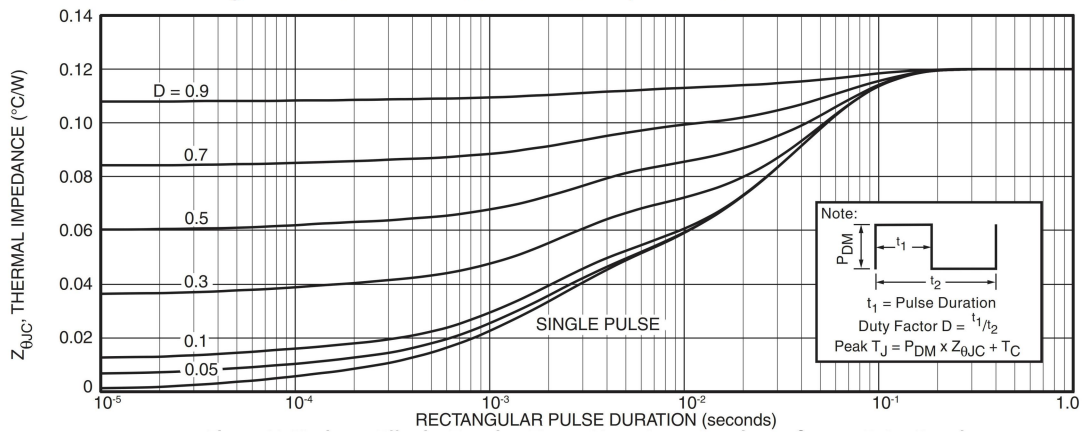
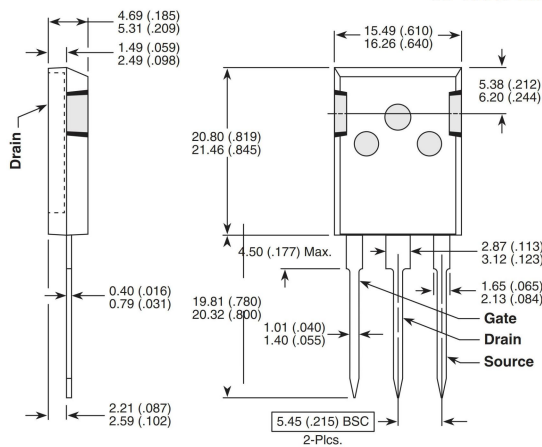


Figure 11. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration



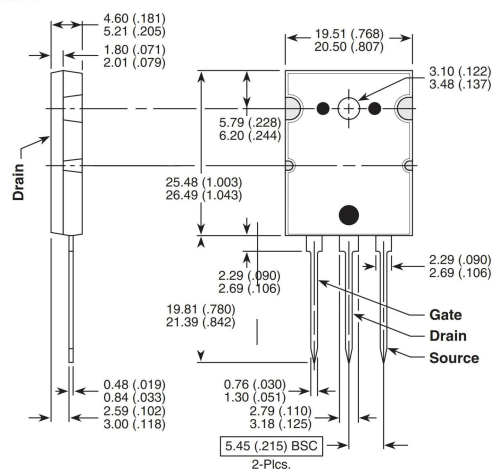
## Package Mechanical DATA

e3 100% Sn Plated



These dimensions are equal to the TO-247 without the mounting hole.  
Dimensions in Millimeters and (Inches)

**247plus**



Dimensions in Millimeters and (Inches)

**TO-264**