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# FDC2512

## 150V N-Channel PowerTrench® MOSFET

### General Description

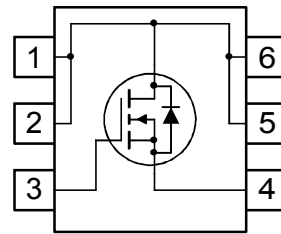
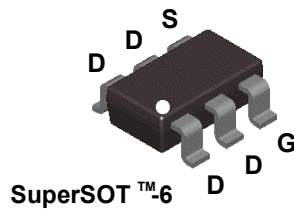
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $R_{DS(ON)}$  and fast switching speed.

### Applications

- DC/DC converter

### Features

- 1.4 A, 150 V.  $R_{DS(ON)} = 425 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$   
 $R_{DS(ON)} = 475 \text{ m}\Omega @ V_{GS} = 6 \text{ V}$
- High performance trench technology for extremely low  $R_{DS(ON)}$
- Low gate charge (8nC typ)
- High power and current handling capability
- Fast switching speed



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain-Source Voltage	150	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous (Note 1a)	1.4	A
	– Pulsed	8	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	13.5	mJ
$P_D$	Maximum Power Dissipation (Note 1a) (Note 1b)	1.6	W
		0.8	
$T_J, T_{stg}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

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

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.252	FDC2512	7"	8mm	3000 units

**Electrical Characteristics** $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off Characteristics**

$BV_{DSS}$	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		147		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSSF}$	Gate–Body Leakage, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA
$I_{GSSR}$	Gate–Body Leakage, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$			-100	nA

**On Characteristics** (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2	2.6	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-5.6		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 1.4\text{ A}$ $V_{GS} = 6.0\text{ V}, I_D = 1.3\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 1.4\text{ A}, T_J = 125^\circ\text{C}$		319 332 624	425 475 875	m $\Omega$
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 5\text{ V}$	4			A
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 1.4\text{ A}$		4		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		344		pF
$C_{oss}$	Output Capacitance			22		pF
$C_{rss}$	Reverse Transfer Capacitance			9		pF
$R_g$	Gate Resistance		0.1	1.4	3.0	$\Omega$

**Switching Characteristics** (Note 2)

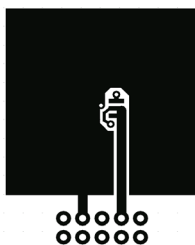
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 75\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		6.5	13	ns
$t_r$	Turn–On Rise Time			3.5	7	ns
$t_{d(off)}$	Turn–Off Delay Time			22	33	ns
$t_f$	Turn–Off Fall Time			4	8	ns
$Q_g$	Total Gate Charge	$V_{DS} = 75\text{ V}, I_D = 1.4\text{ A},$ $V_{GS} = 10\text{ V}$		8	11	nC
$Q_{gs}$	Gate–Source Charge			1.5		nC
$Q_{gd}$	Gate–Drain Charge			2.3		nC

**Drain–Source Diode Characteristics and Maximum Ratings**

$I_S$	Maximum Continuous Drain–Source Diode Forward Current			1.3		A
$V_{SD}$	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 1.3\text{ A}$ (Note 2)		0.8	1.2	V
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 1.4\text{ A},$		45.8		nS
$Q_{rr}$	Diode Reverse Recovery Charge	$d_{IF}/d_t = 300\text{ A}/\mu\text{s}$ (Note 2)		119		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)  $78^\circ\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



b)  $156^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

Scale 1 : 1 on letter size paper

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

3.  $E_{AS}$  of 13.5 mJ is based on starting  $T_J = 25^\circ\text{C}$ ; N-ch:  $L = 3\text{ mH}, I_{AS} = 3\text{ A}, V_{DD} = 150\text{ V}, V_{GS} = 10\text{ V}$ .

## Typical Characteristics

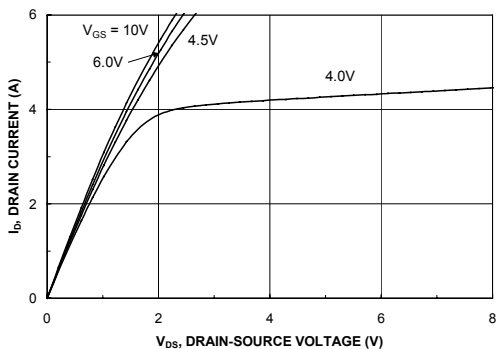


Figure 1. On-Region Characteristics.

