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# FDMC89521L

## Dual N-Channel PowerTrench<sup>®</sup> MOSFET

60 V, 8.2 A, 17 mΩ

### Features

- Max  $r_{DS(on)}$  = 17 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 8.2\text{ A}$
- Max  $r_{DS(on)}$  = 27 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 6.7\text{ A}$
- Termination is Lead-free
- RoHS Compliant

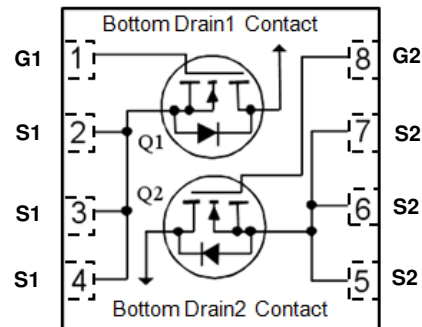
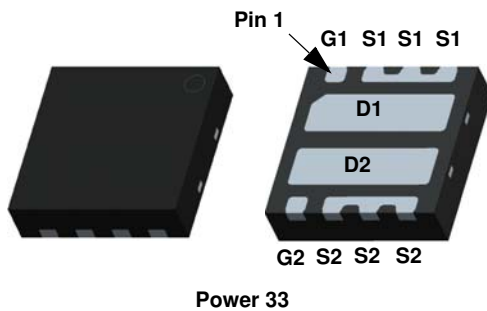


### General Description

This device includes two 60 V N-Channel MOSFETs in a dual Power 33 (3 mm X 3 mm MLP) package. The package is enhanced for exceptional thermal performance.

### Applications

- Battery Protection
- Load Switching
- Bridge Topologies



### MOSFET Maximum Ratings $T_A = 25\text{ °C}$ unless otherwise noted.

Symbol	Parameter	Rated	Units
$V_{DS}$	Drain to Source Voltage	60	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current -Continuous	$T_A = 25\text{ °C}$ (Note 1a)	8.2
	-Pulsed		40
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	32
$P_D$	Power Dissipation	$T_C = 25\text{ °C}$	16
	Power Dissipation	$T_A = 25\text{ °C}$ (Note 1a)	1.9
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	8.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	65	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	155	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC89521L	FDMC89521L	Power 33	13 "	12 mm	3000 units

## Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		30		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 48\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 8.2\text{ A}$		13	17	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 6.7\text{ A}$		21	27	
		$V_{GS} = 10\text{ V}$ , $I_D = 8.2\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		20	26	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}$ , $I_D = 8.2\text{ A}$		28		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 30\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		1228	1635	pF
$C_{oss}$	Output Capacitance			243	325	pF
$C_{rss}$	Reverse Transfer Capacitance			10	15	pF
$R_g$	Gate Resistance			0.7		$\Omega$

### Switching Characteristics

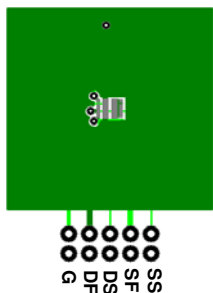
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{ V}$ , $I_D = 8.2\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		7.9	16	ns
$t_r$	Rise Time			2.1	10	ns
$t_{d(off)}$	Turn-Off Delay Time			18	33	ns
$t_f$	Fall Time			1.7	10	ns
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V}$ to $10\text{ V}$		17	24	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V}$ to $4.5\text{ V}$	$V_{DD} = 30\text{ V}$ , $I_D = 8.2\text{ A}$	7.9	12	nC
$Q_{gs}$	Gate to Source Charge			3.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			1.9		nC

### Drain-Source Diode Characteristics

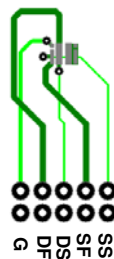
$V_{SD}$	Source-Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 8.2\text{ A}$ (Note 2)		0.85	1.3	V
		$V_{GS} = 0\text{ V}$ , $I_S = 1.6\text{ A}$ (Note 2)		0.75	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 8.2\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		25	40	ns
$Q_{rr}$	Reverse Recovery Charge			11	20	nC

#### Notes:

- $R_{\theta JA}$  is determined with the device mounted on a  $1\text{ in}^2$  pad of 2 oz copper pad on a  $1.5 \times 1.5\text{ in.}$  board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a.  $65\text{ }^\circ\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



b.  $155\text{ }^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width <  $300\text{ }\mu\text{s}$ , Duty cycle < 2.0%.

