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# FDC8886

## N-Channel Power Trench<sup>®</sup> MOSFET

30 V, 6.5 A, 23 mΩ

### Features

- Max  $r_{DS(on)}$  = 23 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 6.5\text{ A}$
- Max  $r_{DS(on)}$  = 36 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 6.0\text{ A}$
- High performance trench technology for extremely low  $r_{DS(on)}$
- Fast switching speed
- RoHS Compliant

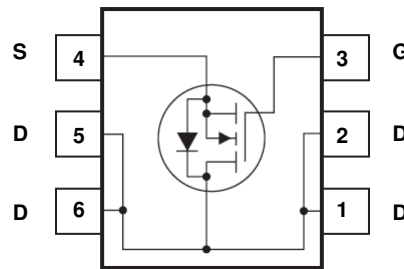
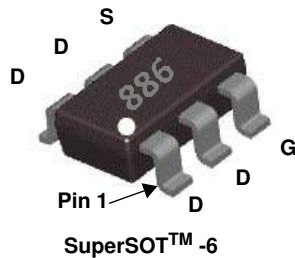


### General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench<sup>®</sup> process that has been optimized for  $r_{DS(on)}$  switching performance.

### Application

- Primary Switch



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage (Note 3)	±20	V
$I_D$	Drain Current -Continuous (Package limited) $T_C = 25\text{ °C}$	8.0	A
	-Continuous $T_A = 25\text{ °C}$ (Note 1a)	6.5	
	-Pulsed	25	
$P_D$	Power Dissipation (Note 1a)	1.6	W
	Power Dissipation (Note 1b)	0.8	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	30	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	78	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.886	FDC8886	SSOT-6	7"	8 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	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		18		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current, Forward	$V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$			100	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.2	1.9	3.0	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	$V_{GS} = 10\text{ V}$ , $I_D = 6.5\text{ A}$		19	23	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 6.0\text{ A}$		30	36	
		$V_{GS} = 10\text{ V}$ , $I_D = 6.5\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		25	30	
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\text{ V}$ , $I_D = 6.5\text{ A}$		24		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		348	465	pF
$C_{oss}$	Output Capacitance			135	180	pF
$C_{rss}$	Reverse Transfer Capacitance			16	25	pF
$R_g$	Gate Resistance			1.2		$\Omega$

### Switching Characteristics

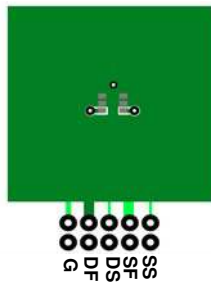
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}$ , $I_D = 6.5\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		5	10	ns
$t_r$	Rise Time			1	10	ns
$t_{d(off)}$	Turn-Off Delay Time			11	19	ns
$t_f$	Fall Time			1	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }10\text{ V}$	$V_{DD} = 15\text{ V}$ , $I_D = 6.5\text{ A}$	5.3	7.4	nC
	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$		2.5	3.5	nC
$Q_{gs}$	Total Gate Charge			1.0		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			0.8		nC

### Drain-Source Diode Characteristics

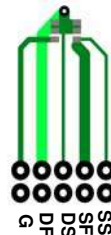
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 6.5\text{ A}$ (Note 2)		0.86	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 6.5\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		14	22	ns
$Q_{rr}$	Reverse Recovery Charge			3	10	nC

#### NOTES:

1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a.  $78\text{ }^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