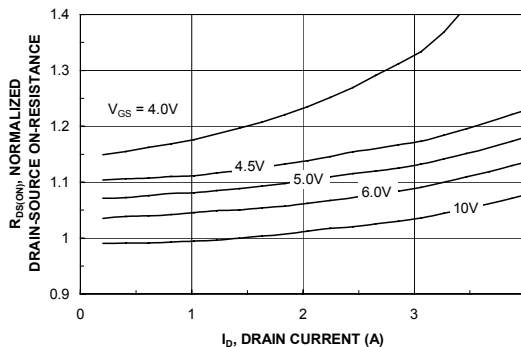


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

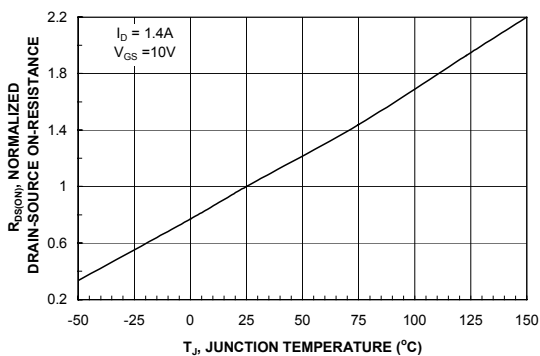


Figure 3. On-Resistance Variation with Temperature.

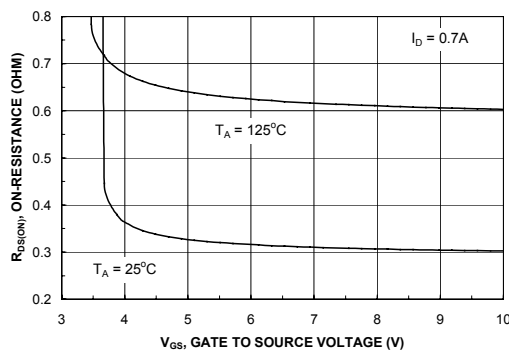


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

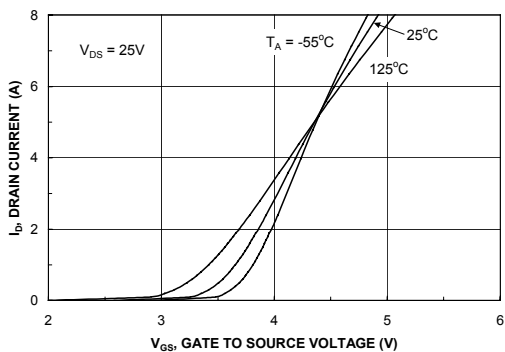


Figure 5. Transfer Characteristics.

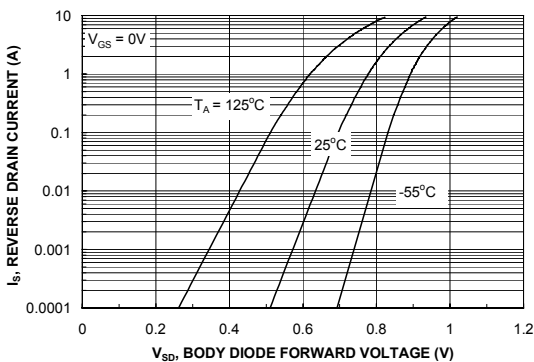


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics

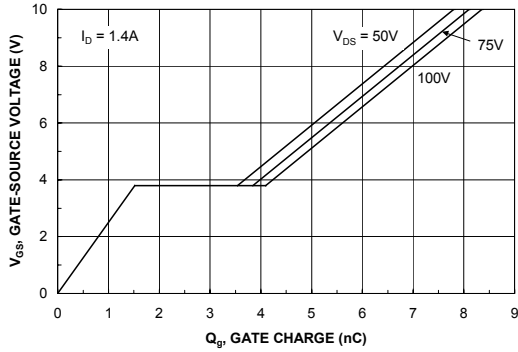


Figure 7. Gate Charge Characteristics.