- $E_{AS}$  of 32 mJ is based on starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 1\text{ mH}$ ,  $I_{AS} = 8\text{ A}$ ,  $V_{DD} = 54\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% tested at  $L = 3\text{ mH}$ ,  $I_{AS} = 5.4\text{ A}$ .

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.

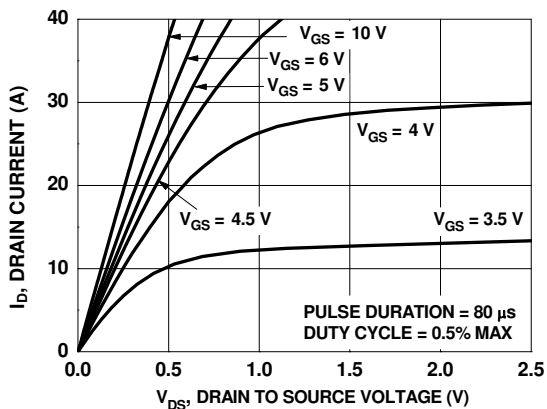


Figure 1. On Region Characteristics

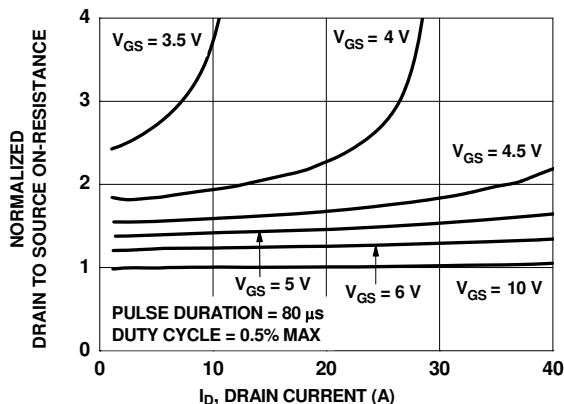


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

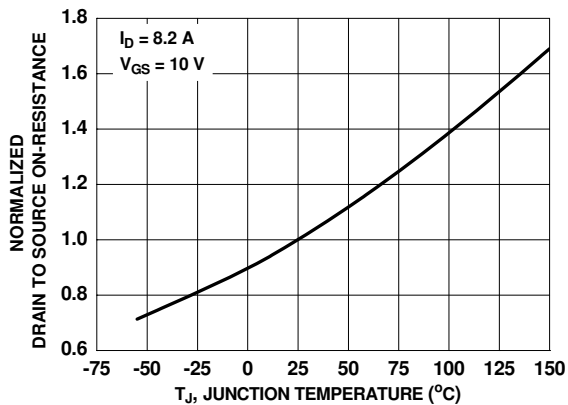


Figure 3. Normalized On Resistance vs. Junction Temperature