b.  $175\text{ }^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper

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

3. As an N-ch device, the negative  $V_{gs}$  rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

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

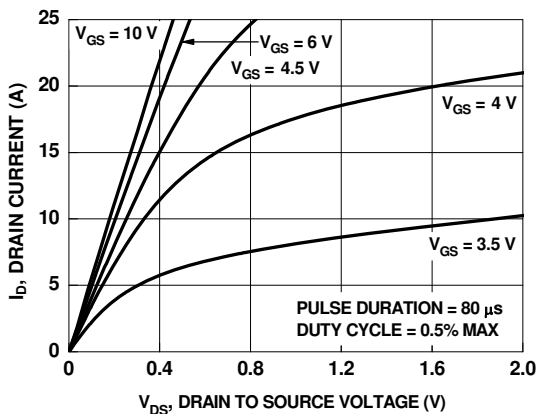


Figure 1. On Region Characteristics

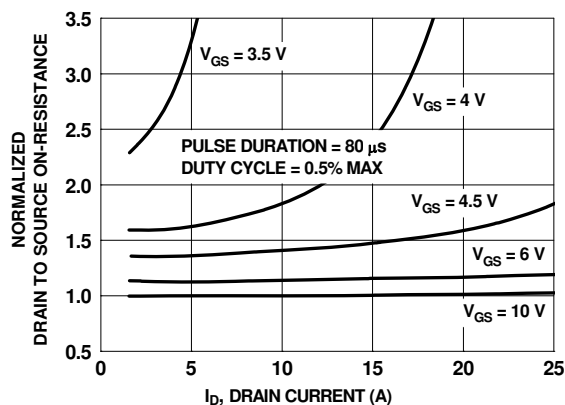


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

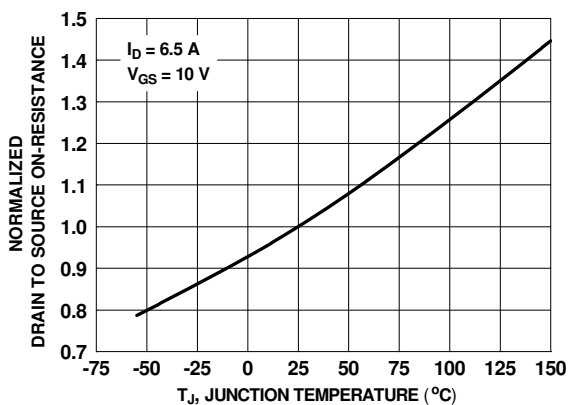


Figure 3. Normalized On Resistance vs Junction Temperature

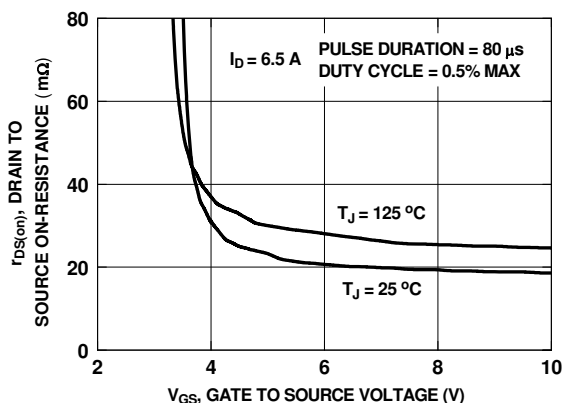


