

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (U-MOSVI-H)

# TPC8050-H

Switching Regulator Applications

Motor Drive Applications

DC-DC Converter Applications

- Small footprint due to a small and thin package
- High-speed switching
- Small gate charge:  $Q_{SW} = 9.2 \text{ nC} (\text{typ.})$
- Low drain-source ON-resistance:

$$R_{DS (\text{ON})} = 9.3 \text{ m}\Omega (\text{typ.})$$

- High forward transfer admittance:  $|Y_{fs}| = 40 \text{ S} (\text{typ.})$
- Low leakage current:  $I_{DSS} = 10 \mu\text{A} (\text{max}) (V_{DS} = 60 \text{ V})$
- Enhancement mode:  $V_{th} = 1.3 \text{ to } 2.3 \text{ V} (V_{DS} = 10 \text{ V}, I_D = 0.5 \text{ mA})$

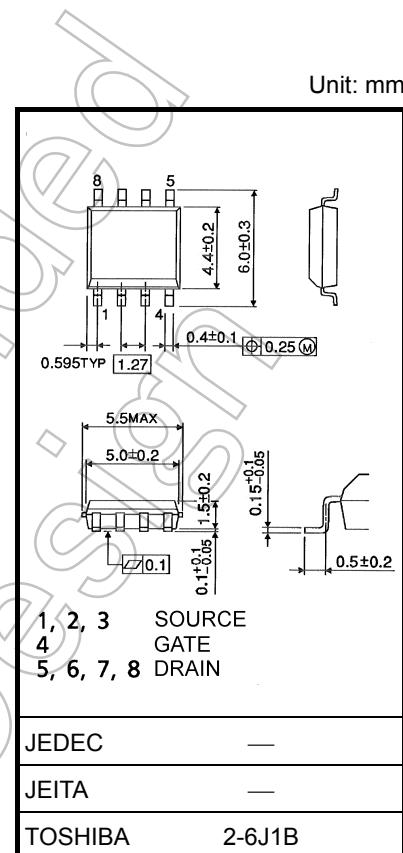
## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	60	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	$V_{DGR}$	60	V
Gate-source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	A
	Pulsed (Note 1)	$I_{DP}$	
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2a)	$P_D$	1.9	W
Drain power dissipation ( $t = 10 \text{ s}$ ) (Note 2b)	$P_D$	1.0	W
Single-pulse avalanche energy (Note 3)	$E_{AS}$	44	mJ
Avalanche current	$I_{AR}$	11	A
Repetitive avalanche energy ( $T_c = 25^\circ\text{C}$ ) (Note 4)	$E_{AR}$	0.05	mJ
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ\text{C}$

Note: For Notes 1 to 4, refer to the next page.

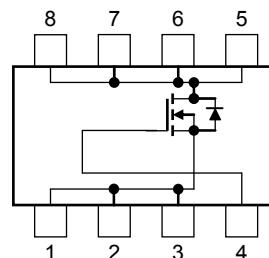
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

This transistor is an electrostatic-sensitive device. Handle with care.



Weight: 0.085g (typ.)

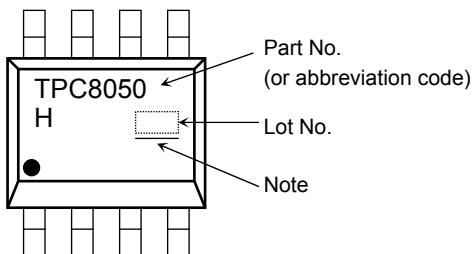
## Circuit Configuration

Start of commercial production  
2008-10

## Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to ambient ( $t = 10$ s) (Note 2a)	$R_{th}$ (ch-a)	65.8	°C/W
Thermal resistance, channel to ambient ( $t = 10$ s) (Note 2b)	$R_{th}$ (ch-a)	125	°C/W

## Marking (Note 5)

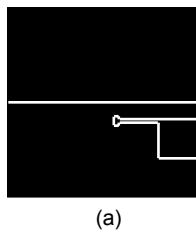


Note : A line under a Lot No. identifies the indication of product Labels  
[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

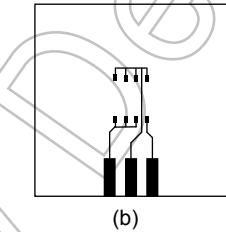
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)

(a)



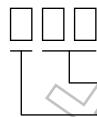
FR-4  
25.4 × 25.4 × 0.8  
(Unit: mm)

(b)