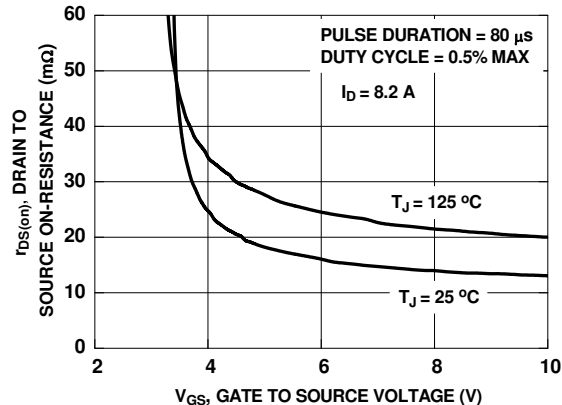


Figure 4. On-Resistance vs. Gate to Source Voltage

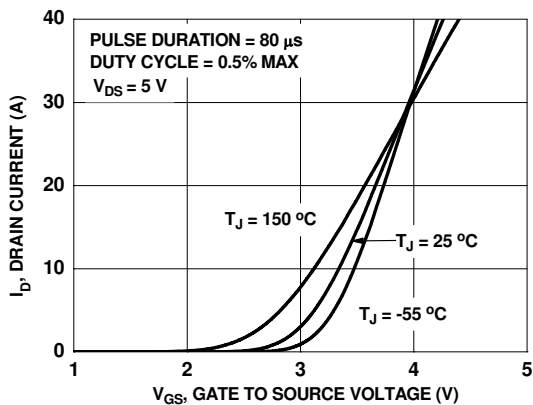


Figure 5. Transfer Characteristics

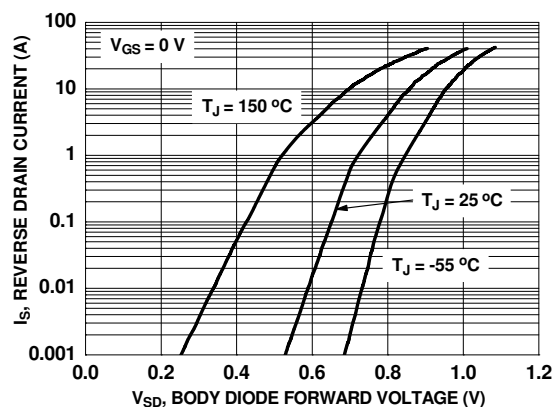
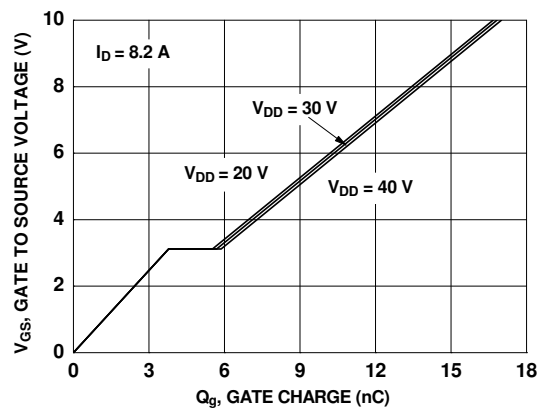
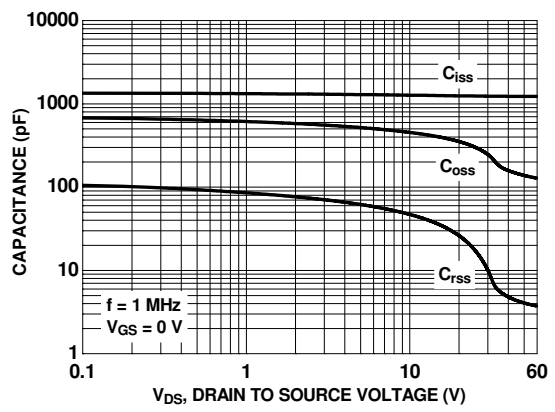


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

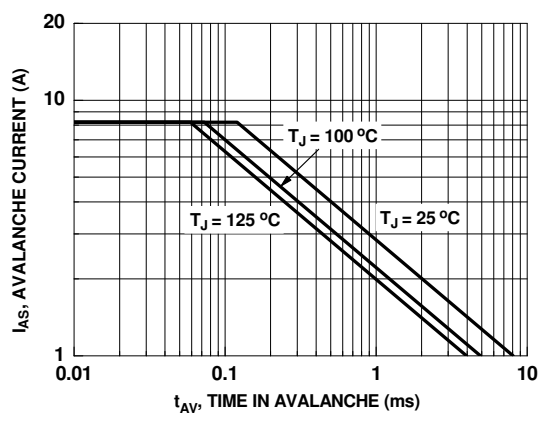
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.



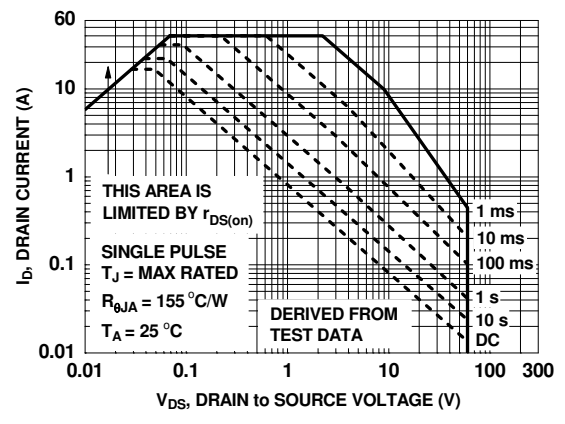
**Figure 7. Gate Charge Characteristics**



