ON Semiconductor®

FGD3N60LSD
IGBT

Features

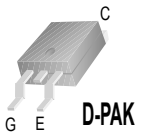
- High Current Capability
- Very Low Saturation Voltage : $V_{CE(sat)}$ = 1.2 V @ I_C = 3A
- High Input Impedance

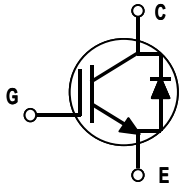
Applications

- HID Lamp Applications
- Piezo Fuel Injection Applications

Description

ON Semiconductor's Insulated Gate Bipolar Transistors (IGBTs) provide very low conduction losses. The device is designed for applica-tions where very low On-Voltage Drop is a required feature.





Absolute Maximum Ratings

Symbol	Description		FGD3N60LSD	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	6	A
	Collector Current	@ T_C = 100°C	3	A
$I_{CM\ (1)}$	Pulsed Collector Current	(1)	25	A
I_F	Diode Continous Forward Current	@ T_C = 100°C	3	A
I_{FM}	Diode Maximum Forward Current		25	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	40	W
	Derating Factor		0.32	W/°C
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8” from Case for 5 Seconds		250	°C

Notes :

(1) Repetitive rating : Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance, Junction-to-Case	--	3.1	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (PCB Mount) (2)	--	100	°C/W

Notes :

(2) Mounted on 1” squre PCB (FR4 or G-10 Material)

©2006 Semiconductor Components Industries, LLC.
October-2017,Rev. 2

Publication Order Number:
FGD3N60LSD/D

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGD3N60LSD	FGD3N60LSDTM	D-PAK	380mm	16mm	2500

Electrical Characteristics of the IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 250uA	600	--	--	V
$\Delta B_{VCES}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0V, I_C = 1mA	--	0.6	--	V/°C
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0V	--	--	250	uA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0V	--	--	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 3mA, V_{CE} = V_{GE}	2.5	3.2	5.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 3A, V_{GE} = 10V	--	1.2	1.5	V
		I_C = 6A, V_{GE} = 10V	--	1.8	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	--	185	--	pF
C_{oes}	Output Capacitance		--	20	--	pF
C_{res}	Reverse Transfer Capacitance		--	5.5	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 480 V, I_C = 3A, R_G = 470Ω, V_{GE} = 10V, Inductive Load, T_C = 25°C	--	40	--	ns
t_r	Rise Time		--	40	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	600	--	ns
t_f	Fall Time		--	600	--	ns
E_{on}	Turn-On Switching Loss		--	250	--	uJ
E_{off}	Turn-Off Switching Loss		--	1.00	--	mJ
E_{ts}	Total Switching Loss		--	1.25	--	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 480 V, I_C = 3A, R_G = 470Ω, V_{GE} = 10V, Inductive Load, T_C = 125°C	--	40	--	ns
t_r	Rise Time		--	45	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	620	--	ns
t_f	Fall Time		--	800	--	ns
E_{on}	Turn-On Switching Loss		--	300	--	uJ
E_{off}	Turn-Off Switching Loss		--	1.9	--	mJ
E_{ts}	Total Switching Loss		--	2.2	--	mJ
Q_g	Total Gate Charge	V_{CE} = 480 V, I_C = 3A, V_{GE} = 10V	--	12.5	--	nC
Q_{ge}	Gate-Emitter Charge		--	2.8	--	nC
Q_{gc}	Gate-Collector Charge		--	4.9	--	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	7.5	--	nH

Electrical Characteristics of DIODE T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	I_F = 3A	T_C = 25°C	--	1.5	1.9	V
			T_C = 100°C	--	1.55	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 3A, di/dt = 100A/us V_R = 200V	T_C = 25°C	--	234	--	ns
			T_C = 100°C	--	--	--	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	--	2.64	--	A
			T_C = 100°C	--	--	--	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	--	309	--	nC
			T_C = 100°C	--	--	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