Figure 4. On-Resistance vs Gate to Source Voltage

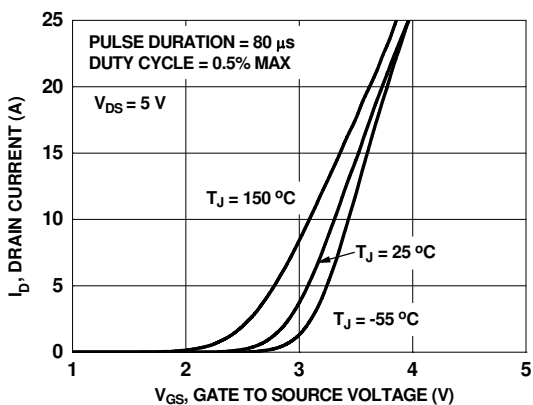


Figure 5. Transfer Characteristics

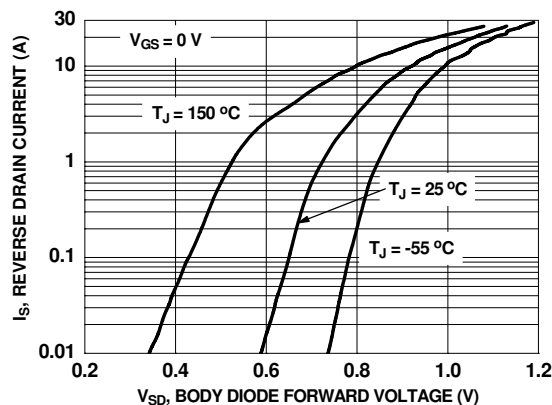
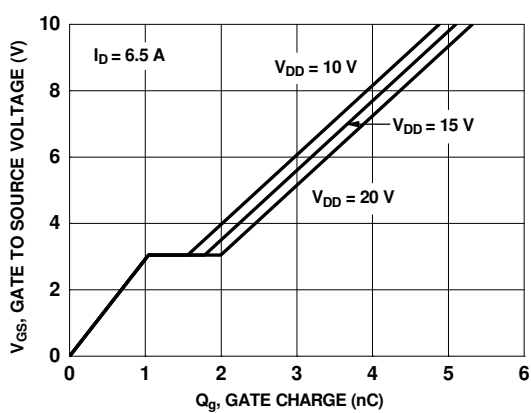
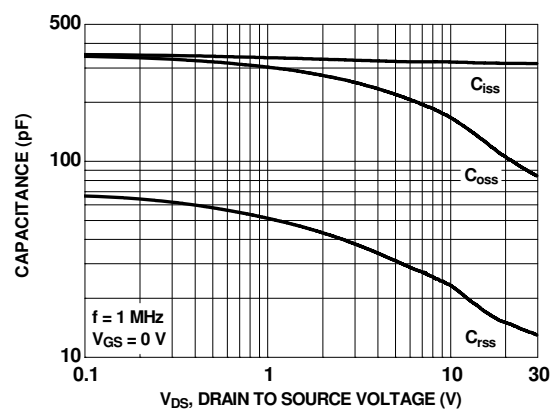


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

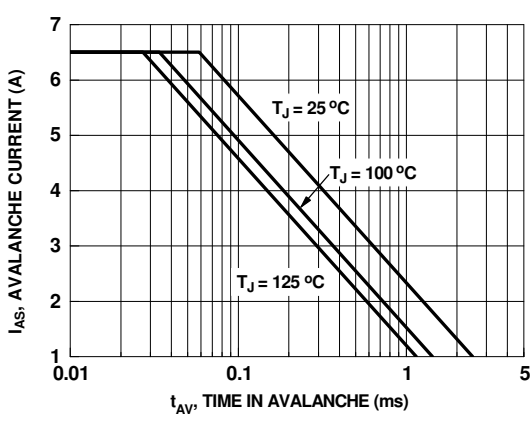
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



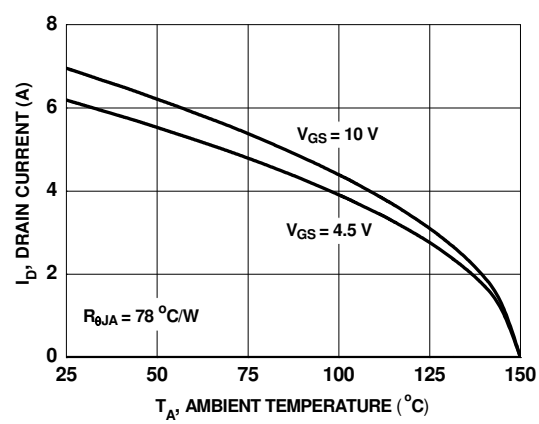
**Figure 7. Gate Charge Characteristics**



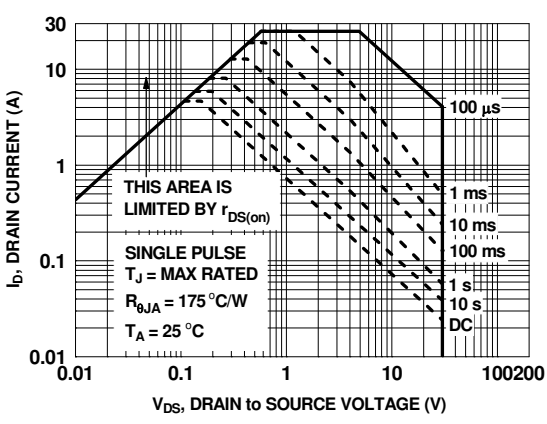
**Figure 8. Capacitance vs Drain to Source Voltage**



