



N-Channel Enhancement Mode Power MOSFET **MXD2060K**

## DESCRIPTION

The MXD2060K uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a wide variety of applications.

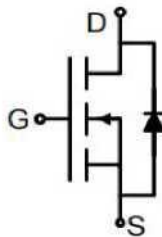
## GENERAL FEATURES

- $V_{DS}=20V$ ,  $I_D=60A$   
 $R_{DS(ON)}(Typ.)=6.2m\Omega @ V_{GS}=2.5V$   
 $R_{DS(ON)}(Typ.)=4.8m\Omega @ V_{GS}=4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

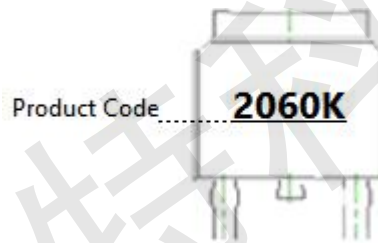
## APPLICATION

- Battery Protection
- Load switch
- Power management

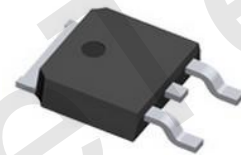
## PINOUT



Schematic diagram



Marking and pin Assignment



TO-252 top view

## ORDERING INFORMATION

Device	Marking	Storage Temperature	Package	Devices Per Reel
MXD2060K	2060K	-55°C to 150°C	TO-252	2500

## KEY PERFORMANCE PARAMETERS ( $T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS}=0V$ )	$V_{DS}$	20	V
Gate-Source Voltage ( $V_{DS}=0V$ )	$V_{GS}$	$\pm 10$	V
Drain Current-Continuous ( $T_C=25^\circ C$ ) <sup>(Note 1)</sup>	$I_D$	60	A
Drain Current-Continuous ( $T_C=100^\circ C$ )	$I_D$	42.5	A
Drain Current-Continuous@Current-Pulsed <sup>(Note 2)</sup>	$I_{DM(pluse)}$	240	A
Maximum Power Dissipation ( $T_C=25^\circ C$ )	$P_D$	50	W
Maximum Power Dissipation ( $T_C=100^\circ C$ )	$P_D$	25	W
Avalanche energy <sup>(Note3)</sup>	$E_{AS}$	156	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ C$

## THERMAL CHARACTERISTIC

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3	$^\circ C/W$

Notes 1. The maximum current rating is package limited.

Notes 2. Repetitive Rating: Pulse width limited by maximum junction temperature

Notes 3. EAS condition:  $T_J=25^\circ C$ ,  $V_{DD}=30V$ ,  $V_G=4.5V$ ,  $R_G=25\Omega$ ,



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**ELECTRICAL CHARACTERISTICS** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
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**On/Off Characteristics**

Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	19.5	22	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=19V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 10V, V_{DS}=0V$	-	-	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.5	0.7	1.1	V
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=10A$	-	38	-	S
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=2.5V, I_D=10A$	-	6.2	9.4	$m\Omega$
		$V_{GS}=4.5V, I_D=15A$	-	4.8	6.3	$m\Omega$

**Dynamic Characteristics**

Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0V,$ $F=1.0MHz$	-	1825	-	pF
Output Capacitance	$C_{oss}$		-	275	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	218	-	pF
Gate resistance	$R_g$	$V_{DS}=0V, V_{GS}=0V,$ $F=1.0MHz$	-	1.3	-	$\Omega$

**Switching Times**

Turn-on Delay Time	$t_{d(on)}$	$V_{GS}=4.5V, V_{DS}=10V,$ $R_L=0.5\Omega, R_{GEN}=3\Omega$	-	5.9	-	nS
Turn-on Rise Time	$t_r$		-	10.2	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	54	-	nS
Turn-Off Fall Time	$t_f$		-	16	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=20A,$ $V_{GS}=4.5V$	-	25.3	-	nC
Gate-Source Charge	$Q_{gs}$		-	2.6	-	nC
Gate-Drain Charge	$Q_{gd}$		-	9.4	-	nC