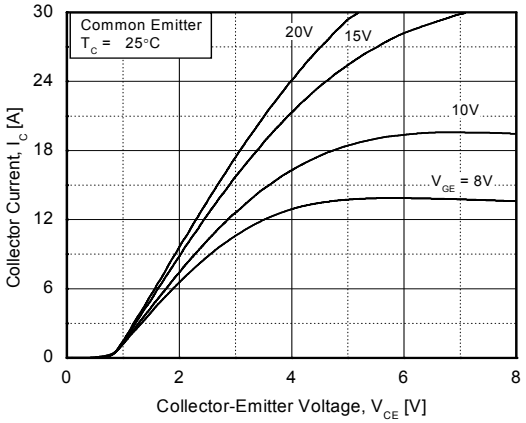


Figure 2. Typical Output Characteristics

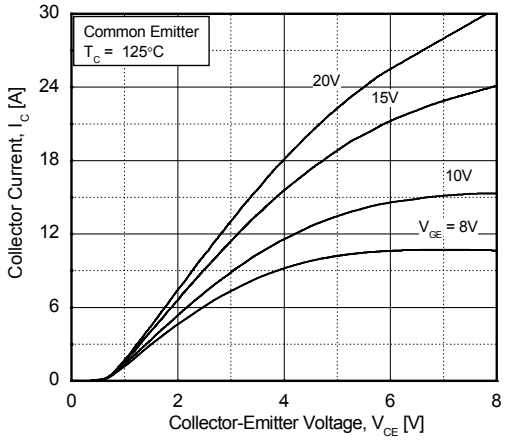


Figure 3. Typical Output Characteristics

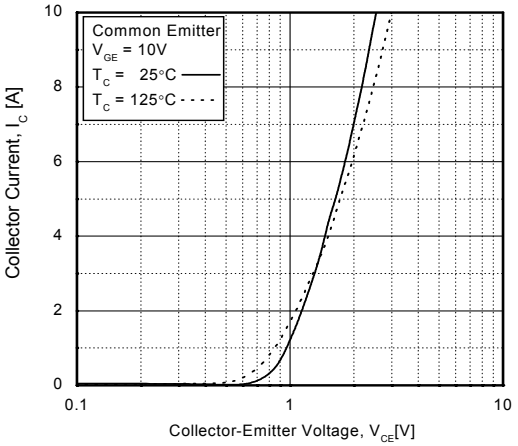


Figure 4. Transfer Characteristics

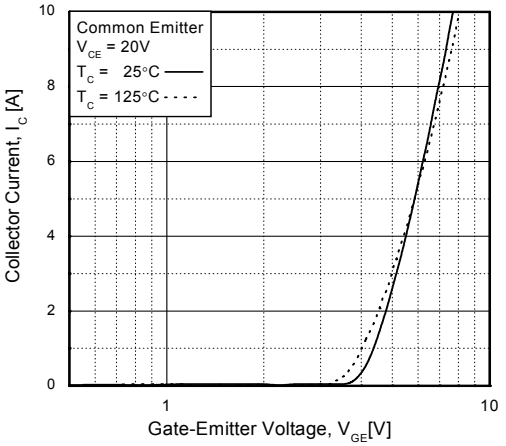


Figure 5. Saturation Voltage vs. Case

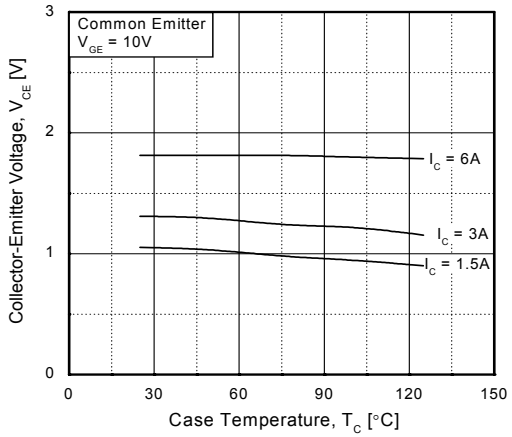
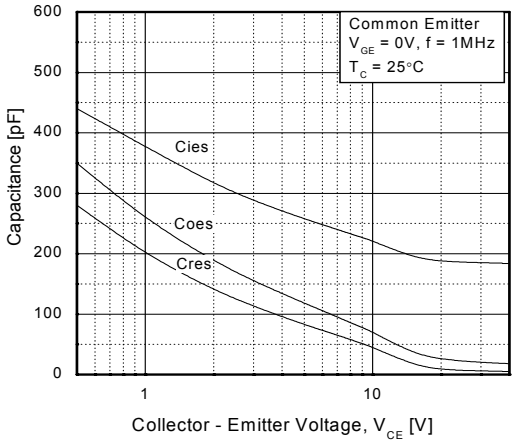


Figure 6. Capacitance Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Gate Charge

