

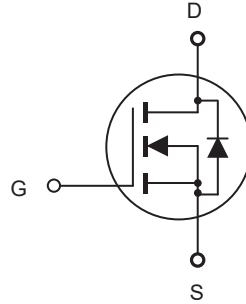


# CED13N65S/CEU13N65S

## N-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- 700V@ $T_{J\max}$ , 12.3A,  $R_{DS(ON)} = 0.32\Omega$  @ $V_{GS} = 10V$ .
- Super high dense cell design for extremely low  $R_{DS(ON)}$ .
- High power and current handling capability.
- RoHS compliant.
- TO-251 & TO-252 package.



### ABSOLUTE MAXIMUM RATINGS $T_C = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Limit	Units
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Drain Current-Continuous @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	$I_D$	12.3	A
		7.8	A
Drain Current-Pulsed <sup>a</sup>	$I_{DM}$	49.2	A
Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$ - Derate above $25^\circ\text{C}$	$P_D$	125	W
		1	W/ $^\circ\text{C}$
Single Pulsed Avalanche Energy <sup>e</sup>	$E_{AS}$	306	mJ
Single Pulsed Avalanche Current <sup>e</sup>	$I_{AS}$	3.5	A
Operating and Store Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

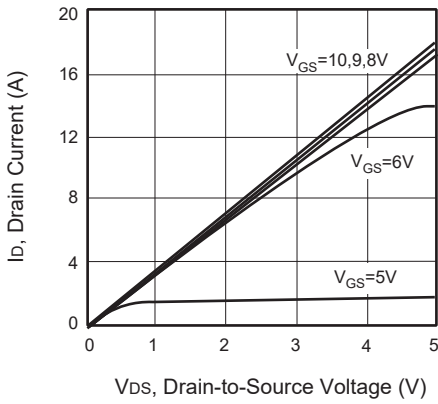
Parameter	Symbol	Limit	Units
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	50	$^\circ\text{C}/\text{W}$