Note 3:  $V_{DD} = 24$  V,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 500 \mu\text{H}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 11$  A

Note 4: Repetitive rating: pulse width limited by maximum channel temperature

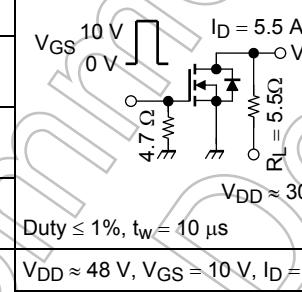
Note 5: \* Weekly code: (Three digits)



Week of manufacture  
(01 for the first week of the year, continuing up to 52 or 53)

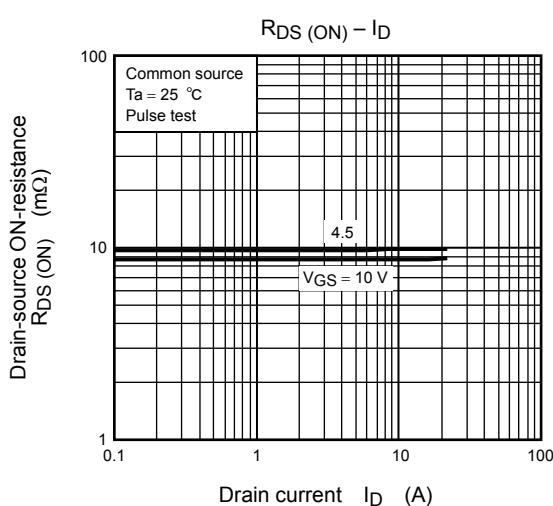
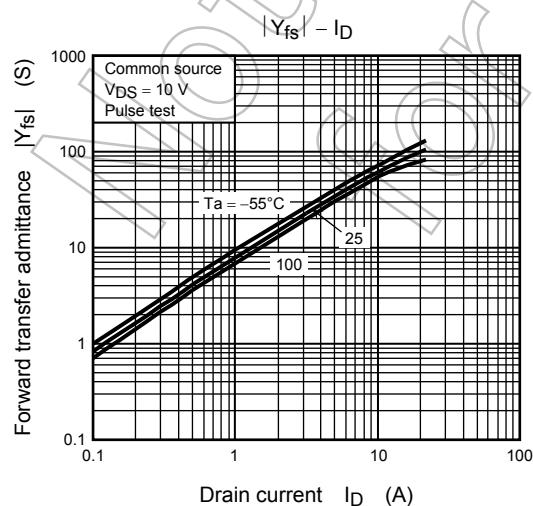
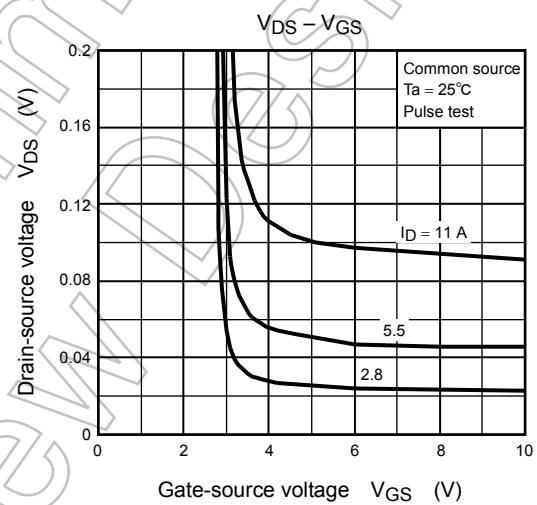
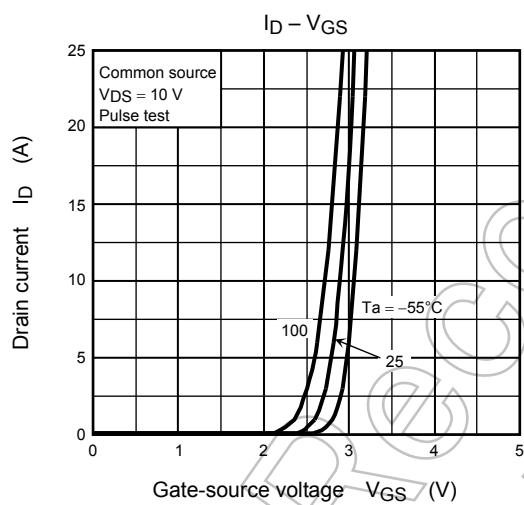
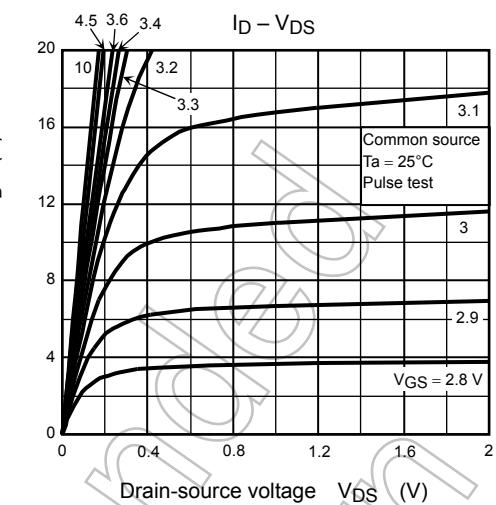
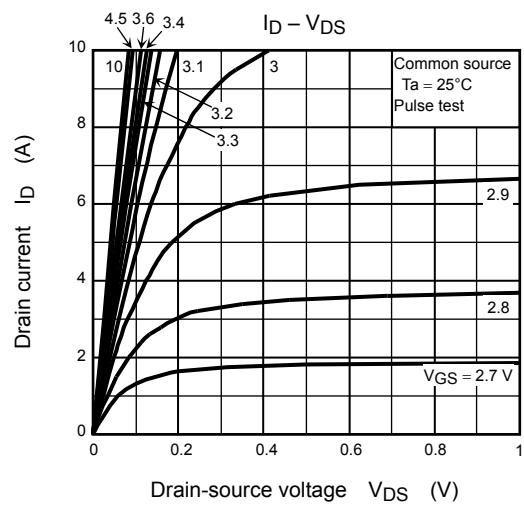
Year of manufacture  
(The last digit of the year)