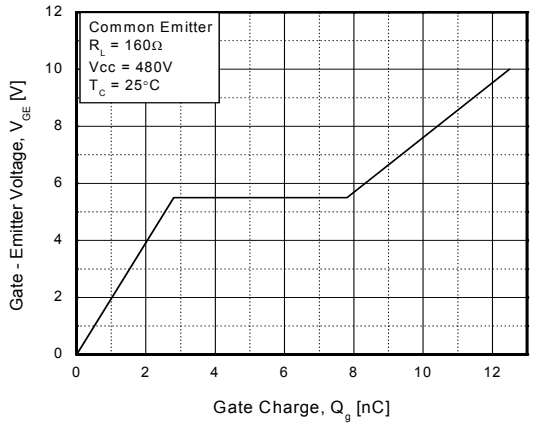


Figure 8. Turn-On Characteristics vs. Gate Resistance

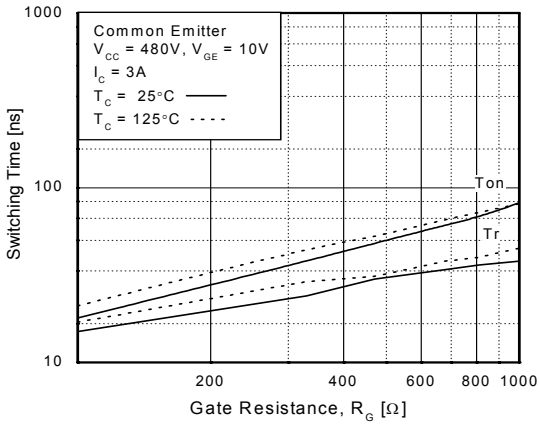


Figure 9. Turn-Off Characteristics vs. Gate Resistance

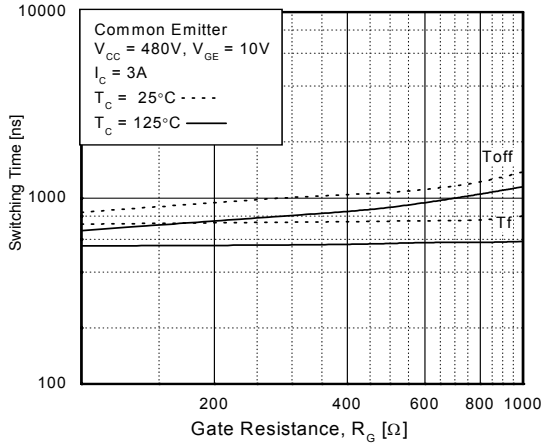


Figure 10. Switching Loss vs. Gate Resistance

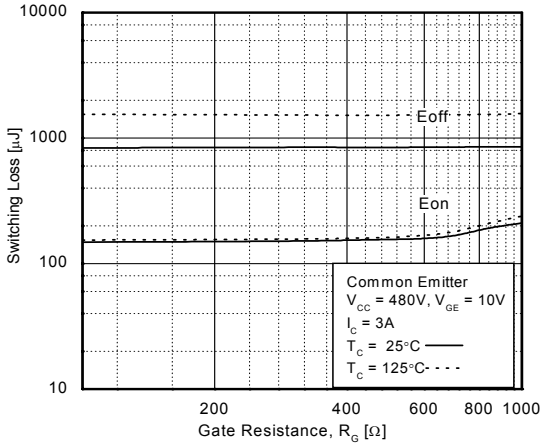


Figure 11. Turn-On Characteristics vs. Collector Current

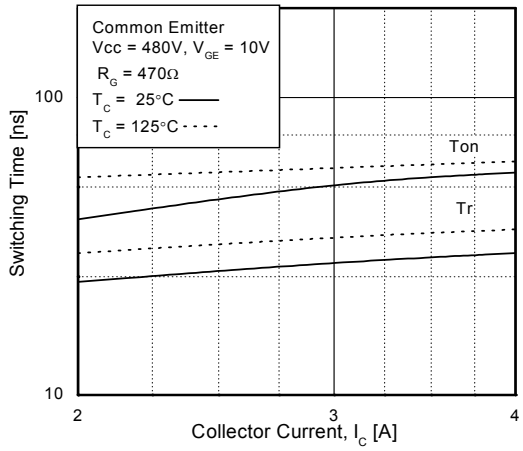
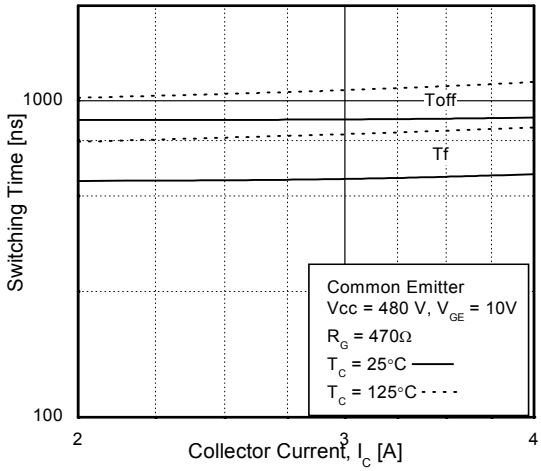