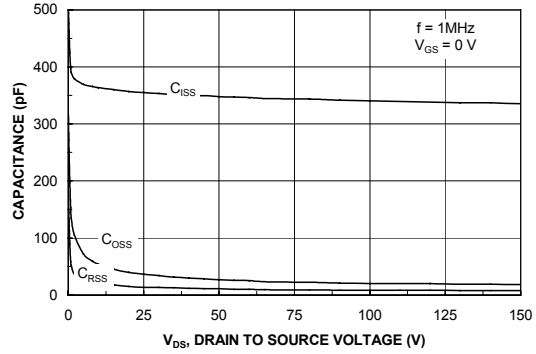


Figure 8. Capacitance Characteristics.

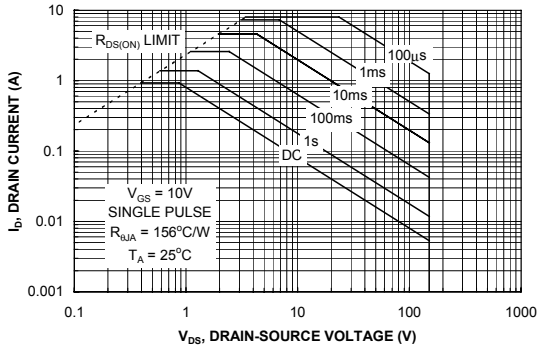


Figure 9. Maximum Safe Operating Area.

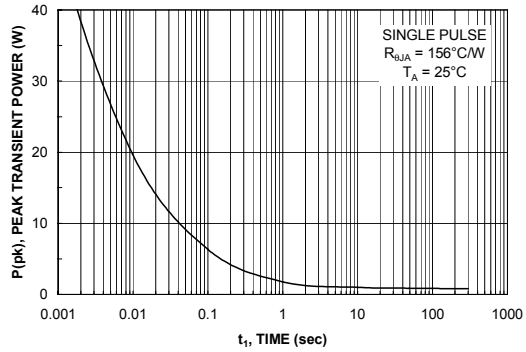


Figure 10. Single Pulse Maximum Power Dissipation.

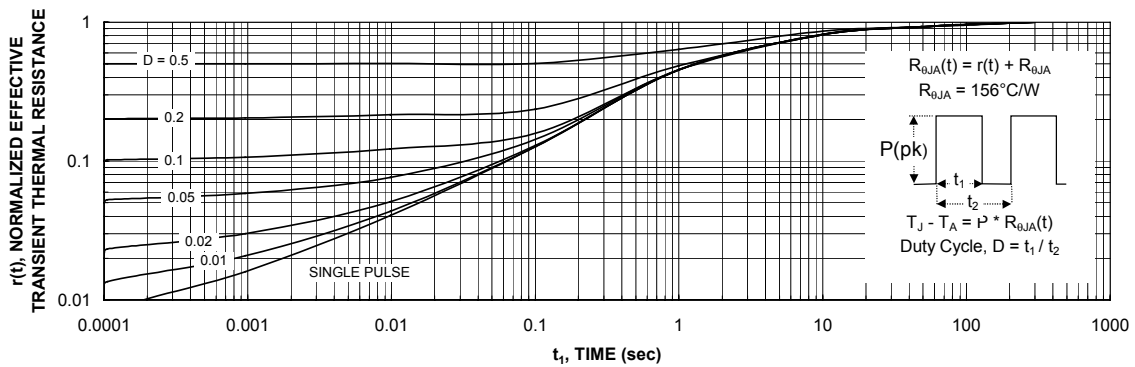
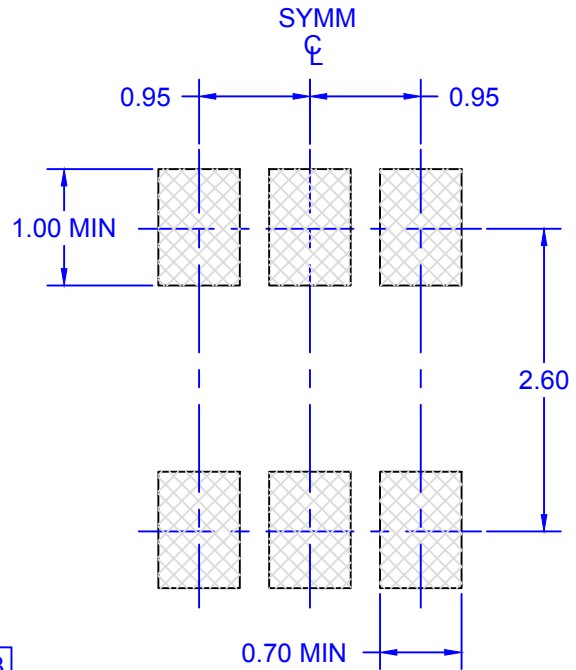
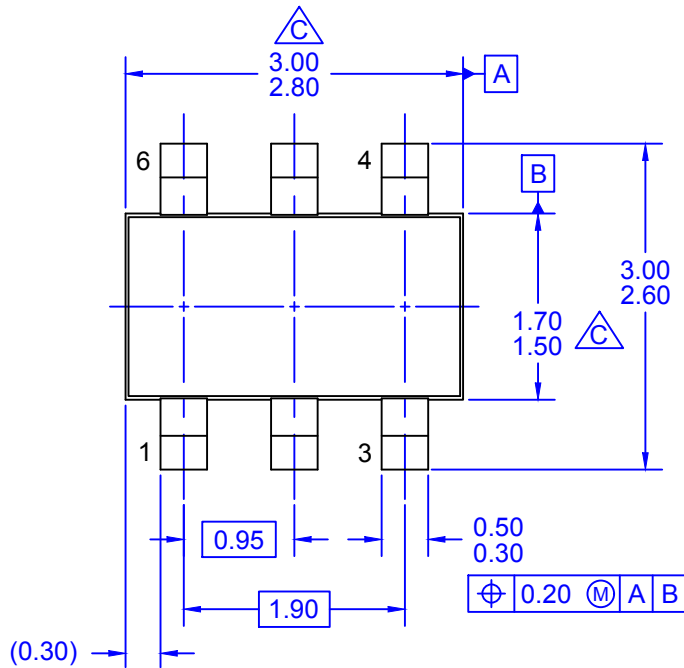