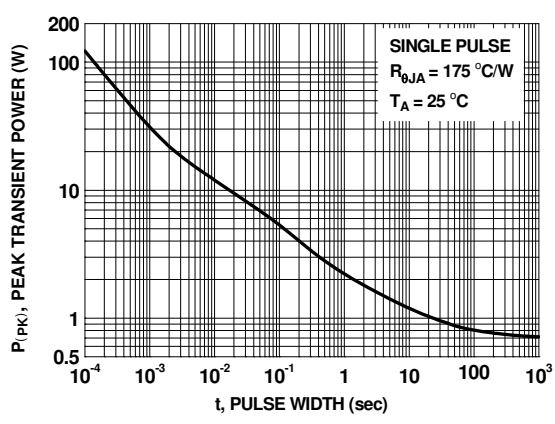
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Ambient Temperature**

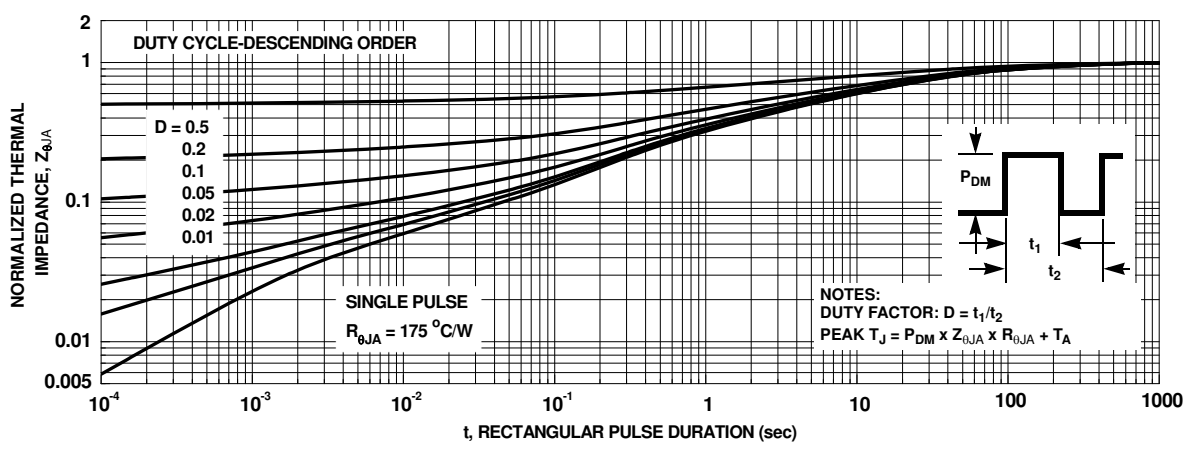


**Figure 11. Forward Bias Safe Operating Area**

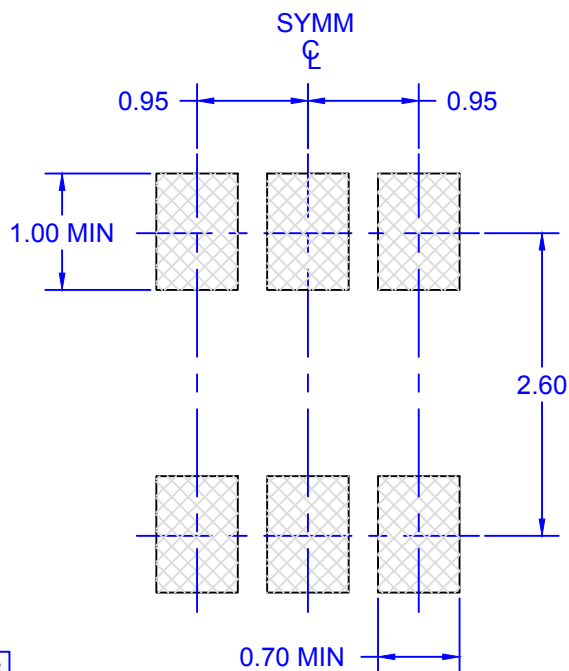
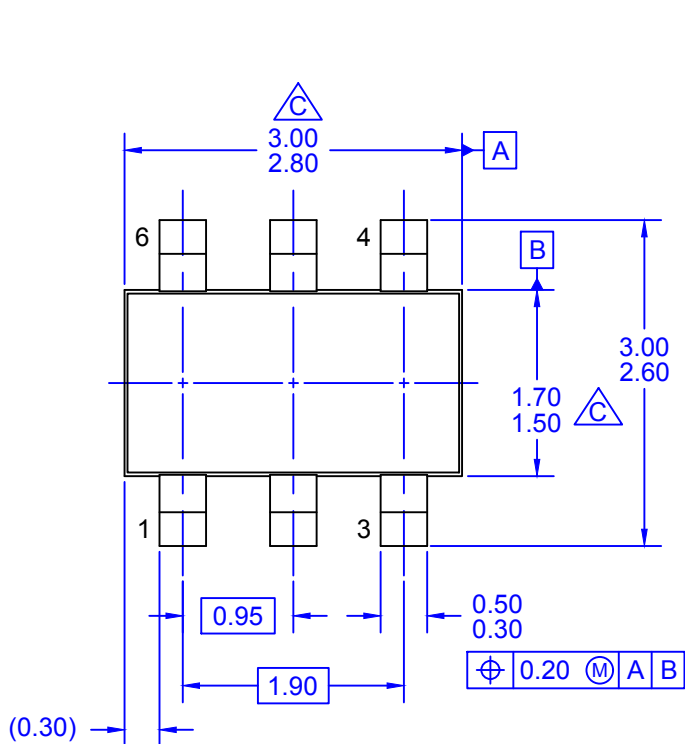


**Figure 12. Single Pulse Maximum Power Dissipation**

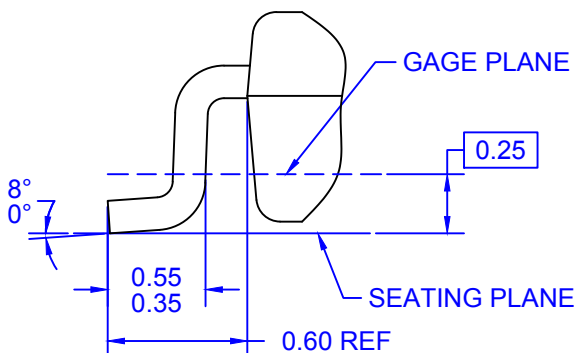
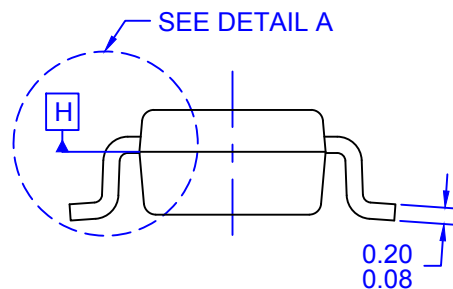
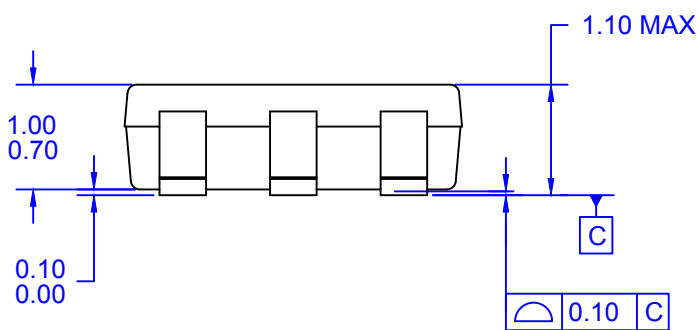
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



**Figure 13. Junction-to-Ambient Transient Thermal Response Curve**



LAND PATTERN RECOMMENDATION



DETAIL A  
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- NOTES: UNLESS OTHERWISE SPECIFIED
- A) THIS PACKAGE CONFORMS TO JEDEC MO-193. VAR. AA, ISSUE E.
  - B) ALL DIMENSIONS ARE IN MILLIMETERS.
  - C) PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.25mm PER END. PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25mm PER SIDE. PACKAGE LENGTH AND WIDTH DIMENSIONS ARE DETERMINED AT DATUM H.
  - D) DRAWING FILE NAME: MKT-MA06AREVF

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