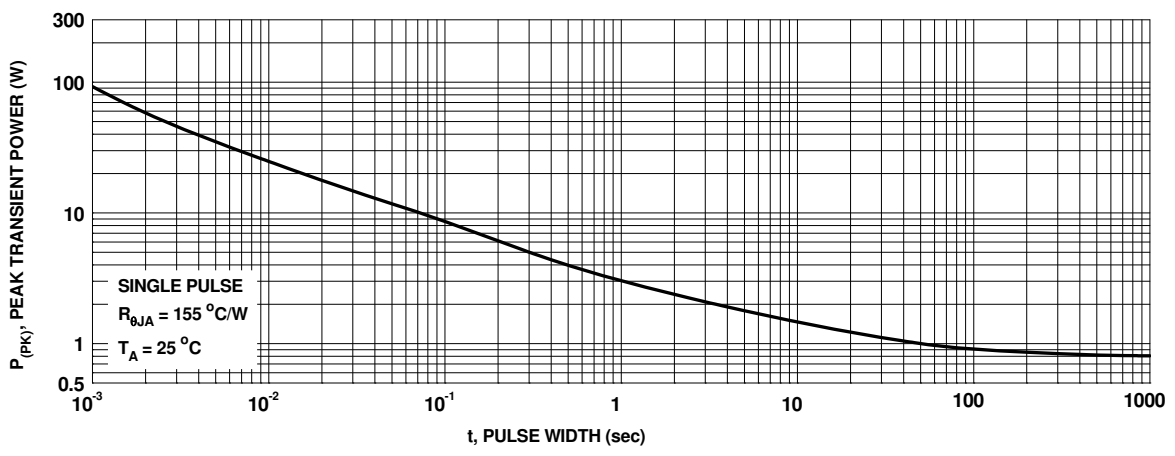
**Figure 8. Capacitance vs. Drain to Source Voltage**