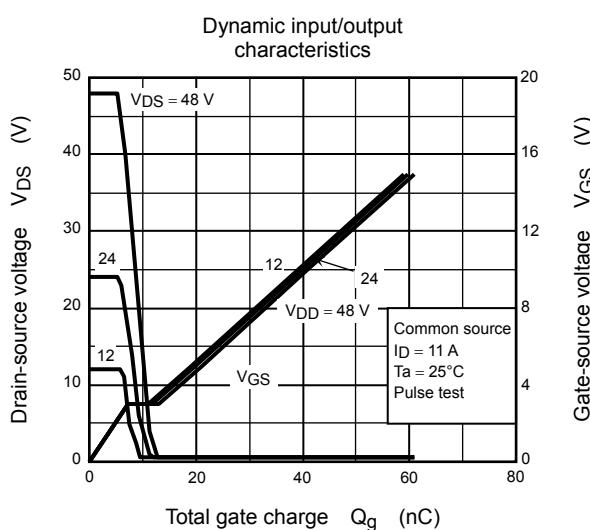
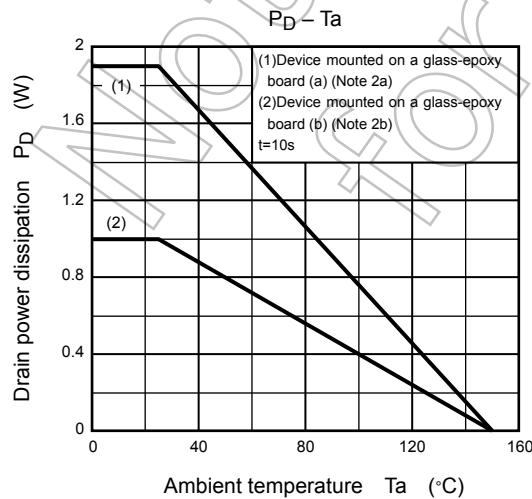
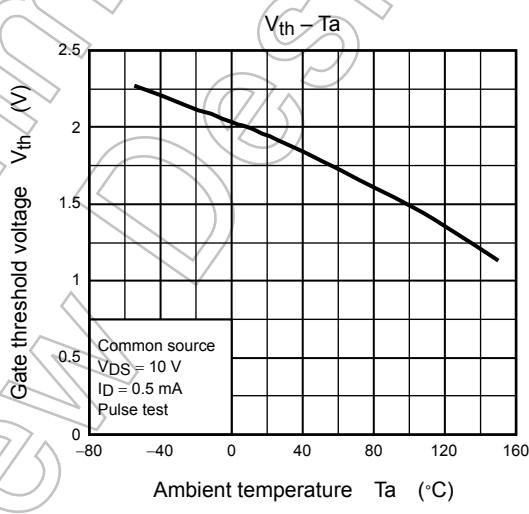
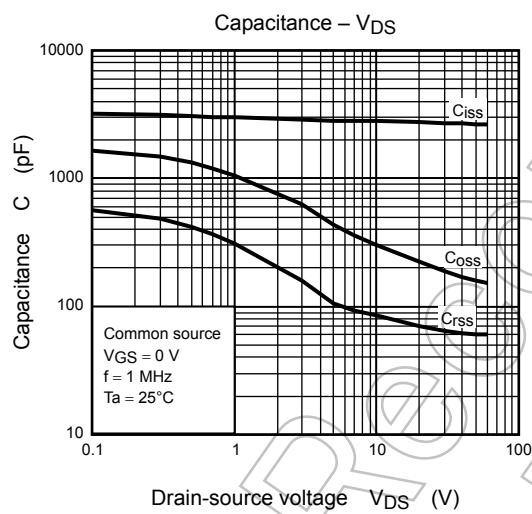
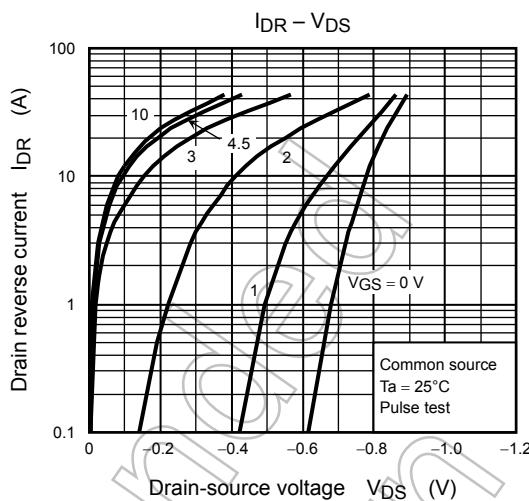
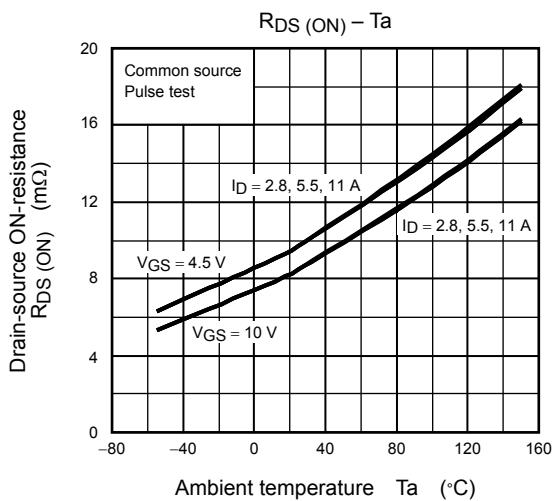
Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