**Source-Drain Diode Characteristics**

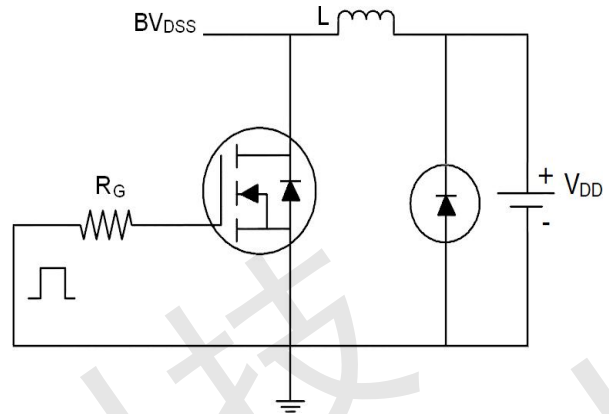
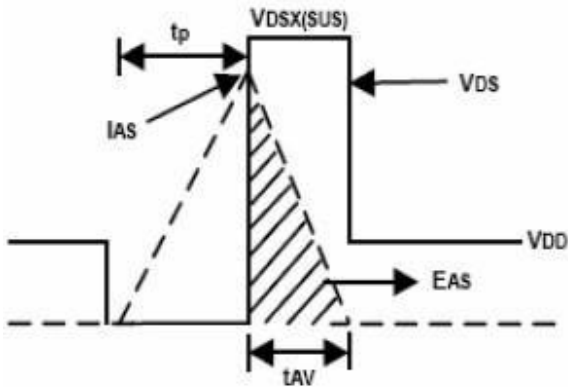
Source-Drain Current(Body Diode)	$I_{SD}$		-	-	60	A
Forward On Voltage	$V_{SD}$	$V_{GS}=0V, I_S=1A$	-	0.78	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F=20A, di/dt=100A/\mu s$	-	26.5	-	nS
Body Diode Reverse Recovery Charge	$Q_{rr}$	$I_F=20A, di/dt=100A/\mu s$	-	25	-	nC



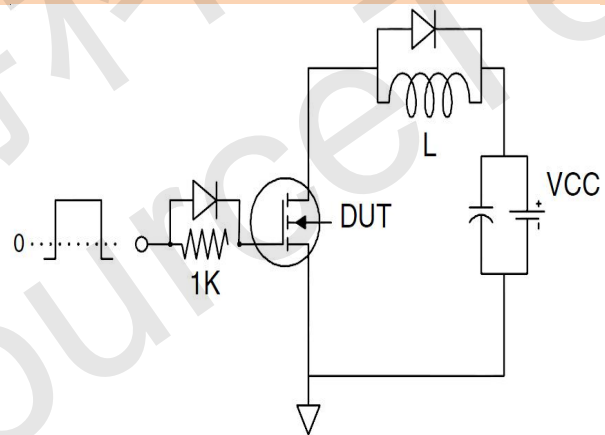
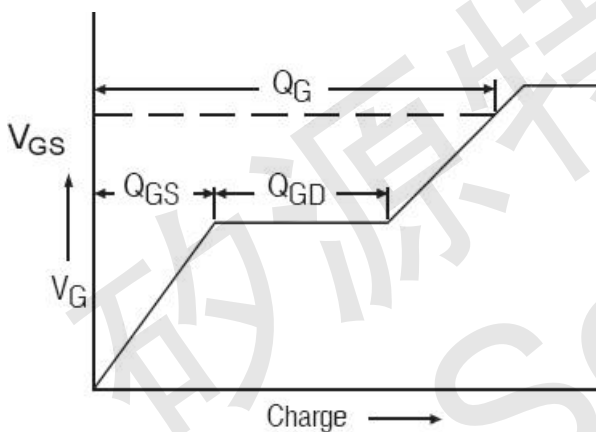
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**TEST CIRCUIT**