**Figure 9. Unclamped Inductive Switching Capability**

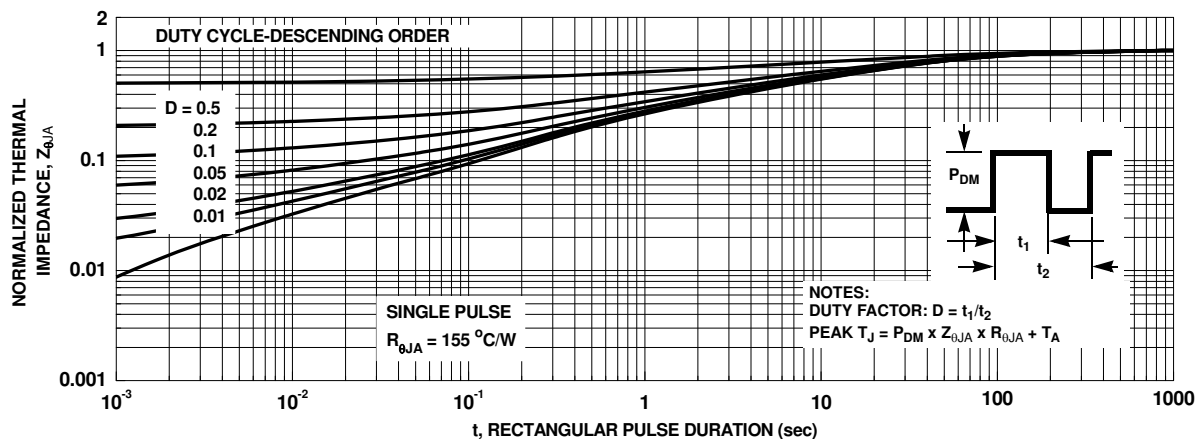


**Figure 10. Forward Bias Safe Operating Area**

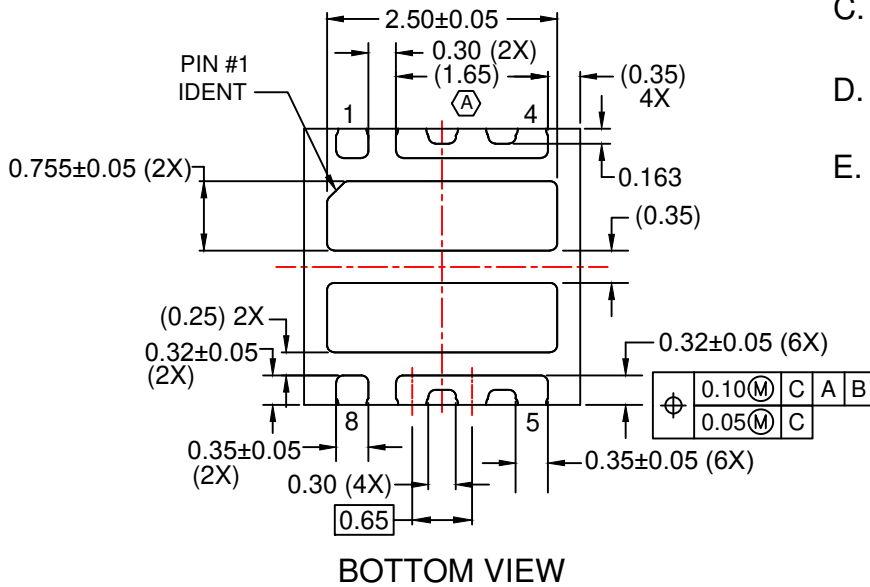
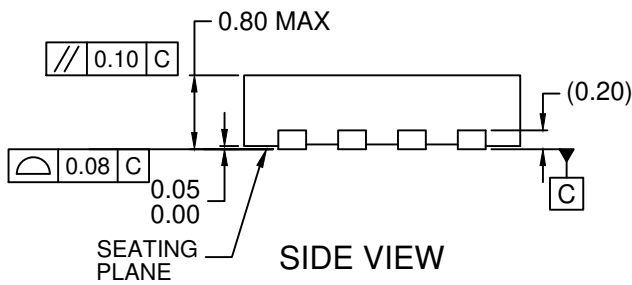
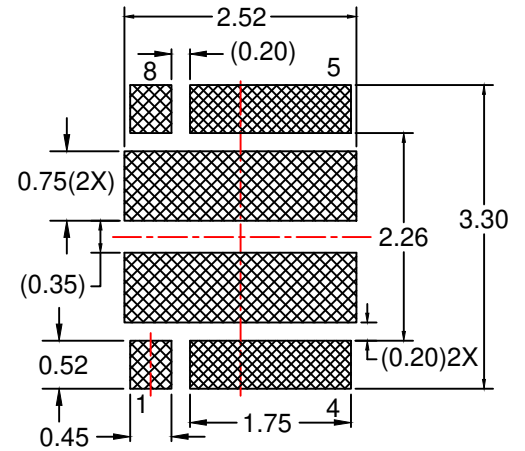
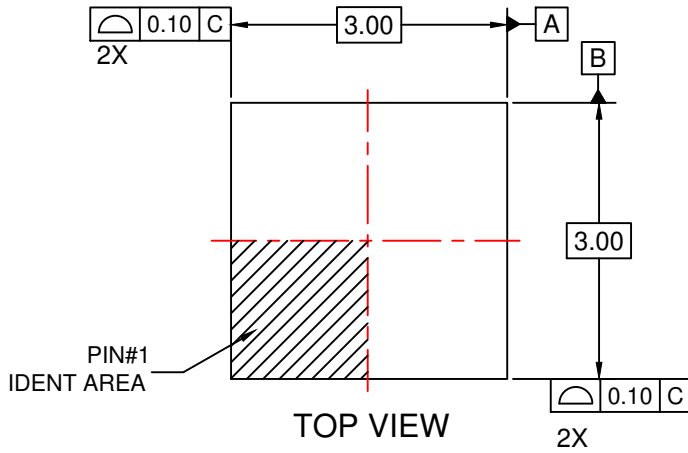


**Figure 11. Single Pulse Maximum Power Dissipation**

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.



**Figure 12. Junction-to-Ambient Transient Thermal Response Curve**



## RECOMMENDED LAND PATTERN

### NOTES:

- A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY
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