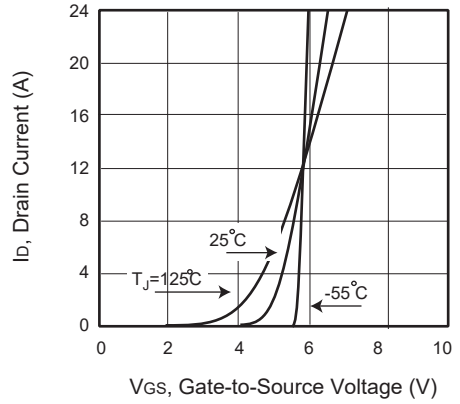
# CED13N65S/CEU13N65S

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

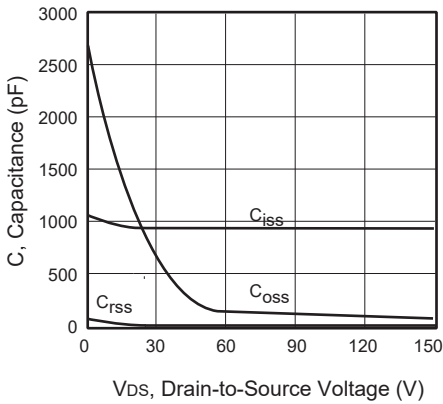
Parameter	Symbol	Test Condition	Min	Typ	Max	Units
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	650			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 650V, V_{GS} = 0V$			1	$\mu A$
Gate Body Leakage Current, Forward	$I_{GSSF}$	$V_{GS} = 30V, V_{DS} = 0V$			100	nA
Gate Body Leakage Current, Reverse	$I_{GSSR}$	$V_{GS} = -30V, V_{DS} = 0V$			-100	nA
<b>On Characteristics</b> <sup>c</sup>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 250\mu A$	2.5		4.5	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 6A$		0.27	0.32	$\Omega$
<b>Dynamic Characteristics</b> <sup>d</sup>						
Input Capacitance	$C_{iss}$	$V_{DS} = 150V, V_{GS} = 0V,$ $f = 1.0\text{ MHz}$		910		pF
Output Capacitance	$C_{oss}$			60		pF
Reverse Transfer Capacitance	$C_{rss}$			15		pF
<b>Switching Characteristics</b> <sup>d</sup>						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 400V, I_D = 6A,$ $V_{GS} = 10V, R_{GEN} = 10\Omega$		30		ns
Turn-On Rise Time	$t_r$			13		ns
Turn-Off Delay Time	$t_{d(off)}$			65		ns
Turn-Off Fall Time	$t_f$			11		ns
Total Gate Charge	$Q_g$	$V_{DS} = 400V, I_D = 1A,$ $V_{GS} = 10V$		25		nC
Gate-Source Charge	$Q_{gs}$			4		nC
Gate-Drain Charge	$Q_{gd}$			10		nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
Drain-Source Diode Forward Current	$I_S$				12.3	A
Drain-Source Diode Forward Voltagec	$V_{SD}$	$V_{GS} = 0V, I_S = 6A$			1.2	V
Reverse Recovery Time	$T_{rr}$	$I_D = 6A, di/dt = 100A/\mu s$		240		ns
Reverse Recovery Charge	$Q_{rr}$			2.35		$\mu C$
Peak Reverse Recovery Current	$I_{rr}$			16.8		A
<b>Notes :</b> a.Repetitive Rating : Pulse width limited by maximum junction temperature. b.Surface Mounted on FR4 Board, $t \leq 10$ sec. c.Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ . d.Guaranteed by design, not subject to production testing. e.L = 50mH, $I_{AS} = 3.5A$ , $V_{DD} = 50V$ , $R_G = 25\Omega$ , Starting $T_J = 25^\circ C$ .						



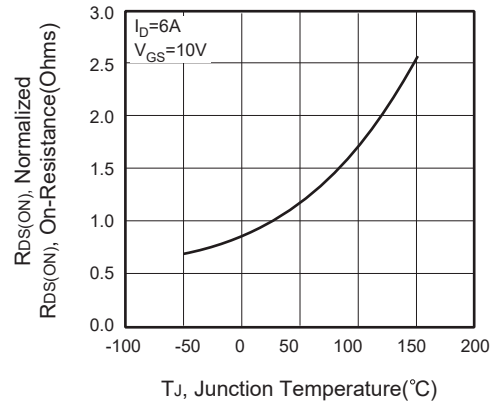
**Figure 1. Output Characteristics**



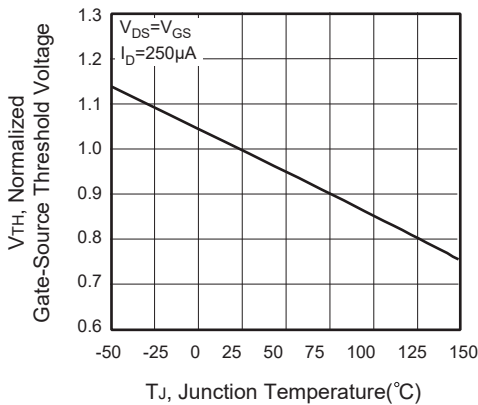
**Figure 2. Transfer Characteristics**



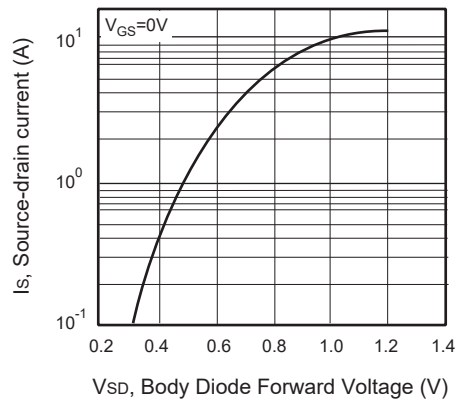
**Figure 3. Capacitance**



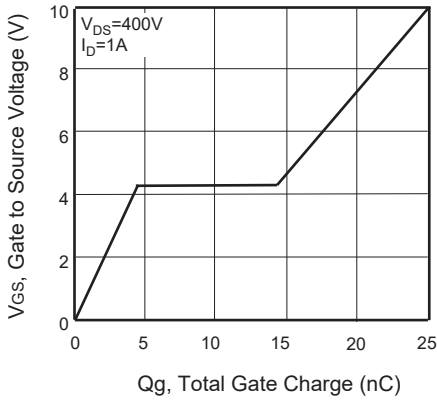
**Figure 4. On-Resistance Variation with Temperature**