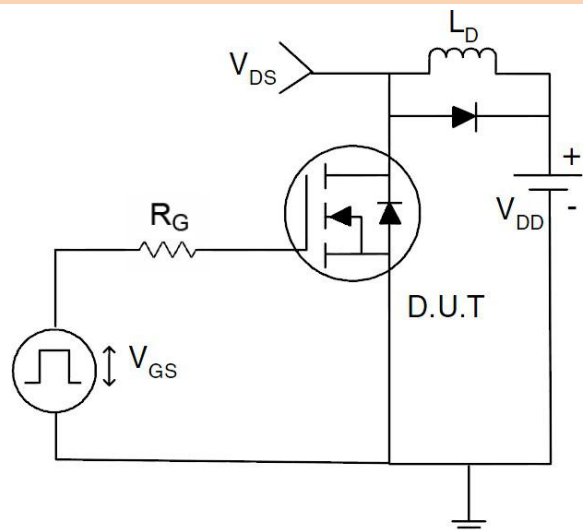
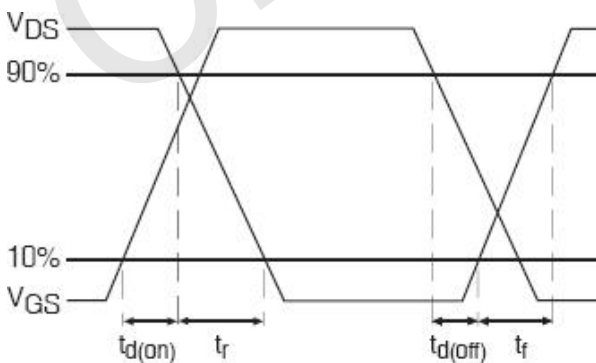
**1) EAS Test Circuits**



**2) Gate Charge Test Circuit**



**3) Switch Time Test Circuit**

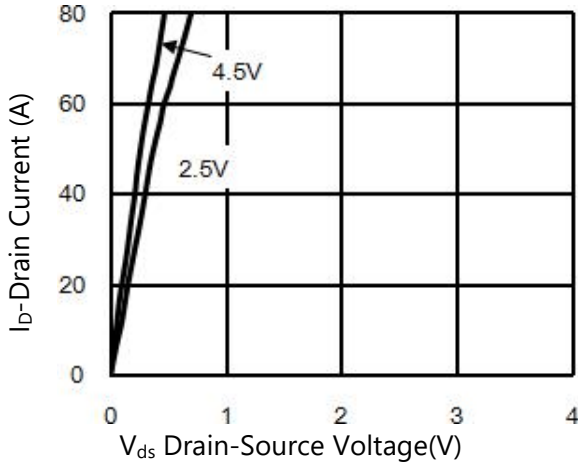




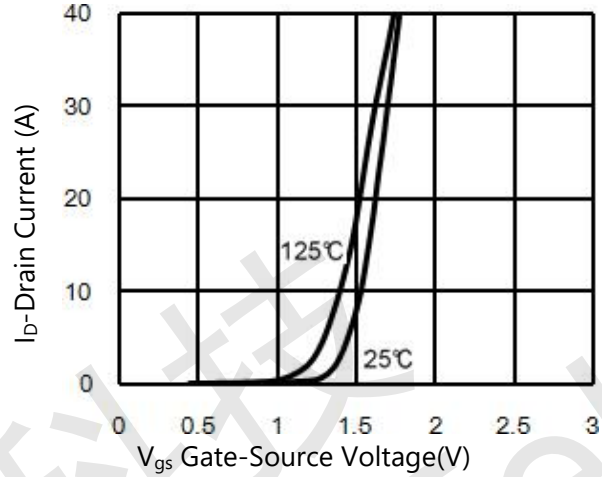
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**TYPICAL PERFORMANCE CHARACTERISTICS**