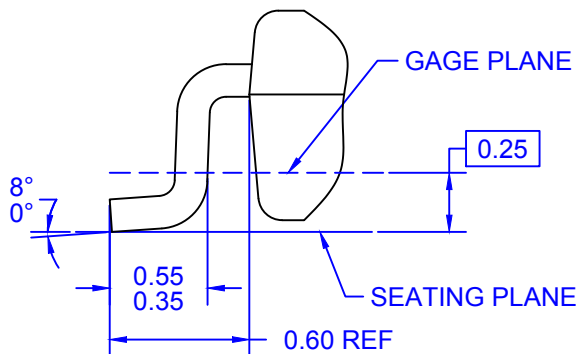
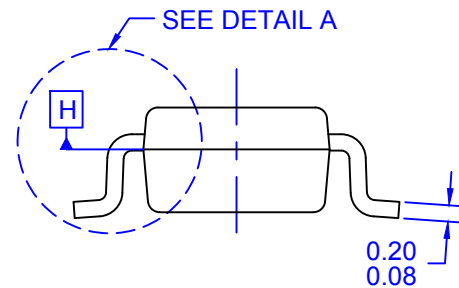
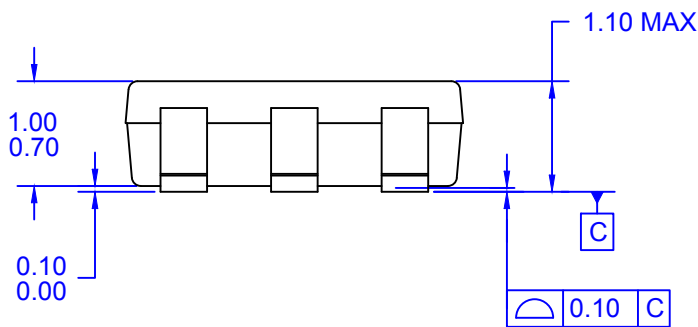
Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b.  
Transient thermal response will change depending on the circuit board design.

# Dimensional Outline and Pad Layout



LAND PATTERN RECOMMENDATION



DETAIL A  
SCALE: 50X

- 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-MA06AREV F

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