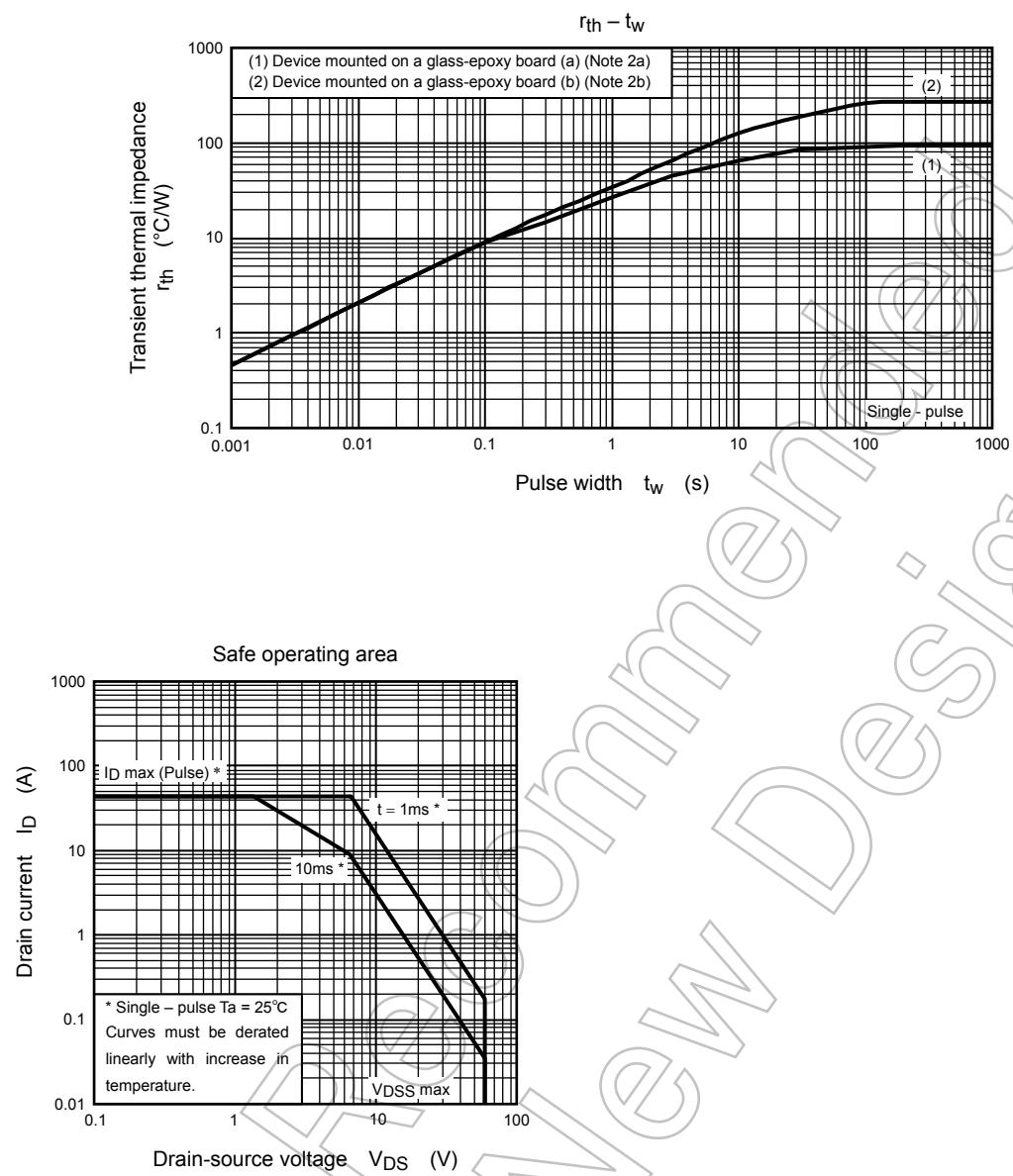
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$	—	—	$\pm 100$	nA
Drain cutoff current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$ , $V_{GS} = 0\text{ V}$	60	—	—	V
	$V_{(\text{BR})\text{DSX}}$	$I_D = 10\text{ mA}$ , $V_{GS} = -20\text{ V}$	45	—	—	
Gate threshold voltage	$V_{th}$	$V_{DS} = 10\text{ V}$ , $I_D = 0.5\text{ mA}$	1.3	—	2.3	V
Drain-source ON-resistance	$R_{DS\text{ (ON)}}$	$V_{GS} = 4.5\text{ V}$ , $I_D = 5.5\text{ A}$	—	10.4	15.6	$\text{m}\Omega$
		$V_{GS} = 10\text{ V}$ , $I_D = 5.5\text{ A}$	—	9.3	14.5	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$ , $I_D = 5.5\text{ A}$	20	40	—	S
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$	—	2590	3365	pF
Reverse transfer capacitance	$C_{rss}$		—	95	140	
Output capacitance	$C_{oss}$		—	300	—	
Gate resistance	$r_g$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$	—	1.0	1.5	$\Omega$
Switching time	Rise time	$t_r$		—	2.5	—
	Turn-on time	$t_{on}$		—	11	—
	Fall time	$t_f$		—	5.7	—
	Turn-off time	$t_{off}$		—	41	—
Total gate charge (gate-source plus gate-drain)	$Q_g$	$V_{DD} \approx 48\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 11\text{ A}$	—	41	—	nC
		$V_{DD} \approx 48\text{ V}$ , $V_{GS} = 5\text{ V}$ , $I_D = 11\text{ A}$	—	21	—	
Gate-source charge 1	$Q_{gs1}$	$V_{DD} \approx 48\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 11\text{ A}$	—	7.3	—	
Gate-drain ("Miller") charge	$Q_{gd}$		—	5.8	—	
Gate switch charge	$Q_{SW}$		—	9.2	—	

Source-Drain Ratings and Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Peak forward current Pulse (Note 1)	$I_{FP}$	—	—	—	44	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 11\text{ A}$ , $V_{GS} = 0\text{ V}$	—	—	-1.2	V







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