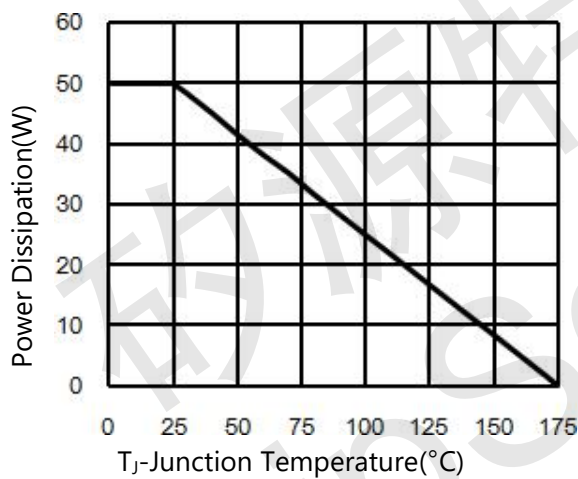
**Figure1. Output Characteristics**



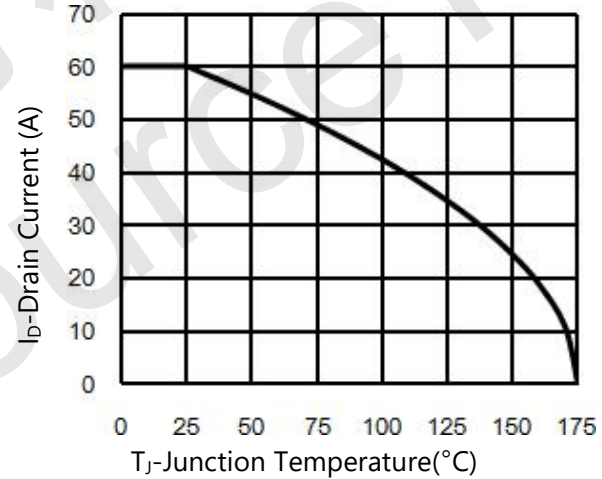
**Figure2. Transfer Characteristics**



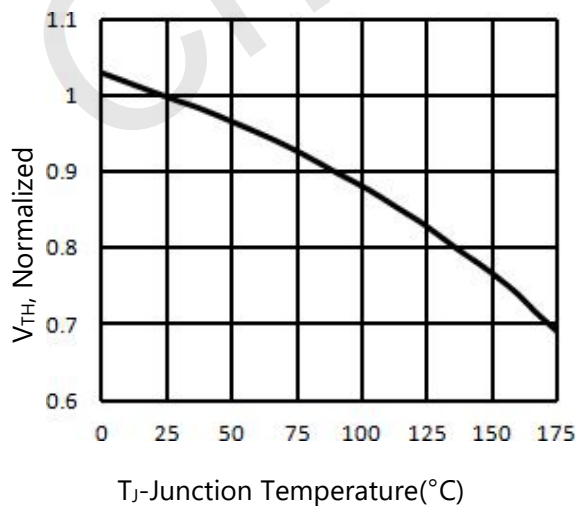
**Figure3. Power Dissipation**



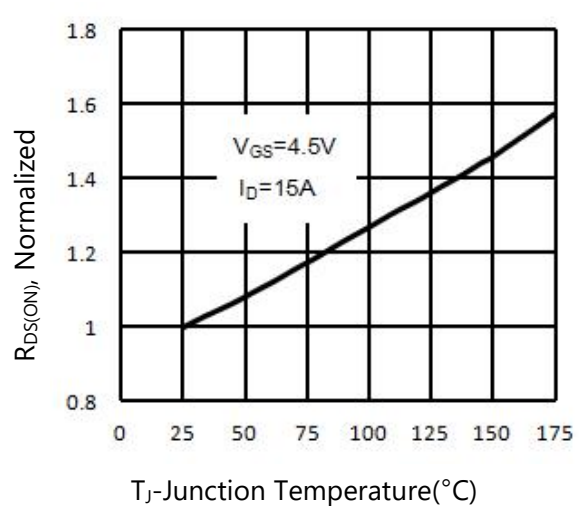