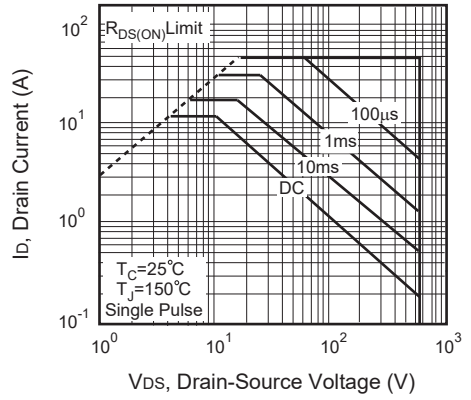
**Figure 5. Gate Threshold Variation with Temperature**



**Figure 6. Body Diode Forward Voltage Variation with Source Current**



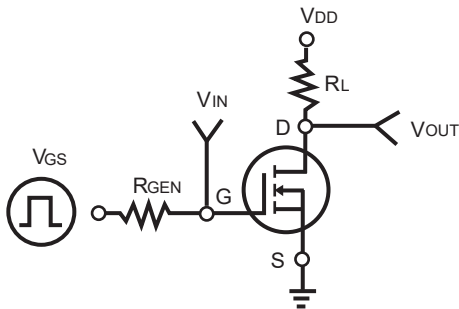
**Figure 7. Gate Charge**



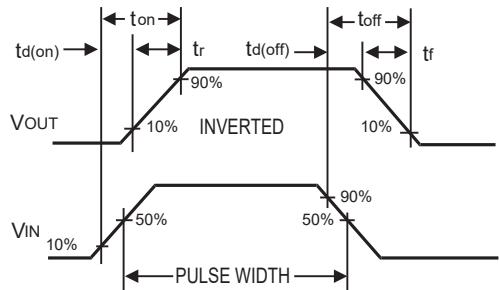
**Figure 8. Maximum Safe Operating Area**



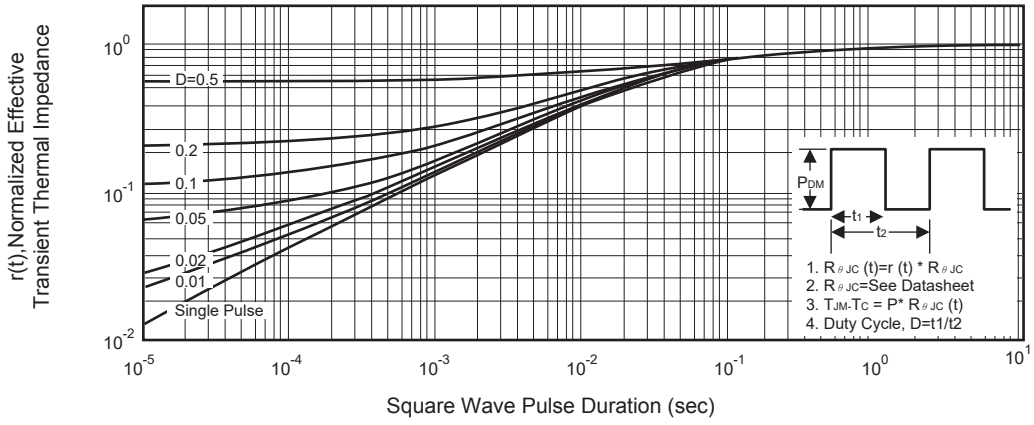
**Figure 9. Breakdown Voltage Variation VS Temperature**



**Figure 10. Switching Test Circuit**



**Figure 11. Switching Waveforms**



**Figure 12. Normalized Thermal Transient Impedance Curve**