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

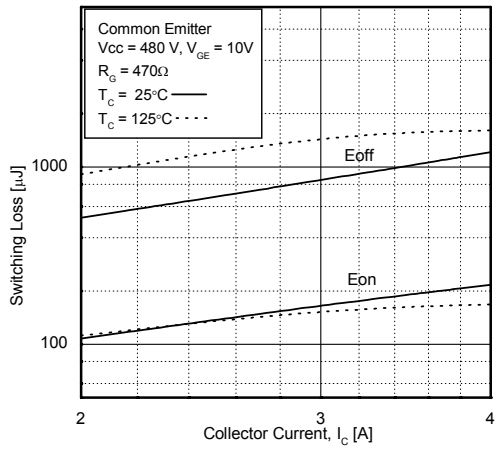


Figure 14. Forward Characteristics

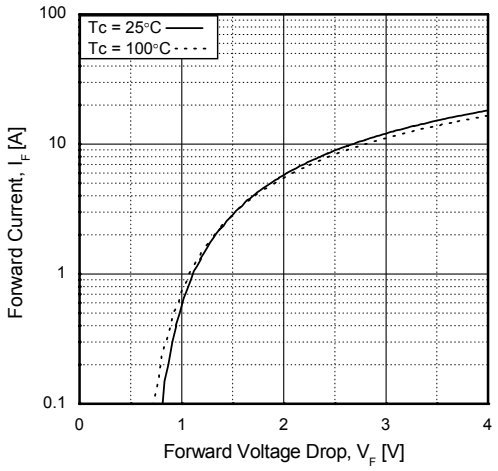


Figure 15. Forward Voltage Drop Vs Tj

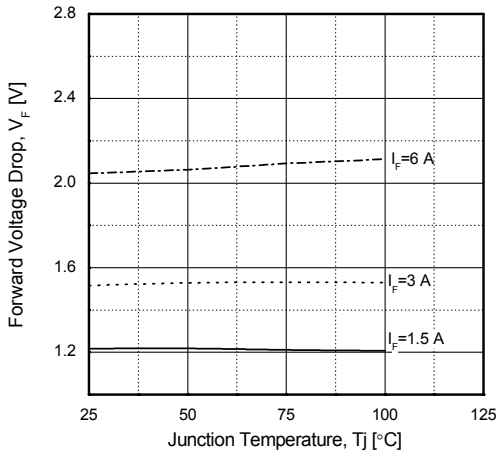


Figure 16. SOA Characteristics

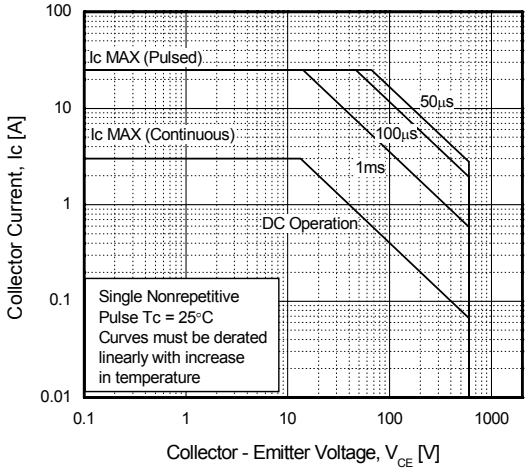
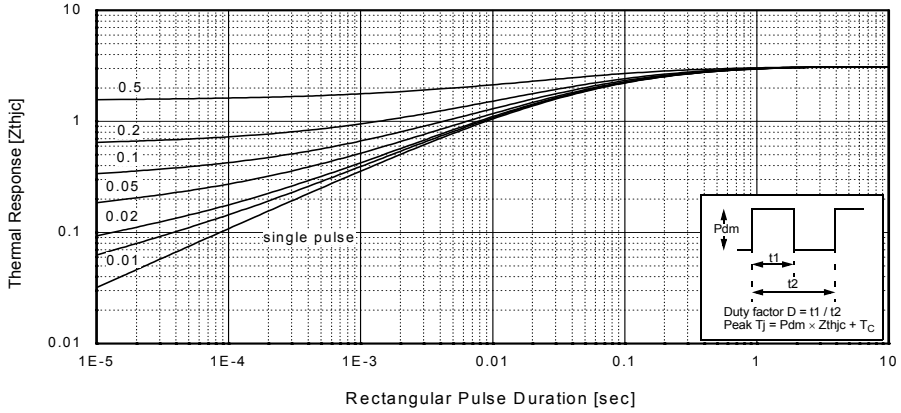
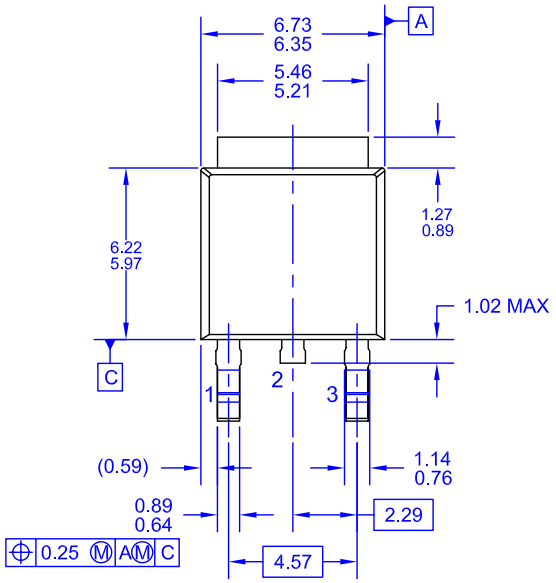