**Figure4. Drain Current**



**Figure5.  $V_{GS(th)}$  vs Junction Temperature**



**Figure6.  $R_{DS(on)}$  vs Junction Temperature**

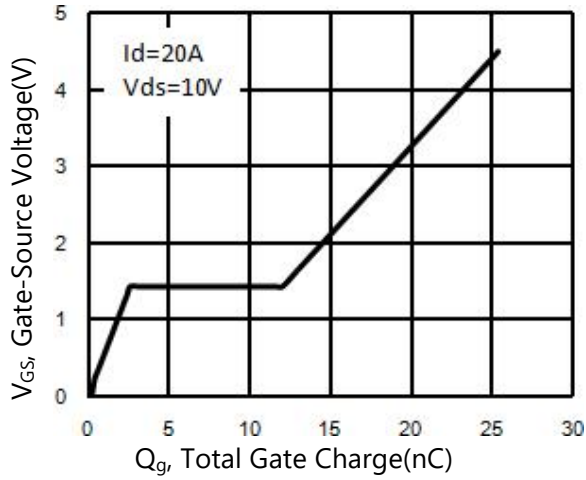




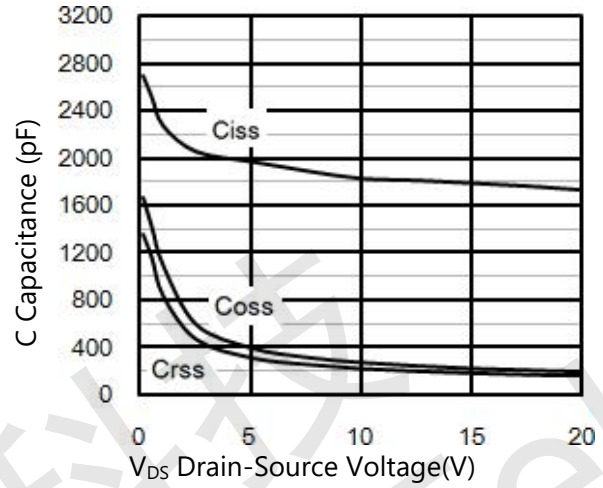
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**TYPICAL PERFORMANCE CHARACTERISTICS**

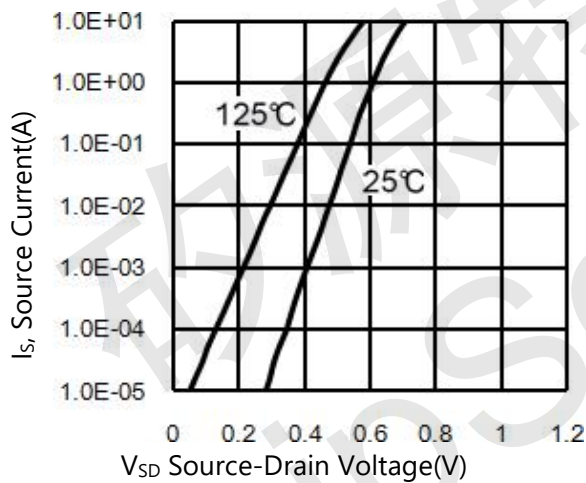
**Figure7. Gate Charge Waveforms**



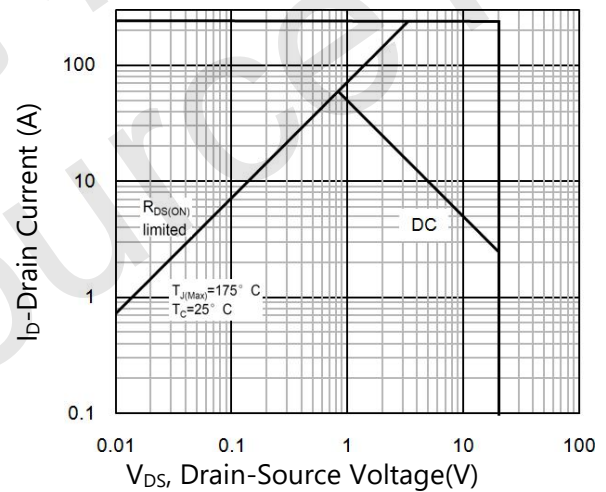
**Figure8. Capacitance**



**Figure9. Body-Diode Characteristics**



**Figure10. Maximum Safe Operating Area**

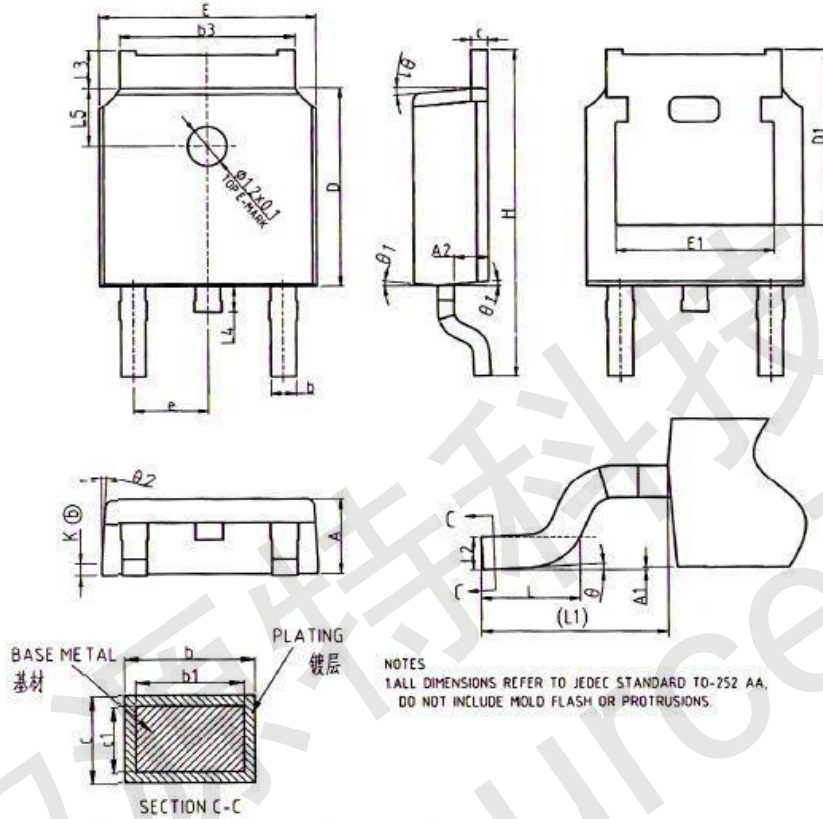




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**PACKAGE INFORMATION**

TO-252



SYMBOL	Dimensions In Millimeters		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.97	1.07	1.17
b	0.72	0.78	0.85
b1	0.71	0.76	0.81
b3	5.23	5.33	5.46
c	0.47	0.53	0.58
c1	0.46	0.51	0.56
D	6.00	6.10	6.20
D1		5.30REF	
E	6.50	6.60	6.70
E1	4.70	4.83	4.92
e		2.286BSC	
H	9.90	10.10	10.30
L	1.40	1.50	1.70
L1		2.90REF	
L2		0.51BSC	
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	1.70	1.80	1.90
θ	0°	-	8°
θ1	5°	7°	9°
θ2	5°	7°	9°
K		0.40REF	