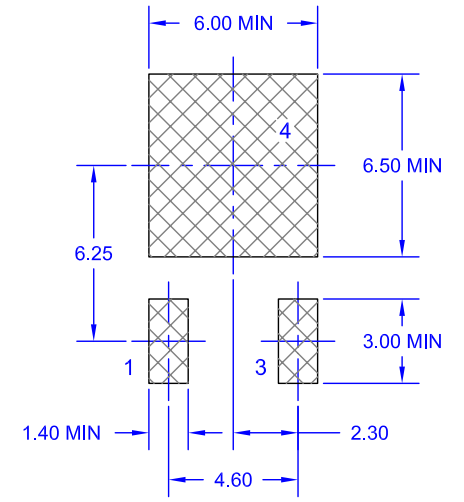
Figure 17. Transient Thermal Impedance of IGBT



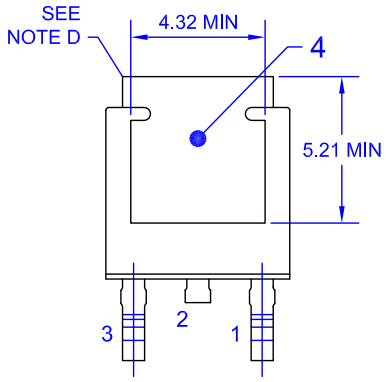
Mechanical Dimensions

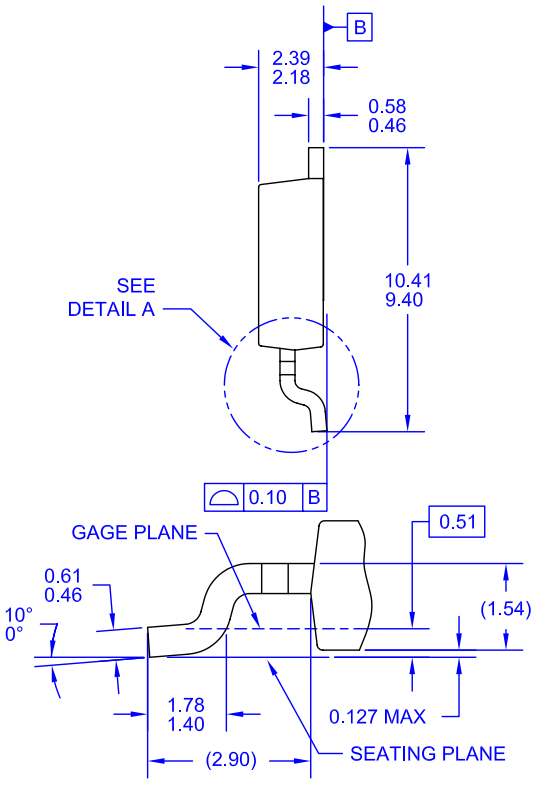
D-PAK





LAND PATTERN RECOMMENDATION





NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
E) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.
F) DIMENSIONS ARE EXCLUSSIVE OF BURSS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMENDATION IS BASED ON IPC7351A STD TO220P1003X238-3N.
H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV8

Dimensions in Millimeters

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative